

# PLANTS

## For Stormwater Design

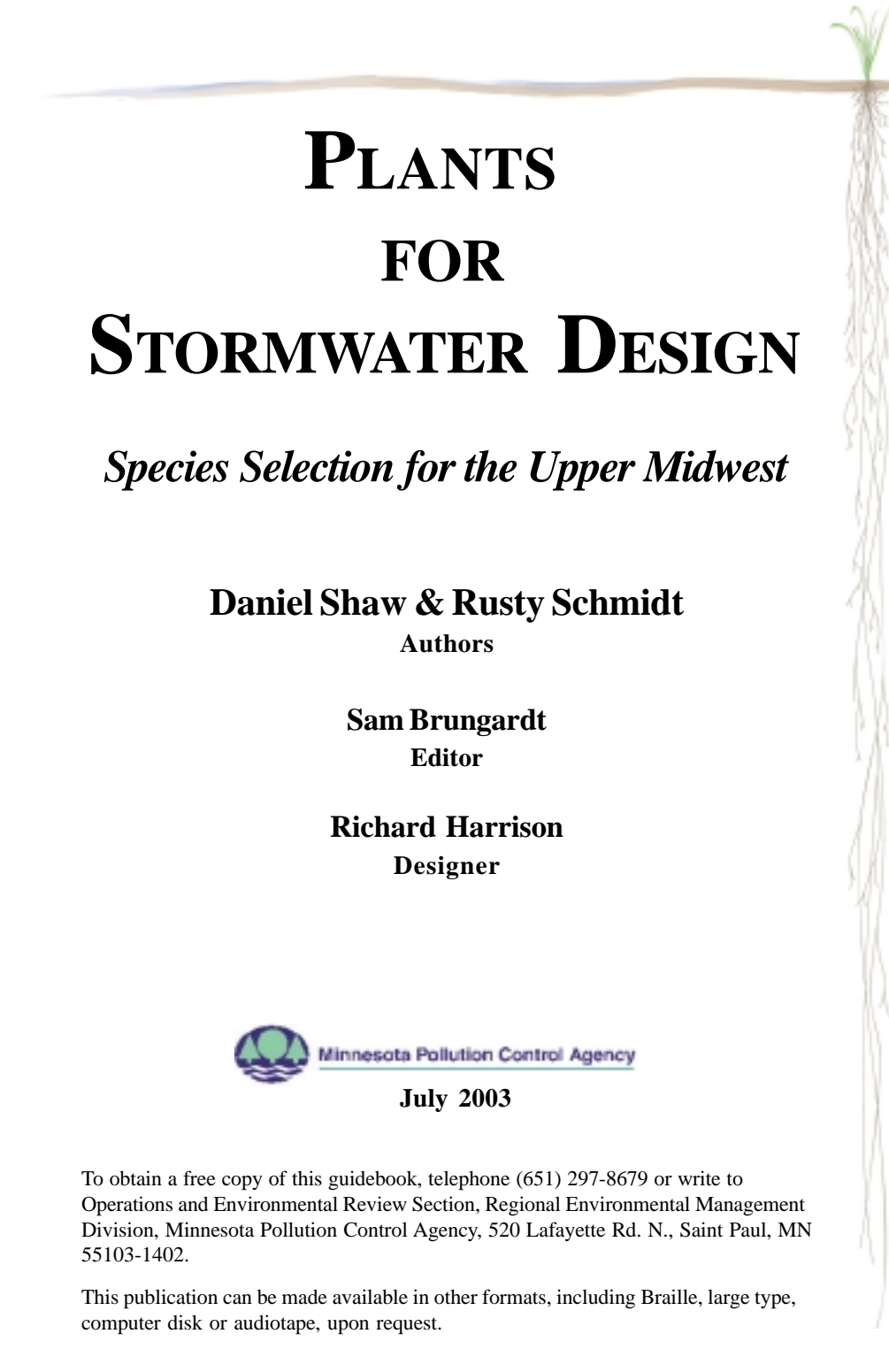
Species Selection for the Upper Midwest

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Daniel Shaw

Rusty Schmidt





# PLANTS FOR STORMWATER DESIGN

*Species Selection for the Upper Midwest*

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## ABOUT THE AUTHORS

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Rusty Schmidt is a wildlife biologist and landscape ecologist with 10 years of natural resource experience, having spent approximately eight years with the Minnesota Department of Natural Resources and two years at URS. He conducts inventories and evaluations for game and non-game wildlife species and has conducted function and value assessments for wetlands and woodlands. Schmidt is also very involved in designing and constructing alternative methods for managing surface water runoff in an environmentally conscious way. He has created designs for restorations, rainwater gardens, bio-infiltration swales and bioretention areas. His Cedar Pond project is featured at the end of this guidebook.



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*TURTLEHEAD*

## INTRODUCTION

In recent years interest has increased in the use of innovative methods to retain and treat stormwater. These methods, often called stormwater management practices (MPs), rely on natural processes, such as microbial activity, filtration, infiltration, denitrification, nutrient reduction and evapotranspiration, to attain water-quality goals.

Although technical information is available on the design of many types of stormwater MPs, little information is currently available on plant species appropriate for these systems. This book has been developed to guide designers through the process of selecting plant

species for a variety of stormwater MPs.




Photo: Dan Shaw

*RAIN WATER GARDEN*

Plant species included in this book have been chosen based on their availability, presence in the Upper Midwest before European settlement, aesthetic properties and functional abilities within stormwater MPs. Native plants are the focus of the book and are recommended exclusively due to their hardiness, and the wide variety of functions they provide. See page 61 for a complete list of species included in the book.

This guidebook focuses on the selection of plant species that will optimize landscape function. The beneficial functions plants perform in the landscape are varied and complex, and range from providing habitat for beneficial microbes to physically inhibiting the flow of stormwater. The ability of plants to intercept and hold rainwater and to decrease water flow with stalks, stems, branches and foliage is one of the better recognized functions of vegetation, but there are many others (MPCA 2000). In many stormwater systems, native vegetation provides habitat for amphibians, reptiles, birds and insects. Native plants also take



nutrients into their tissues and their roots provide a substrate for growth of bacteria and algae, which are responsible for nutrient cycling and organic degradation. In addition, decaying plant matter supplies fixed organic carbon and food for microbes (Fassman et al. 2001). Native plants also contribute to the water cycle by returning water to the atmosphere through evapotranspiration. In stormwater MPs such as vegetated filter strips, the roots of native species increase soil strength and stability. Another function of native plants, particularly in urban areas, is to add aesthetic value to stormwater systems. The vegetation softens the appearance of structures and shoreline edges, adds interest through line, texture and contrast, and provides color and harmony with the natural environment (Fassman et al. 2001, MPCA 2000).

Selecting plants for stormwater MPs is not a simple process. Stormwater systems are often affected by a number of environmental conditions that are not conducive to plant growth and survival. Some of these environmental conditions include prolonged flooding, fluctuating water levels, sedimentation and pollutants. To complicate matters, invasive species are sometimes better adapted to the above-mentioned conditions and ongoing plant management may be important for project success.

### **Tools included in this book to aid plant selection**

- Information about environmental factors that influence wetland plants
- Description of retention, detention, infiltration, wetland and filtration BMPs and species lists for individual types of BMPs
- A plant matrix to select plants appropriate for various environmental conditions
- Information and photographs of 131 plant species
- Hydrology and species information for three stormwater projects in the Twin Cities area

## USING THIS GUIDEBOOK

This book was developed to lead designers through a plant selection process. First, **environmental factors** that influence plants in stormwater systems are presented. The potential influence of these environmental factors should be investigated during the site-analysis

process and will be useful information for the selection of stormwater management practices (MPs).



INFILTRATION SWALE  
(ADAPTED FROM CITY OF PORTLAND)


Next, information is presented for **common types of MPs and plant considerations are provided for each**. The information about stormwater MPs corresponds to design information in the *Minnesota Urban Small Sites BMP Manual, Stormwater Best Management Practices for Cold Climates* (Barr 2001) and the *Protecting Water Quality in Urban Areas, Best Management*

*Practices for Dealing with Storm Water Runoff from Urban, Suburban and Developing Areas of Minnesota* manual (MPCA 2000).

Only stormwater MPs that incorporate vegetation are included in this guidebook.

In addition to a discussion of planting considerations for each system, **plant lists** are provided. These lists include a large number of species for each stormwater MP. Many species were included to ensure that plant options are available to cover as many potential site conditions as possible. The plant lists are arranged by scientific name and range from mesic prairie species to emergent wetland plants. To help designers





refine their plant lists for a project, **detailed information is provided for all of the 131 species that are included in the plant lists.** Page numbers are provided in the plant lists referring to the more detailed information for each plant species located in the Plant Species for Stormwater Management Practices section of this guidebook.

### **Information for each plant includes**

- Habitat/plant community and type of system where the plant can be used
- Geographic range
- Plant description
- Normal water level for which the species is adapted
- Fluctuation tolerance
- Sensitivity of other tolerances
- Design considerations
- Wildlife use
- Nursery/plant information
- Planting techniques
- Indicator status

**Flood tolerance charts** that correlate water level and duration are presented to demonstrate how long each species can remain inundated. These charts were developed from available research, site observations and professional judgement and review.

A **plant matrix** summarizing information for each plant starts on page 66. The plant matrix has been developed from information for each of the 131 species in the guidebook. The matrix will aid in plant selection for a number of different environmental conditions and stormwater management practices.

The authors gathered **plant composition and hydrology information for three stormwater projects** in the Twin Cities area. Plant community success and structure for each case study project is presented in appendix 2. This information should be useful to designers in making decisions about plant selection.



## ENVIRONMENTAL INFLUENCES ON PLANTS

Many environmental factors affect plant growth and survival. These factors should be considered during project planning (particularly during plant selection). This guidebook is designed for the selection of plants after stormwater MPs have been chosen for a site. However, many site characteristics that relate to plant growth should also be considered when stormwater MPs are being selected. A thorough site analysis is necessary to compile information to aid in species selection.


### General site conditions to investigate during site analysis

- Texture, organic content and pH of the soil
- Anticipated water levels or soil moisture
- Adjacent plant communities
- Slopes
- Surrounding weedy vegetation
- Amount of sun or shade
- Aspect (north-, south-, east- or west-facing slope)

Several additional environmental factors can significantly affect plant growth in stormwater projects. The following section provides detailed information about these factors. The potential influence that each of these may have on a project should be investigated thoroughly during site analysis to aid in the plant-selection process.

### Environmental threats to investigate

- |                            |                   |
|----------------------------|-------------------|
| • Flood depth and duration | • Nutrients       |
| • Low water levels         | • Salt            |
| • Flood frequency          | • Turbidity       |
| • Wave energy              | • Erosion         |
| • Sediment loads           | • Invasive plants |
| • Pollutants and toxins    | • Herbivores      |



**Flood Depth and Duration** Flood depth and duration can significantly influence the growth and survival of vegetation. Flooding particularly influences plants in detention basins and wetland systems that receive a significant amount of water during storms.

The effect of flooding on plants includes the inhibition of seed germination and vegetative reproduction, changes in plant anatomy and mortality. In plants that are not adapted to flooding, leaf and fruit formation and growth can be suppressed, premature leaf abscission and senescence can result, and shoot dieback and decreased cambial

growth can occur in woody plants. Flooding can also inhibit root formation and branching as well as growth of existing roots and mycorrhizae. It may also lead to decay of the root system.




Photo: Rusiy Schmidt

*URBAN STREAM*

Flooding can often cause many physiological changes in plants: photosynthesis and transport of carbohydrates are inhibited, absorption of macronutrients (nitrogen, phosphorus and potassium, or N, P and K) is decreased due to root mortality, mycorrhizae may be lost, stomata may close and root metabolism may be suppressed. The hormonal balance in plants can also be altered by

increases in ethylene (Kozlowski 1997).

Despite the negative influences of flooding, many plant species have developed physiological and anatomical adaptations that allow them to survive in flooded conditions. These adaptations include metabolic adaptations, oxygen transport and rhizospheric oxidation, hypertrophied lenticels, aerenchyma tissue and adventitious roots.



**Metabolic adaptations.** Several metabolic adaptations to flooding are utilized by plants. They include control of energy metabolism, availability of abundant energy resources, provision of essential gene products and synthesis of macromolecules and protection against post-anoxic injury (Kozłowski 1997).

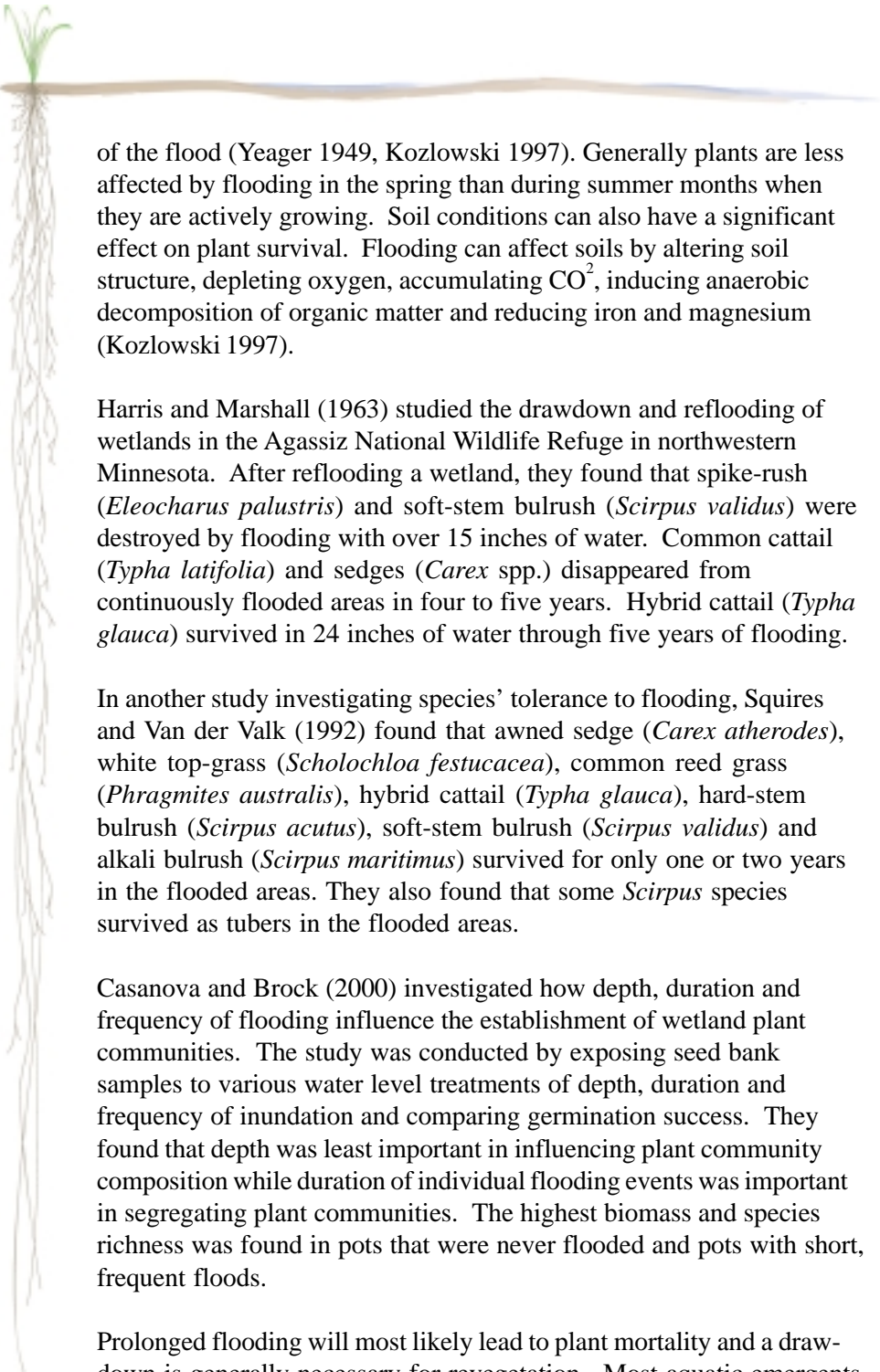
**Oxygen transport and rhizospheric oxidation.** This is the capacity of plants to absorb and transport oxygen from above-ground tissues to roots growing in oxygen-scarce environments. Oxygen transport is aided by hypertrophied lenticels, aerenchyma tissues and adventitious roots (Kozłowski 1997).

**Aerenchyma tissue.** This root and stem tissue is permeated with large intercellular spaces. Species that do not respond to soil anaerobiosis by enlarging their internal air spaces typically undergo anoxia in their roots (Kozłowski 1997).

**Adventitious roots.** Adventitious roots are specialized roots growing at or just above the water or ground surface that increase the flood tolerance of plants. Adventitious roots increase water absorption, assist with oxygen absorption, transform some toxins to less harmful compounds and increase the supply of root-synthesized gibberellins and cytokinins to the leaves (Kozłowski 1997). Adventitious roots may allow species such as buttonbush and black willow to persist in early successional environments characterized by fluctuating water levels and sediment levels (Donovan et al. 1988).

Seedlings and plants that are totally submerged are the most susceptible to flood-related mortality. Photosynthesis is limited or nonexistent in times of complete submergence except for plants that are adapted to submerged conditions. Seedlings are particularly susceptible to flood stress because they generally have fewer reserves to draw upon during stressful conditions. Seedlings are also susceptible to sediment deposition and scouring. Kennedy and Krinard (1974) found that tree seedlings were killed in a flood whereas trees at least one year old survived.

Other factors that can influence a plant's resistance to flooding and saturated soil include its age and condition and the timing and duration



of the flood (Yeager 1949, Kozlowski 1997). Generally plants are less affected by flooding in the spring than during summer months when they are actively growing. Soil conditions can also have a significant effect on plant survival. Flooding can affect soils by altering soil structure, depleting oxygen, accumulating CO<sup>2</sup>, inducing anaerobic decomposition of organic matter and reducing iron and magnesium (Kozlowski 1997).

Harris and Marshall (1963) studied the drawdown and reflooding of wetlands in the Agassiz National Wildlife Refuge in northwestern Minnesota. After reflooding a wetland, they found that spike-rush (*Eleocharus palustris*) and soft-stem bulrush (*Scirpus validus*) were destroyed by flooding with over 15 inches of water. Common cattail (*Typha latifolia*) and sedges (*Carex* spp.) disappeared from continuously flooded areas in four to five years. Hybrid cattail (*Typha glauca*) survived in 24 inches of water through five years of flooding.

In another study investigating species' tolerance to flooding, Squires and Van der Valk (1992) found that awned sedge (*Carex atherodes*), white top-grass (*Scholochloa festucacea*), common reed grass (*Phragmites australis*), hybrid cattail (*Typha glauca*), hard-stem bulrush (*Scirpus acutus*), soft-stem bulrush (*Scirpus validus*) and alkali bulrush (*Scirpus maritimus*) survived for only one or two years in the flooded areas. They also found that some *Scirpus* species survived as tubers in the flooded areas.

Casanova and Brock (2000) investigated how depth, duration and frequency of flooding influence the establishment of wetland plant communities. The study was conducted by exposing seed bank samples to various water level treatments of depth, duration and frequency of inundation and comparing germination success. They found that depth was least important in influencing plant community composition while duration of individual flooding events was important in segregating plant communities. The highest biomass and species richness was found in pots that were never flooded and pots with short, frequent floods.

Prolonged flooding will most likely lead to plant mortality and a draw-down is generally necessary for revegetation. Most aquatic emergents need low water levels or complete removal of water from a basin for

seeds to germinate. The physiological processes necessary for germination require oxygen. Since flooding restricts oxygen availability, it also prevents germination from occurring (Kozlowski 1997). Linde (University of Michigan 1974) found that cattail (*Typha* spp.), sweet flag (*Acorus calamus*), burreed (*Sparganium* spp.), bulrush (*Scirpus* spp.), Walter's millet (*Echinochloa walteri*), smartweed (*Polygonum* spp.), willow (*Salix* spp.) and flatsedge (*Cyperus* spp.) germinated most successfully when mud flats were exposed by drawdowns. Harris and Marshall (1963) determined that it is desirable to induce drawdowns in wetlands with continuous standing water every five or six years to maintain emergent cover.



CUP PLANT





Photo: Rusiy Schmidt

*CARDINAL FLOWER*

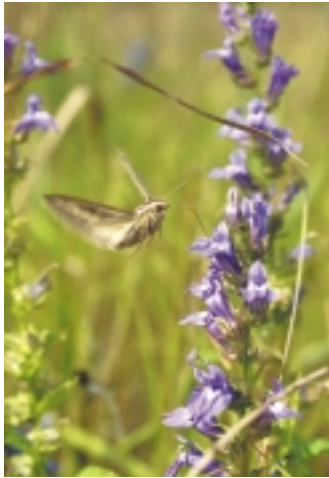


Photo: Paul Jackson

*BLUE LOBELIA*

**Low Water Levels** Prolonged low water levels can also stress plants within wetlands and stormwater systems. Most wetland plants are not well adapted to retaining moisture during dry conditions. In areas of open water that become dry, submergent species are generally replaced by emergent species. Emergent species have root systems such as large rhizomes and tubers that make them resistant to erosion by waves and ice as well as changes in water level.

Submergents, however, devote most of their biomass to above-ground structures and cannot survive prolonged periods of drying (Wetzel

1983). In a study of aquatic vegetation of the St. Lawrence River, Hudson (1997) found that emergent vegetation was not affected by a one-year drop in water levels whereas submerged plants did not survive.




Photo: Rusty Schmidt

DRY POND

A variety of short-lived, early successional species are also well adapted to low water levels. Species that germinate quickly on exposed mud flats and are common in seasonally flooded basins include smartweed (*Polygonum* spp.), flatsedge (*Cyperus* spp.), spikerush (*Eleocharis* spp.) and beggartick (*Bidens cernua*). If water levels remain low, these species are generally replaced with perennial grasses and forbs.

**Flood Frequency** The effect of flood frequency and accompanying water fluctuations on plants has not been studied as thoroughly as that of flooding depth and duration, but it is believed to be a major plant stressor. Galatowitsch et al. (1997) found that hydrologic alterations by stormwater could reduce native perennial cover to the





same extent as cultivation in wet meadows. They discovered that less than 25 percent of the relative abundance of species in stormwater-impacted wetlands is comprised of species that are characteristic of unimpacted sites. Examples of species not found in impacted wetlands included slender sedge (*Carex lasiocarpa*), Canada blue-joint grass (*Calamagrostis canadensis*) and prairie cord grass (*Spartina pectinata*). It is not known whether altered water chemistry, water fluctuations or both are responsible for the plant community changes observed. Reed canary grass (*Phalaris arundinacea*), an invasive species found in many impacted sites, may have an advantage because



Photo: Rusty Schmidt

WETLAND EDGE

it can grow in flooded conditions as well as in relatively dry soils. Husveth (1999) found that sedge meadow species were more prevalent in low-fluctuation wetlands than in high-fluctuation wetlands while mudflat annual

species were more common to high-fluctuation wetlands than low-fluctuation wetlands.

In Montgomery County, Maryland, Shenot (1993) conducted a study to investigate the persistence of wetland species planted along the aquatic bench (a plateau, 3-18 inches deep, designed to optimize area for emergent species) of three stormwater ponds two to three years after planting. The ponds were planted with six to eight species of plants in single-species clusters with an average density of four plants per square meter. Two ponds were extended detention ponds with periodic inundation of 3-6 feet. Eighty-two percent of the planted species persisted in the ponds after two to three years. Factors believed to contribute to plant death included frequency and depth of inundation, nutrient-poor inorganic soils, steep bench slopes and predation by ducks. Thirty-five to 80 wetland plant species established as volunteers in each of the ponds (Shenot 1993, Schueler 2000).




Relative Persistence of Eight Species of Wetland Plants on the Aquatic Bench (Shenot, 1993)		
	<i>Persistence</i>	<i>Spread</i>
Sweet flag ( <i>Acorus calamus</i> )	Good	Limited
Arrow arum ( <i>Peltandria virginia</i> )	Poor	None
Pickerelweed ( <i>Pontederia cordata</i> )	Good	Moderate
Arrowhead ( <i>Sagittaria latifolia</i> )	Excellent	Excellent
Lizard's tail ( <i>Saururus cernus</i> )	Poor	None
Common three square ( <i>Scirpus americanus</i> )	Good	Excellent
Soft-stem bulrush ( <i>Scirpus validus</i> )	Excellent	Good
Wild Rice ( <i>Zizania aquatica</i> )	Excellent	Limited

(Adapted from Schueler 2000)

Top 10 Volunteer Species Recorded at the Three Ponds (Shenot 1993)	
Various exotic grasses ( <i>Graminea</i> )	75%
Common rush ( <i>Juncus effusus</i> )	55%
Fox sedge ( <i>Carex vulpinoidea</i> )	33%
Other sedges ( <i>Carex</i> spp.)	33%
Smartweeds ( <i>Polygonum</i> spp.)	33%
Mostly many-flowered aster ( <i>Aster</i> spp.)	30%
False nettle ( <i>Boehmeria cylindrica</i> )	30%
Rice cutgrass ( <i>Leersia oryzoides</i> )	30%
Bugleweed ( <i>Lycopus virginicus</i> )	30%
Spike rush ( <i>Eleocharis</i> sp.)	22%
Defined as percentage of stations where the species was recorded as one of the five most numerically dominated species at the station. N=40	

(Adapted from Schueler 2000)

As was discussed earlier, flooding tends to limit root growth, and in some cases specialized water roots are developed. It is likely that as plants dry quickly after flooding, their root systems may not be able to supply sufficient water. A study on the effects of water fluctuation on trees, including black gum (*Nyssa sylvatica*), common baldcypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*), in a swamp in the southeastern United States showed that weekly changes in the growth of the three species were significantly affected by changes in water levels. It is believed that the reduced growth resulted from frequent restructuring of root systems in response to alternately flooded



and drained conditions. In sites that were permanently flooded or saturated, limits of tree growth was not observed (Keeland and Sharitz 1997).




*SMARTWEED*

Kozlowski (1997) states that “Because root growth typically is reduced more than stem growth, the root/shoot ratio is decreased. When the flood water drains away, the previously flooded plants may be less tolerant of drought because absorption of water by their small root systems cannot adequately replenish losses due to transpiration.”

Although water fluctuations can have detrimental effects on plants, it is also important to recognize that the fluctuation of water levels is a natural phenomenon in many basins, particularly where there are steep slopes surrounding wetlands. In some cases, water fluctuations can help certain community types, such as floodplain forests, that are adapted to such conditions. The fluctuations may decrease weed competition and aid in seed dispersal.

Flooding frequency has been shown to influence plant diversity in some situations. Pollock et al. (1998) studied 16 wetland sites in Alaska and found that “species-rich sites had low to intermediate levels of productivity and intermediate flood frequencies, and species-poor sites had very low or high flood frequency and low productivity.” This corresponds with Huston’s (1979) dynamic-equilibrium model of species diversity, which predicts that the highest diversity will be found where there are intermediate levels of disturbance and low diversity will be found where there are high or low levels of disturbance.


A study in northern Minnesota (Wilcox and Meeker 1990) also demonstrated that high diversity can be found with intermediate levels of disturbance. Two regulated lakes and one unregulated lake were



studied to determine the effects of water fluctuations on aquatic macrophytes. It was found that the unregulated lake, which fluctuated about 1.6 m annually, had structurally diverse plant communities at all depths. In Rainy Lake, which had reduced water fluctuations (1.1 m annually), few species were present along transects that were never dewatered. In Namakan Lake, which had increased water fluctuations (2.7 m annually), rosette and mat-forming species dominated transects where drawdown occurred in early winter and disturbance resulted from ice formation in the sediments.

Stormwater MPs, such as wet and dry swales, filter strips and rain water gardens, can be important for treating and slowing water flow before it reaches ponds and wetlands. Appropriate design is important to ensure that flooding and water fluctuation will not be severe. The outlets should be designed so as to endure natural fluctuations during storm events. Multiple wetland cells and gentle side slopes can add to species diversity by dispersing water, decreasing water fluctuations and providing a wide range of available habitat for wetland species. A Vermont study (Occoquan Watershed Monitoring Lab et al. 1990) demonstrated that multiple pond systems can promote diversity (18 species) in wetland BMPs. Common rush (*Juncus effusus*), spikerush (*Eleocharis obtusa*) and rice-cut grass (*Leersia oryzoides*) dominated the 0-to-6-inch zone; spikerush (*Eleocharis* spp.) and rice-cut grass dominated the 6-to-12-inch zone; water purslane (*Ludwigia palustris*) and duckweed (*Lemna* spp.) dominated the 12-to-18-inch zone; and cattail (*Typha* spp.), spikerush (*Eleocharis* spp.), yellow water lily (*Nuphar adventa*) and white water lily (*Nymphaea odorata*) dominated the 18-to-30-inch zone.

For more information on the effect of hydrology on vegetation, see appendix 2 for an investigation of three stormwater projects in the Twin Cities area.



**Wave Energy** On large water bodies, waves can have a significant influence on plant growth. In a study of the effects of wave action at Axe Lake in Ontario, Keddy (1983) found that “waves may have direct effects on vegetation; for example, through removing biomass, uprooting seedlings, and transporting propagules.” He observed that “waves may also have many indirect effects through the erosion, transport and deposition of sediment.” At Axe Lake, Keddy found that “Large leafy species on sheltered shores tended to be replaced by small creeping or rosette species on exposed shores.” Of the emerged species, bulrushes (*Scirpus* spp.) tend to do best in exposed situations. If emerged plants can become established, their presence may reduce wave and current action and permit a greater variety of plants to establish (University of Michigan 1974). Stormwater MPs, such as wet ponds, generally are not large enough to be significantly affected by wave action, but waves may contribute to plant stress. Wave break structures are often necessary on large water bodies to ensure planting success.

**Sediment Loads** Wetlands often receive sediment and nutrients from runoff (Brown 1985) and this is the case in stormwater detention basins and other types of stormwater systems. A study of beaked sedge (*Carex rostrata*) and common fox sedge (*Carex stipata*) in Washington State (Ewing 1995) investigated the effect of sedimentation and showed that sediment deposition can depress plant productivity. Other studies have shown similar results. Van der Valk et al. (1981) found that with 15 cm of sediment, root density decreased by 37 and 49 percent in subsequent years in freshwater lowland wetlands in Alaska.

It has also been demonstrated that the accumulation of sediment negatively affects seed germination. Jurik et al. (1994) found that sediment loads as low as 0.25 cm significantly decreased the number of species that germinated from seedbank samples. The addition of sediment had the least effect on species with large seeds.



**Pollutants and Toxins** Plants vary greatly in their ability to assimilate toxins and pollutants into their stems and roots. With recent interest in phytoremediation and wastewater cleansing, an increasing number of species are being investigated to determine their ability to assimilate pollutants and toxins. A study by the City of Seattle (1993) investigated the ability of five wetland species to take up zinc, lead and total petroleum hydrocarbons (TPH) into plant tissue. The species chosen for the study were common cattail (*Typha latifolia*), water flag (*Iris pseudacorus*), burreed (*Sparganium* spp.), blunt-spikerush



GREEN BULRUSH

(*Eleocharis ovata*) and hardstem bulrush (*Scirpus acutus*). Of the five species, cattail was the most efficient at taking up pollutants, but concentrations of lead, zinc and TPH were highest in burreed tissue. Cattail was more vigorous and therefore had a higher pollutant uptake per area of cover. Spike rush also had high pollution concentrations within plant tissue. There is concern that wetland species that assimilate pollutants may pose a risk to wildlife that use them as a food source. This study found that concentrations of TPH, zinc and lead were higher in the roots than in the shoots, which may help decrease the risk to most wildlife species.

Just as plant species vary in their ability to assimilate toxins and pollutants, they also vary in their tolerance to these materials (Stockdale 1991). Snowden and Wheeler (1993) examined 44 fen species in solution culture to determine their tolerance to iron. The plants varied greatly in their tolerance, with species such as common rush (*Juncus effusus*) and water-flag (*Iris pseudacorus*) being very tolerant, marsh marigold (*Caltha palustris*) and reed canary grass (*Phalaris arundinacea*) being semi-tolerant, and green sorrel (*Rumex acetosa*) and queen of the meadow (*Filipendula ulmaria*) being very sensitive.

Individual species can be affected by some chemicals and unaffected by others. Dushenko et al. (1995) investigated the effect of arsenic bioaccumulation and toxicity in aquatic macrophytes exposed to gold mine effluent and found that broad-leaved cattail (*Typha latifolia*)



MARSH MILKWEED

responded with decreased stand height, necrosis of leaf tips and reduced micronutrient concentrations of copper, manganese and zinc in root tissues. A study in China (Ye et al. 1998) investigating the tolerance of broad-leaved cattail to zinc (1.0  $\mu\text{g/ml}$ ), lead (10.0  $\mu\text{g/ml}$ ) and cadmium (0.2  $\mu\text{g/ml}$ ) accumulation found that this species was able to tolerate these metals for 48 to 72 days.

**Nutrients** As nutrient inputs to wetlands increase, nutrients can be stored in surface litter, plants or soils. However, the capacity of a wetland to retain a nutrient such as phosphorus can become saturated over time and release of the nutrient can result. Nutrient inputs can have a direct effect on vegetation. Species like reed canary grass (*Phalaris arundinacea*) that thrive in nutrient-rich conditions can displace species that are adapted to conditions of lower nutrient availability (Horner et al. 1988). A study of a wastewater-treatment wetland showed that plants near the discharge point had greater biomass, were taller and had higher concentrations of phosphorus in their tissues (Tilton et al. 1979). Athanas and Stevenson (1991) compared two stormwater wetlands in Maryland. They found that the system that received higher amounts of sediment and nutrients had higher diversity (cattails, rushes, sedges and boneset) than the other system (cattails and common reeds), which received less sediment and nutrients. A study in Vermont (Schwartz 1985) investigated the effect of sewage on wetland vegetation. Nitrate levels of 0.328 mg/L and phosphate levels of 2.53 mg/L from raw sewage resulted in unchanged growth of cattail (*Typha* spp.). Rushes (*Scirpus* spp.), giant burreed (*Sparganium eurycarpum*), lesser duckweed (*Lemna minor*)

and coontail (*Ceratophyllum demersum*) were positively affected by the nutrients, while elodea (*Elodea canadensis*) and pondweeds (*Potamogeton* spp.) were negatively affected.



FOX SEDGE


There is concern that wetland treatment systems in northern climates will not function effectively during the winter months due to inactivity of bacteria and plant material. Research being conducted at Montana State University by Stein and Hook is showing that systems containing plants can function effectively in cold climates. The researchers are finding that wetland systems with water temperatures of 36 degrees F can effectively remove nitrogen and organic carbon from water. Plant debris and snow cover helps keep water temperatures around 36 degrees. In addition, water treatment in cold temperatures improves significantly

when plants are a part of the system. This differs from research conducted in southern climates that shows that bacteria play the largest role in cleaning water and plants play a less important role. Plants that the Montana State researchers are finding most effective are sedges and bulrushes. These species are much more effective at treating water during the winter than cattails, which are relatively inactive (Flaherty 2002).

Mowing and removing above-ground growth of cattails, grasses and other species used in stormwater MPs is one method of removing nutrients. The removed biomass can be composted or possibly incinerated.

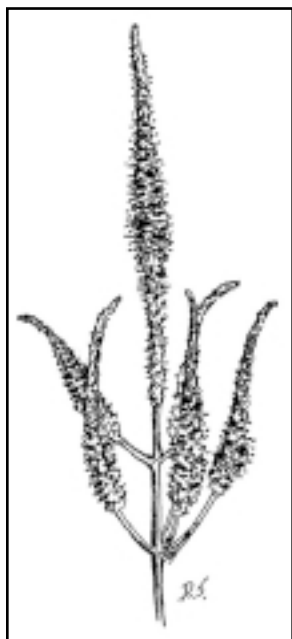
**Salt** Roadways and parking lots in the Midwest are salted heavily during winter months. During melting and rainfall events, salt can be washed into a stormwater system. Biesboer and Jacobson (1994) studied the role of road salt in limiting germination of warm-season grasses. They found that salt concentrations were highest within the





first 3 feet from the road and then rapidly declined within 30 feet. They found that most warm- and cool-season grasses could germinate and grow beyond 10 feet from a road without experiencing stress. They state that warm-season grasses, such as blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*), can handle high salinities. Warm-season grasses also have advantages over cool-season grasses because they germinate later in the season, after spring rains reduce concentrations of sodium chloride in the soil (Ohrel 2000).

Another study (Isabelle et al. 1987) demonstrated that salt in roadside snowmelt can affect species composition and biomass of wetland vegetation. In the study, seed of five wetland species was planted in greenhouse plots and exposed to snowmelt/tapwater mixtures containing 0, 20 and 100 percent snowmelt each day. After




CULVER'S ROOT

a month the seedlings were harvested, and it was found that the number of germinating seeds was inversely proportional to snowmelt salt concentration. Two species, purple loosestrife (*Lythrum salicaria*) and common cattail (*Typha latifolia*), germinated when exposed to undiluted snowmelt while other species (*Aster umbellatus*, *Dulichium arundinaceum* and *Scirpus cyperinus*) did not. Both purple loosestrife and cattails dominate many urban wetland and stormwater systems and their ability to germinate under high-salt conditions may contribute to their dominance.

Wilcox (1986) observed that a bog in Indiana that was adjacent to an uncovered salt storage pile for 10 years was prone to invasion by non-bog species such as narrow-leaf cattail (*Typha angustifolia*).

Many tamarack (*Larix laricina*) and many species of sphagnum moss (*Sphagnum* spp.) were killed by the salt. The author noted that it is probable that red maple




(*Acer rubrum*), eastern white pine (*Pinus strobus*), leather-leaf (*Chamaedaphne calyculata*), holly (*Ilex* spp.) and highbush blueberry (*Vaccinium corymbosum*) were also affected by the salt. Other than cattails, species that did not appear to be affected by salt included duckweed (*Lemna* spp.), arrowhead (*Sagittaria* spp.) and bladderwort (*Utricularia* spp.).

**Turbidity** While flooding is a stress to many plant species, turbid water can compound the problem. Turbidity tends to reduce the amount of photosynthesis that can be conducted by a plant by limiting sunlight. Shaw (2002) observed that in nursery beds, Tussock sedge (*Carex stricta*) fully submerged in turbid water declined quickly while plants that still had some leaves above the surface of the water continued to increase their above-ground growth. It was believed to be the combination of flooding and turbid water that caused the plants to decline.

Loading of sediments can directly increase turbidity. Street cleaning and erosion control can effectively decrease the amount of sediment entering stormwater systems.

**Erosion** Erosive action around roots is another potential stress to plants in stormwater systems. Erosion naturally occurs in floodplains but may also occur in stormwater systems that are not adequately vegetated. Deep-rooted, native, prairie species and wetland shrubs do a good job of stabilizing buffer areas around ponds and wetlands. Aggressive grasses, such as prairie cord grass, big bluestem, Indian grass and switch grass, as well as many native shrub species are particularly well suited for this use. Cover crops such as oats, winter wheat and annual ryegrass are also useful in controlling erosion. Cover crops germinate quickly and hold the soil while the slower-developing native grasses become established. Since cover crops germinate quickly, they are good indicators of the overall success of plantings. If cover crops do not germinate in an area, there is a good chance that native species that were planted will need to be re-seeded.

**Invasive species** Flooding can influence plant competition by physically or physiologically damaging plants and by changing the physical and chemical environment of soils (Pollock et al. 1998). Some invasive



species seem to thrive under conditions of flooding and fluctuating water levels. Cooke et al. (1989) found that invasive species such as reed canary grass (*Phalaris arundinacea*) and purple loosestrife (*Lythrum salicaria*) can come to dominate wetlands that receive urban stormwater. Salt tolerance also gives an advantage to some invasive species, and the combination of these factors may explain why so many urban wetlands and stormwater systems are dominated by invasive plants.

While few native plants can compete with these invasive species,



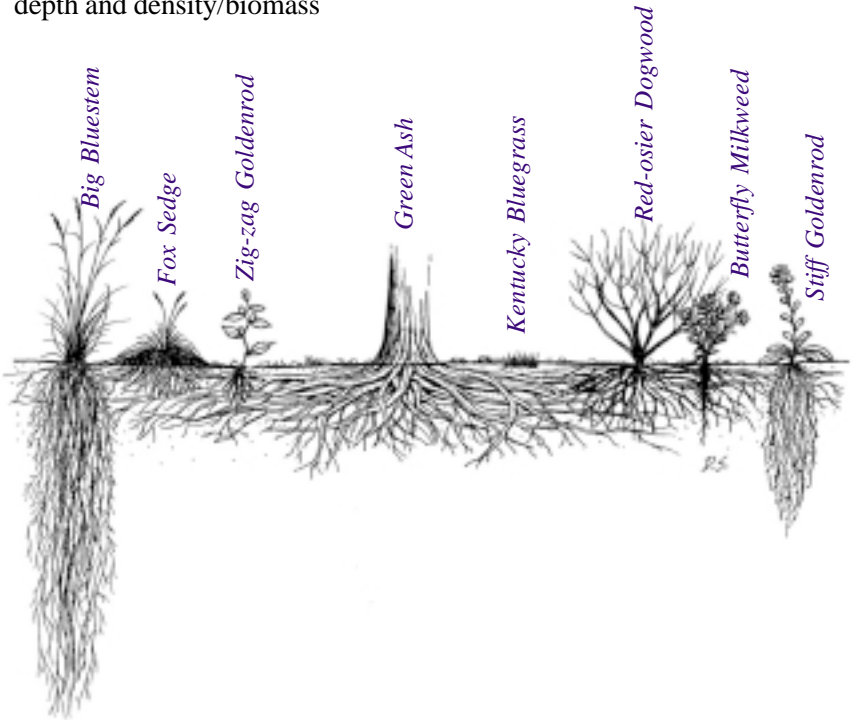
PURPLE LOOSESTRIFE

some aggressive native species can live amongst them. For example, cup plant (*Silphium perfoliatum*), blue vervain (*Verbena hastata*) and green bulrush (*Schoenoplectus atrovirens*) can be found in ditches among reed canary grass (*Phalaris arundinacea*). Seed of fast-establishing natives can be used also to stabilize and compete in areas where reed canary grass is a significant threat. Ultimately, management of native plantings is important to limit the growth of invasive plants.

**Herbivores** Wild geese and other herbivores, such as deer, rabbits, muskrat, beavers, mice and carp, are a significant threat to new plantings. Geese are particularly attracted to seedling plants and have been known to completely destroy projects. Animal exclosures are often necessary to stop herbivores. Exclosures constructed to prevent geese from grazing newly planted areas should also help to prevent grazing by deer, rabbits, muskrat, beavers and carp. It is difficult to select plants that herbivores will not eat, so exclosures are generally the best option.

## PLANT CONSIDERATIONS AND SPECIES FOR STORMWATER MANAGEMENT PRACTICES

Root systems of species covered in this guidebook vary greatly in their depth and density/biomass

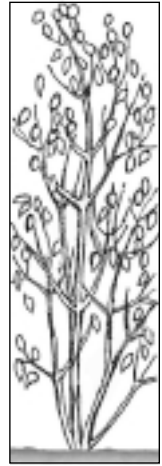


Vegetation is often grouped into the categories of trees and shrubs, grasses/sedges/rushes and forbs/ferns. Each of these categories of vegetation has its own benefits and limitations for stormwater projects.

## Trees and Shrubs

### *Benefits*

- Trees and shrubs, particularly willow species, have a significant influence on evapotranspiration and a capacity for nutrient uptake.
- Roots aid infiltration by acting as pathways for water flow.
- Fibrous roots absorb large amounts of water.
- Trees and shrubs are useful for bank stabilization and can often be planted as cuttings. Deep-rooted species are particularly useful for anchoring soil to steep slopes.
- Trees provide vertical structure in the landscape.
- Trees provide important habitat for many wildlife species.
- Trees provide important habitat for many wildlife species.



### *Limitations*

- Debris from trees may block outlets.
- Trees cannot be used in stormwater MPs where sediment will be excavated.
- Trees can inhibit the growth of prairie species.



## Grasses, Sedges and Rushes

### *Benefits*

- Roots of prairie grasses can extend deep into the ground and aid in infiltration and evapotranspiration.
- Dense root networks stabilize soil and minimize erosion.
- Wetland species, particularly broad-leaved sedges and bulrushes, generally have shallow roots but aid in evapotranspiration.
- Grasses generally have many stems and produce thatch that slows water flow and facilitates filtration, making them well suited for filter strips.
- Many grasses, sedges and rushes are efficient at nutrient uptake.
- Native grasses, sedges and rushes add winter interest to the landscape and have high wildlife value.



### *Limitations*

- In projects with high flow rates, grasses must be mowed often to most efficiently decrease stormwater velocity. Mown clump grasses will not produce seed.

## Forbs and Ferns

### *Benefits*

- Roots of prairie forbs can extend deep into the ground and aid in infiltration and evapotranspiration.
- Wetland forbs, particularly broad-leaved species, generally have shallow roots but aid in evapotranspiration.
- Native forbs add aesthetic appeal to the landscape and have high wildlife value.

### *Limitations*

- Forbs generally have fewer basal stems than grasses and may not filter stormwater as efficiently.





Photo: Beth Kunkel

## STORMWATER MANAGEMENT PRACTICES

The types of stormwater management practices (MPs) are grouped into the categories of retention, detention, infiltration, wetlands and filtration. The following information provides a brief description of the types of stormwater MPs and planting considerations for each.

### Retention

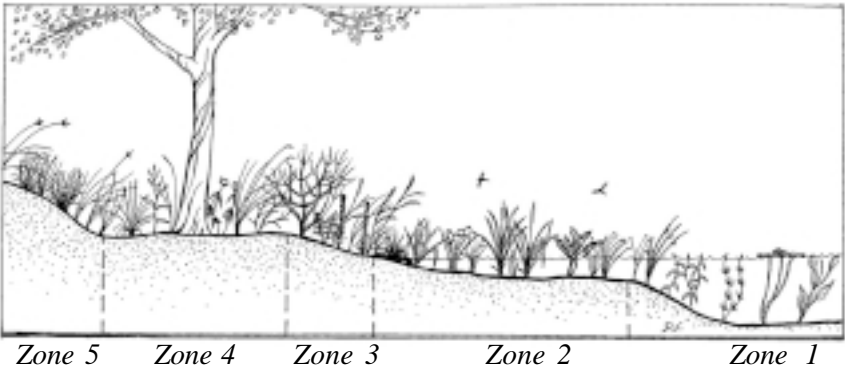


Retention (extended detention) systems are designed to utilize the retention of water to improve water quality. Retention systems covered in this guidebook include wet ponds and extended storage ponds.

**Wet Ponds and Extended Storage Ponds.** Wet ponds are designed to retain a permanent pool of water. The primary function of wet ponds is sedimentation, which removes metals, nutrients, sediment and organics from stormwater. Wet ponds are suitable for sites with high nutrient loads. Benches are often incorporated into wet ponds to add areas for plant growth which aid in sedimentation, evapotranspiration and providing wildlife habitat. Vegetation also acts as a barrier to keep children away from open water areas (MPCA 2000). Extended storage ponds are similar to wet ponds but are generally designed to provide temporary storage of stormwater. As a result, extended storage ponds are designed to fill quickly and then slowly decrease in water level (Barr 2001). Since both wet and extended storage ponds may experience significant water fluctuations after storms, plants must be chosen that can handle these conditions. Many urban wetlands and lakes that receive stormwater experience environmental conditions similar to wet ponds and many of the species in the following tables would be suitable for their planting.




Floodplain species may be well suited for extended storage ponds that flood and then become dry. Plant species suitable for ponds can be grouped according to zones that change with elevation. These zones are often referred to as “plant communities.” It is useful to think about plantings in terms of plant communities because plant communities are composed of species adapted to growing together.



ZONE	PLANT COMMUNITY	HYDROLOGY
1	Submergent zone	1.5-6 feet of water
2	Emergent zone	0-18 inches of water
3	Wet meadow zone	Permanent moisture
4	Floodplain zone	Flooded during snowmelt and large storms
5	Upland zone	Seldom or never inundated (the upland zone includes prairie and forest plant communities)

**Zone 1 (Submergent zone)** – The submergent zone is found in areas of 3-6 feet of water in wet ponds. Submergent vegetation makes up this zone because emergent vegetation generally does not grow deeper than 3 feet. Submergent species may float free in the water column or may root in the pool bottom and have stems and leaves that generally stay under water. Submergent species are important for wildlife habitat and



pollutant removal, especially nitrates and phosphorus. Submergent species are not readily available from native plant nurseries and can be difficult to plant. Many submergent species establish on their own (Ogle and Hoag 2000).

**Zone 2 (Emergent zone)** – The emergent zone of a wet pond is generally 0 to 18 inches deep. It is often designed as benches within ponds to optimize the area for emergent plants. Emergent plants are important for wildlife and evapotranspiration. They also provide habitat for phytoplankton, which play an important role in nutrient removal (Ogle and Hoag 2000). A wide variety of wetland species are adapted to the emergent zone. However, large fluctuations in water level and pollutants within wet ponds may limit the number of species.

**Zone 3 (Wet meadow zone)** – The wet meadow zone is a constantly moist area that can become inundated. The transition area between open water and the shoreline is prone to erosion. Therefore, it is an important area for plant establishment. In addition to wet-meadow grasses, sedges, flowers and shrubs, such as dogwoods, willows, buttonbush and chokeberry, are well suited to this zone.

**Zone 4 (Floodplain zone)** – The floodplain zone is normally dry but may flood during snowmelt and after large storms. Floodplain zones are generally flat terraces and are common along rivers and streams. If a wet pond has a steep side slope, it may go directly from zone 3 (wet meadow zone) to zone 5 (upland zone) without having a floodplain zone. Floodplain species must be adapted to extremes in hydrology; they may be inundated for long periods in the spring and be dry during the summer. The ability of floodplain species to handle extremes in hydrology make them well suited to the edges of wet ponds and detention ponds.

**Zone 5 (Upland zone)** – The upland zone is seldom or never inundated. A wide variety of species are well adapted to the upland zone and their selection will depend on the site conditions.




<b>Zone 1 Submergent zone</b>		<b>3-6 feet of water</b>
Note: Submergent species are not covered in depth in this guidebook, but desirable species include the following:		
<b>Scientific Name</b>	<b>Common Name</b>	
<b><i>Forbs and Ferns</i></b>		
<i>Brasenia schreberi</i>	Water shield	
<i>Ceratophyllum demersum</i>	Coontail	
<i>Elodea canadensis</i>	Elodea	
<i>Lemna trisulca</i>	Lesser duckweed	
<i>Myriophyllum exalbesieus</i>	Water milfoil	
<i>Nelumbo lutea</i>	Lotus	
<i>Nuphar lutea</i>	Yellow water-lily	
<i>Nymphaea odorata</i>	White water-lily	
<i>Potamogeton illinoensis</i>	Illinois pondweed	
<i>Potamogeton natans</i>	Floating-leaved pondweed	
<i>Potamogeton pectinatus</i>	Sago pondweed	
<i>Ranunculus flabellaris</i>	Yellow water crowfoot	
<i>Spirodela polyrrhiza</i>	Giant duckweed	
<i>Urticularia vulgaris</i>	Bladderwort	
<i>Vallisneria americana</i>	Wild celery	
<i>Woffia columbiana</i>	Watermeal	

<b>Zone 2 Emergent zone</b>		<b>0-18 inches of water</b>
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b><i>Trees and Shrubs</i></b>		
<i>Cephalanthus occidentalis</i>	Buttonbush	160
<b><i>Forbs and Ferns</i></b>		
<i>Acorus calamus</i>	Sweet flag	78
<i>Alisma trivale</i>	Water plantain	82
<i>Caltha palustris</i>	Marsh marigold	132
<i>Polygonum amphibium</i>	Water smartweed	250
<i>Pontederia cordata</i>	Pickereelweed	252
<i>Sagittaria latifolia</i>	Broadleaved arrowhead	270
<i>Sparganium eurycarpum</i>	Giant burreed	310
<i>Typha latifolia</i>	Broadleaved cattail	322
<b><i>Grasses, Sedges and Rushes</i></b>		
<i>Carex aquatilis</i>	Water sedge	134
<i>Carex lacustris</i>	Lake sedge	144
<i>Carex stricta</i>	Tussock sedge	154
<i>Juncus balticus</i>	Baltic rush	210
<i>Juncus effusus</i>	Soft rush	212
<i>Scirpus acutus</i>	Hardstem bulrush	282
<i>Scirpus fluviatilis</i>	River bulrush	288



<i>Scirpus pungens</i>	Three-square bulrush	290
<i>Scirpus validus</i>	Soft-stem bulrush	292


<b>Zone 3 Wet meadow zone permanent moisture</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b><i>Trees and Shrubs</i></b>		
<i>Amorpha fruticosa</i>	Indigo bush	88
<i>Salix nigra</i>	Black willow	276
<i>Sambucus pubens</i>	Red-berried elder	278
<b><i>Forbs and Ferns</i></b>		
<i>Agastache foeniculum</i>	Giant hyssop	80
<i>Anemone canadensis</i>	Canada anemone	92
<i>Angelica atropurpurea</i>	Angelica	94
<i>Asclepias incarnata</i>	Marsh milkweed	102
<i>Aster lanceolatus (simplex)</i>	Panicle aster	108
<i>Aster lucidulus</i>	Swamp aster	110
<i>Aster novae-angliae</i>	New England aster	114
<i>Aster puniceus</i>	Red-stemmed aster	118
<i>Bidens cernua</i>	Beggarsticks	124
<i>Boltonia asteroides</i>	Boltonia	126
<i>Chelone glabra</i>	Turtlehead	162
<i>Eryngium yuccifolium</i>	Rattlesnake master	178
<i>Eupatorium maculatum</i>	Joe-pye-weed	180
<i>Eupatorium perfoliatum</i>	Boneset	182
<i>Euthamia graminifolia</i>	Grass-leaved goldenrod	184
<i>Gentiana andrewsii</i>	Bottle gentian	192
<i>Helenium autumnale</i>	Sneezeweed	198
<i>Impatiens capensis</i>	Jewelweed	206
<i>Iris versicolor</i>	Blueflag	208
<i>Liatris ligulistylis</i>	Meadow blazingstar	220
<i>Liatris pycnostachya</i>	Prairie blazingstar	222
<i>Lilium superbum</i>	Turk's-cap lily	224
<i>Lobelia cardinalis</i>	Cardinal flower	226
<i>Lobelia siphilitica</i>	Blue lobelia	228
<i>Lysimachia thysiflora</i>	Tufted loosestrife	230
<i>Monarda fistulosa</i>	Wild bergamot	236
<i>Onoclea sensibilis</i>	Sensitive fern	238
<i>Osmunda regalis</i>	Royal fern	240
<i>Physostegia virginiana</i>	Obedient plant	248
<i>Potentilla palustris</i>	Marsh cinquefoil	258
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Scutellaria lateriflora</i>	Mad-dog skullcap	294
<i>Silphium perfoliatum</i>	Cup plant	298
<i>Spiraea alba</i>	Meadowsweet	314



<b>Zone 3 Wet meadow zone Cont. permanent moisture</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<i>Thalictrum dasycarpum</i>	Tall meadowrue	318
<i>Verbena hastata</i>	Blue vervain	326
<i>Vernonia fasciculata</i>	Ironweed	328
<i>Veronicastrum virginicum</i>	Culver's root	330
<b>Grasses, Sedges and Rushes</b>		
<i>Andropogon gerardii</i>	Big bluestem	90
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Calamagrostis canadensis</i>	Canada blue-joint grass	130
<i>Carex bebbii</i>	Bebb's sedge	136
<i>Carex comosa</i>	Bottlebrush sedge	138
<i>Carex crinita</i>	Caterpillar sedge	140
<i>Carex hystericina</i>	Porcupine sedge	142
<i>Carex languinosa</i>	Wooly sedge	146
<i>Carex lasiocarpa</i>	Wooly needle sedge	148
<i>Carex retrorsa</i>	Retorse sedge	150
<i>Carex stipata</i>	Awl-fruited sedge	152
<i>Carex vulpinoidea</i>	Fox sedge	156
<i>Eleocharis obtusa</i>	Blunt spikerush	170
<i>Equisetum fluviatile</i>	Horsetail	176
<i>Glyceria grandis</i>	Giant manna grass	194
<i>Glyceria striata</i>	Fowl manna grass	196
<i>Juncus balticus</i>	Baltic rush	210
<i>Juncus effusus</i>	Soft rush	212
<i>Juncus torreyi</i>	Torrey rush	214
<i>Leersia oryzoides</i>	Rice-cut grass	218
<i>Panicum virgatum</i>	Switchgrass	242
<i>Scirpus atrovirens</i>	Green bulrush	284
<i>Scirpus cyperinus</i>	Woolgrass	286
<i>Scirpus fluviatilis</i>	River bulrush	288
<i>Scirpus pungens</i>	Three-square bulrush	290
<i>Scirpus validus</i>	Soft-stem bulrush	292
<i>Spartina pectinata</i>	Prairie cord grass	312



<b>Zone 4 Floodplain zone</b>		<b>Flooded during snowmelt and large storms</b>
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b>Trees and Shrubs</b>		
<i>Acer saccharinum</i>	Silver maple	76
<i>Alnus incana</i>	Speckled alder	86
<i>Amorpha fruticosa</i>	Indigo bush	88
<i>Aronia melanocarpa</i>	Black chokeberry	98
<i>Betula nigra</i>	River birch	122
<i>Celtis occidentalis</i>	Hackberry	158
<i>Cephalanthus occidentalis</i>	Buttonbush	160
<i>Cornus amomum</i>	Silky dogwood	164
<i>Cornus sericea</i>	Red-osier dogwood	168
<i>Fraxinus nigra</i>	Black ash	186
<i>Fraxinus pennsylvanica</i>	Green ash	188
<i>Physocarpus opulifolius</i>	Ninebark	246
<i>Populus deltoides</i>	Eastern cottonwood	254
<i>Quercus bicolor</i>	Swamp white oak	264
<i>Salix discolor</i>	Pussy willow	272
<i>Salix exigua</i>	Sandbar willow	274
<i>Salix nigra</i>	Black willow	276
<i>Sambucus pubens</i>	Red-berried elder	278
<i>Spiraea alba</i>	Meadowsweet	314
<i>Viburnum lentago</i>	Nannyberry	332
<i>Viburnum trilobum</i>	High bush cranberry	334
<b>Forbs and Ferns</b>		
<i>Anemone canadensis</i>	Canada anemone	92
<i>Aster lucidulus</i>	Swamp aster	110
<i>Aster puniceus</i>	Red-stemmed aster	118
<i>Boltonia asteroides</i>	Boltonia	126
<i>Impatiens capensis</i>	Jewelweed	206
<i>Lobelia cardinalis</i>	Cardinal flower	226
<i>Lobelia siphilitica</i>	Blue lobelia	228
<i>Lysimachia thrysiflora</i>	Tufted loosestrife	230
<i>Physostegia virginiana</i>	Obedient plant	248
<i>Potentilla palustris</i>	Marsh cinquefoil	258
<i>Scutellaria lateriflora</i>	Mad-dog skullcap	294
<i>Silphium perfoliatum</i>	Cup plant	298
<i>Symplocarpus foetidus</i>	Skunk cabbage	316
<i>Vernonia fasciculata</i>	Ironweed	328
<b>Grasses, Sedges and Rushes</b>		
<i>Carex comosa</i>	Bottlebrush sedge	138
<i>Elymus virginicus</i>	Virginia wild rye	172
<i>Leersia oryzoides</i>	Rice-cut grass	218
<i>Panicum virgatum</i>	Switchgrass	242



<b>Zone 4 Floodplain zone Cont. Flooded during snowmelt and large storms</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<i>Scirpus atrovirens</i>	Green bulrush	284
<i>Spartina pectinata</i>	Prairie cord grass	312

<b>Zone 5 Upland zone</b>		<b>Seldom or never inundated</b>
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b>Trees and Shrubs</b>		
<i>Cornus racemosa</i>	Gray dogwood	166
<i>Populus tremuloides</i>	Quaking aspen	256
<i>Quercus bicolor</i>	Swamp white oak	264
<i>Viburnum lentago</i>	Nannyberry	332
<i>Viburnum trilobum</i>	High bush cranberry	334
<b>Forbs and Ferns</b>		
<i>Agastache foeniculum</i>	Giant hyssop	80
<i>Allium stellatum</i>	Prairie wild onion	84
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	96
<i>Artemisia ludoviciana</i>	Prairie sage	100
<i>Asclepias tuberosa</i>	Butterfly milkweed	104
<i>Aster laevis</i>	Smooth aster	106
<i>Aster lanceolatus (simplex)</i>	Panicled aster	108
<i>Aster macrophyllus</i>	Bigleaf aster	112
<i>Aster pilosus</i>	Frost aster	116
<i>Athyrium filix-femina</i>	Lady fern	120
<i>Boltonia asteroides</i>	Boltonia	126
<i>Epilobium angustifolium</i>	Fireweed	174
<i>Galium boreale</i>	Northern bedstraw	190
<i>Helianthus grosseserratus</i>	Sawtooth sunflower	200
<i>Heuchera richardsonii</i>	Prairie alumroot	202
<i>Monarda fistulosa</i>	Wild bergamot	236
<i>Onoclea sensibilis</i>	Sensitive fern	238
<i>Potentilla palustris</i>	Marsh cinquefoil	258
<i>Pteridium aquilinum</i>	Bracken fern	260
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Ratibida pinnata</i>	Yellow coneflower	266
<i>Rudbeckia subtomentosa</i>	Brown-eyed Susan	268
<i>Smilacina racemosa</i>	False Solomon's seal	300
<i>Solidago flexicaulis</i>	Zig-zag goldenrod	302
<i>Solidago riddellii</i>	Riddell's goldenrod	304
<i>Solidago rigida</i>	Stiff goldenrod	306
<i>Tradescantia ohiensis</i>	Ohio spiderwort	320
<i>Veronicastrum virginicum</i>	Culver's root	330

<i>Zizia aurea</i>	Golden alexanders	336
<b><i>Grasses, Sedges and Rushes</i></b>		
<i>Andropogon gerardii</i>	Big bluestem	90
<i>Panicum virgatum</i>	Switchgrass	242
<i>Schizachyrium scoparium</i>	Little bluestem	280
<i>Sorghastrum nutans</i>	Indian grass	308

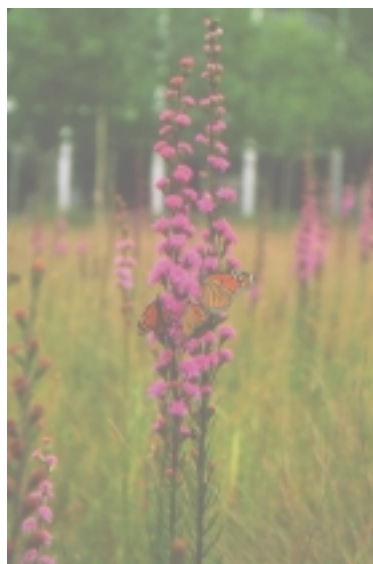


Photo: Paul Jackson

**MEADOW BLAZINGSTAR**





## Detention



Detention systems are designed to filter and slow stormwater. Detention systems covered in this guide included dry ponds and dry swales/ditches.

**Dry Pond.** Dry ponds are generally at the end of storm sewer systems and are designed to reduce stormwater velocity. Dry ponds typically empty completely between storms so they provide limited pollution removal (Barr 2001). Plants in dry ponds must be able to handle flooding and subsequent dry conditions. Only a few species are well suited to dry ponds. However, several floodplain-forest and wet-prairie species are adapted to these conditions.

<b>Dry Pond</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<i>Trees and Shrubs</i>		
<i>Amorpha fruticosa</i>	Indigo bush	88
<i>Aronia melanocarpa</i>	Black chokeberry	98
<i>Betula nigra</i>	River birch	122
<i>Cephalanthus occidentalis</i>	Buttonbush	160
<i>Cornus racemosa</i>	Gray dogwood	166
<i>Cornus sericea</i>	Red-osier dogwood	168
<i>Quercus bicolor</i>	Swamp white oak	264
<i>Salix discolor</i>	Pussy willow	272
<i>Salix exigua</i>	Sandbar willow	274
<i>Spiraea alba</i>	Meadowsweet	314
<i>Forbs and Ferns</i>		
<i>Aster lanceolatum (simplex)</i>	Panicle aster	108
<i>Aster lucidulus</i>	Swamp aster	110
<i>Aster puniceus</i>	Red-stemmed aster	118
<i>Equisetum fluviatile</i>	Horsetail	176
<i>Euthanmia graminifolia</i>	Grass-leaved goldenrod	184
<i>Helenium autumnale</i>	Sneezeweed	198
<i>Liatris pycnostachya</i>	Prairie blazingstar	222
<i>Lobelia siphilitica</i>	Blue lobelia	228

<i>Monarda fistulosa</i>	Wild bergamot	236
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Vernonia fasciculata</i>	Ironweed	328
<i>Veronicastrum virginicum</i>	Culver's root	330
<b>Grasses, Sedges and Rushes</b>		
<i>Andropogon gerardii</i>	Big bluestem	90
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Carex bebbii</i>	Bebb's sedge	136
<i>Carex vulpinoidea</i>	Fox sedge	156
<i>Elymus virginicus</i>	Virginia wild rye	172
<i>Panicum virgatum</i>	Switchgrass	242
<i>Spartina pectinata</i>	Prairie cord grass	312

**Dry Swales/Ditches.** Dry swales are open, vegetated channels that are designed to filter and slow stormwater. Check dams or berms are often used to hold water and settle pollutants. Dry swales are used along easements between properties or along roadways. Sandy soils may be added to the base of dry swales if existing soils are impermeable. Under-drain systems may also be installed to direct water to a storm sewer (Barr 2001).

Grasses are generally chosen for dry swales because they have many stems to slow water flow and can be repeatedly mown during the growing season. Dry swales may be maintained as lawn, but are most effective at slowing and treating water when they are planted with dry or mesic prairie species. Grass swales should be mowed at least annually to prevent trees and shrubs from inhibiting grass growth (King County 1996). Mowing height for grass swales should be 4 to 9 inches. A common Minnesota Department of Transportation (MnDOT) seed mix used for swales is Mixture 28B.

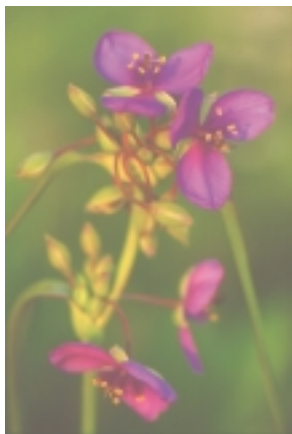



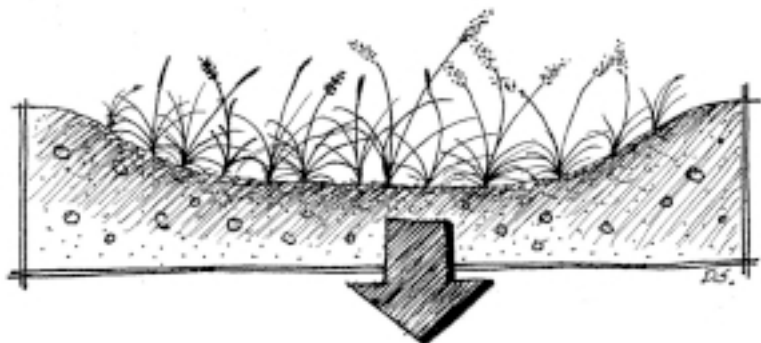
Photo: Jeff Shaw

SPIDERWORT



<b>Dry swales</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b><i>Forbs and Ferns</i></b>		
<i>Anemone canadensis</i>	Canada anemone	92
<i>Artemisia ludoviciana</i>	Prairie sage	100
<i>Asclepias incarnata</i>	Marsh milkweed	102
<i>Aster puniceus</i>	Red-stemmed aster	118
<i>Euthamia graminifolia</i>	Flat-top goldenrod	184
<i>Lobelia siphilitica</i>	Blue lobelia	228
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Verbena hastata</i>	Blue vervain	326
<b><i>Grasses, Sedges and Rushes</i></b>		
<i>Andropogon gerardii</i>	Big bluestem	90
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Calamagrostis canadensis</i>	Canada blue-joint grass	130
<i>Carex bebbii</i>	Bebb's sedge	136
<i>Carex vulpinoidea</i>	Fox sedge	156
<i>Elymus virginicus</i>	Virginia wild rye	172
<i>Glyceria striata</i>	Fowl manna grass	196
<i>Juncus effusus</i>	Soft rush	212
<i>Panicum virgatum</i>	Switchgrass	242
<i>Scirpus atrovirens</i>	Green bulrush	284
<i>Spartina pectinata</i>	Prairie cord grass	312
<b><i>Useful sod-forming grasses not covered in this guidebook</i></b>		
<i>Agrostis palustris</i>	Creeping bentgrass	---
<i>Elymus</i> sp.	Wheat-grass	---
<i>Poa palustris</i>	Fowl bluegrass	---

## Infiltration



Infiltration systems are designed to infiltrate stormwater into the soil and often utilize plants to provide filtration and evapotranspiration. Infiltration systems covered in this guidebook include rain water gardens, infiltration basins, dry swales and infiltration trenches.

### Rain Water Gardens (on-lot infiltration)

Rain water gardens are small depressions that are ideal for residential and small commercial sites. They are most effective in areas where soils have good infiltration capacity. Since these systems are designed to drain relatively quickly, a large variety of shrubs, perennial grasses and flowers can be planted. Dry- and mesic-prairie species are well suited to the side slopes of rain water gardens while wet meadow species are well suited to the lower portions.



*BLUE VERVAIN*

## Rainwater Garden Side Slopes

Scientific Name	Common Name	See Page
<b>Trees and Shrubs</b>		
<i>Aronia melanocarpa</i>	Black chokeberry	98
<i>Cornus racemosa</i>	Gray dogwood	166
<i>Viburnum trilobum</i>	High bush cranberry	334
<b>Forbs and Ferns</b>		
<i>Allium stellatum</i>	Prairie wild onion	84
<i>Anemone canadensis</i>	Canada anemone	92
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	96
<i>Artemisia ludoviciana</i>	Prairie sage	100
<i>Asclepias tuberosa</i>	Butterfly milkweed	104
<i>Aster laevis</i>	Smooth aster	106
<i>Aster macrophyllus</i>	Bigleaf aster	112
<i>Aster pilosus</i>	Frost aster	116
<i>Epilobium angustifolium</i>	Fireweed	174
<i>Eryngium yuccifolium</i>	Rattlesnake master	178
<i>Galium boreale</i>	Northern bedstraw	190
<i>Heuchera richardsonii</i>	Prairie alumroot	202
<i>Liatris ligulistylis</i>	Meadow blazingstar	220
<i>Liatris pycnostachya</i>	Prairie blazingstar	222
<i>Lilium superbum</i>	Turk' s-cap lily	224
<i>Matteuccia struthiopteris</i> var. <i>pennsylvanica</i>	Ostrich fern	234
<i>Monarda fistulosa</i>	Wild bergamot	236
<i>Osmunda regalis</i>	Royal fern	240
<i>Pteridium aquilinum</i>	Bracken fern	260
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Ratibida pinnata</i>	Yellow coneflower	266
<i>Rudbeckia subtomentosa</i>	Brown-eyed Susan	268
<i>Smilacina racemosa</i>	False Solomon's seal	300
<i>Solidago flexicaulis</i>	Zig-zag goldenrod	302
<i>Solidago riddellii</i>	Riddell's goldenrod	304
<i>Solidago rigida</i>	Stiff goldenrod	306
<i>Tradescantia ohiensis</i>	Ohio spiderwort	320
<i>Zizia aurea</i>	Golden alexanders	336
<b>Grasses, Sedges and Rushes</b>		
<i>Andropogon gerardii</i>	Big bluestem	90
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Panicum virgatum</i>	Switchgrass	242
<i>Schizachyrium scoparium</i>	Little bluestem	280
<i>Sorghastrum nutans</i>	Indian grass	308



<b>Rainwater Garden Base</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b><i>Trees and Shrubs</i></b>		
<i>Aronia melanocarpa</i>	Black chokeberry	98
<i>Cephalanthus occidentalis</i>	Buttonbush	160
<i>Cornus sericea</i>	Red-osier dogwood	168
<i>Ilex verticillata</i>	Winterberry	204
<i>Viburnum trilobum</i>	High bush cranberry	334
<b><i>Forbs and Ferns</i></b>		
<i>Agastache foeniculum</i>	Giant hyssop	80
<i>Anemone canadensis</i>	Canada anemone	92
<i>Angelica atropurpurea</i>	Angelica	94
<i>Asclepias incarnata</i>	Marsh milkweed	102
<i>Aster novae-angliae</i>	New England aster	114
<i>Aster puniceus</i>	Red-stemmed aster	118
<i>Boltonia asteroides</i>	Boltonia	126
<i>Chelone glabra</i>	Turtlehead	162
<i>Equisetum fluviatile</i>	Horsetail	176
<i>Eupatorium maculatum</i>	Joe-pye weed	180
<i>Eupatorium perfoliatum</i>	Boneset	182
<i>Gentiana andrewsii</i>	Bottle gentian	192
<i>Helenium autumnale</i>	Sneezeweed	198
<i>Iris versicolor</i>	Blueflag	208
<i>Liatris ligulistylis</i>	Meadow blazingstar	220
<i>Liatris pycnostachya</i>	Prairie blazingstar	222
<i>Lilium superbum</i>	Turk's-cap lily	224
<i>Lobelia cardinalis</i>	Cardinal flower	226
<i>Lobelia siphilitica</i>	Blue lobelia	228
<i>Lysimachia thysiflora</i>	Tufted loosestrife	230
<i>Onoclea sensibilis</i>	Sensitive fern	238
<i>Osmunda regalis</i>	Royal fern	240
<i>Physostegia virginiana</i>	Obedient plant	248
<i>Pteridium aquilinum</i>	Bracken fern	260
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Rudbeckia subtomentosa</i>	Brown-eyed Susan	268
<i>Scutellaria lateriflora</i>	Mad-dog skullcap	294
<i>Silphium perfoliatum</i>	Cup plant	298
<i>Solidago rigida</i>	Stiff goldenrod	306
<i>Thalictrum dasycarpum</i>	Tall meadowrue	318
<i>Vernonia fasciculata</i>	Ironweed	328
<i>Veronicastrum virginicum</i>	Culver's root	330

## Rainwater Garden Base *Cont.*

Scientific Name	Common Name	See Page
<i>Grasses, Sedges and Rushes</i>		
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Carex comosa</i>	Bottlebrush sedge	138
<i>Carex crinita</i>	Caterpillar sedge	140
<i>Carex hystericina</i>	Porcupine sedge	142
<i>Carex vulpinoidea</i>	Fox sedge	156
<i>Glyceria striata</i>	Fowl manna grass	196
<i>Juncus effusus</i>	Soft rush	212
<i>Panicum virgatum</i>	Switchgrass	242
<i>Scirpus cyperinus</i>	Woolgrass	286
<i>Spartina pectinata</i>	Prairie cord grass	312

## Infiltration Basin.

Infiltration basins, like rain water gardens, are designed to infiltrate stormwater relatively quickly, but they are larger in size and receive stormwater from wider areas via pipes or swales. Deep-rooted plants are most effective in these systems as they increase the rate of infiltration and prevent erosion. If sod is chosen to vegetate an infiltration basin, the sod should be grown in permeable soils; sod grown in clay may restrict infiltration. If sod is used for infiltration basins, mowing height should be 4 to 9 inches. Trees can be incorporated along the side slopes of infiltration basins but should be planted at least 15 feet away from perforated pipes and 25 feet from riser structures (Ogle and Hoag 2000).



Photo: Dan Shaw

WILD BERGAMOT

## Infiltration Basin Side Slopes

Scientific Name	Common Name	See Page
<i>Trees and Shrubs</i>		
<i>Acer saccharinum</i>	Silver maple	76
<i>Amorpha fruticosa</i>	Indigo bush	88
<i>Aronia melanocarpa</i>	Black chokeberry	98
<i>Betula nigra</i>	River birch	122
<i>Celtis occidentalis</i>	Hackberry	158
<i>Cornus racemosa</i>	Gray dogwood	166
<i>Fraxinus nigra</i>	Black ash	186
<i>Fraxinus pennsylvanica</i>	Green ash	188

<i>Ilex verticillata</i>	Winterberry	204
<i>Larix laricina</i>	Tamarack	216
<i>Physocarpus opulifolius</i>	Ninebark	246
<i>Populus deltoides</i>	Eastern cottonwood	254
<i>Populus tremuloides</i>	Quaking aspen	256
<i>Quercus bicolor</i>	Swamp white oak	264
<i>Salix nigra</i>	Black willow	276
<i>Sambucus pubens</i>	Red-berried elder	278
<i>Spiraea alba</i>	Meadowsweet	314
<i>Viburnum lentago</i>	Nannyberry	332
<i>Viburnum trilobum</i>	High bush cranberry	334
<b>Forbs and Ferns</b>		
<i>Agastache foeniculum</i>	Giant hyssop	80
<i>Allium stellatum</i>	Prairie wild onion	84
<i>Anemone canadensis</i>	Canada anemone	92
<i>Angelica atropurpurea</i>	Angelica	94
<i>Artemisia ludoviciana</i>	Prairie sage	100
<i>Asclepias tuberosa</i>	Butterfly milkweed	104
<i>Aster laevis</i>	Smooth aster	106
<i>Aster lanceolatus (simplex)</i>	Panicle aster	108
<i>Aster macrophyllus</i>	Bigleaf aster	112
<i>Aster novae-angliae</i>	New England aster	114
<i>Aster pilosus</i>	Frost aster	116
<i>Athyrium filix-femina</i>	Lady fern	120
<i>Boltonia asteroides</i>	Boltonia	126
<i>Equisetum fluviatile</i>	Horsetail	176
<i>Eryngium yuccifolium</i>	Rattlesnake master	178
<i>Euthamia graminifolia</i>	Grass-leaved goldenrod	184
<i>Galium boreale</i>	Northern bedstraw	190
<i>Helianthus grosseserratus</i>	Sawtooth sunflower	200
<i>Heuchera richardsonii</i>	Prairie alumroot	202
<i>Liatris ligulistylis</i>	Meadow blazingstar	220
<i>Liatris pycnostachya</i>	Prairie blazingstar	222
<i>Lilium superbum</i>	Turk's-cap lily	224
<i>Matteuccia struthiopteris</i> var. <i>pennsylvanica</i>	Ostrich fern	234
<i>Monarda fistulosa</i>	Wild bergamot	236
<i>Osmunda regalis</i>	Royal fern	240
<i>Peridium aquilinum</i>	Bracken fern	260
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Smilacina racemosum</i>	False Solomon's seal	300
<i>Solidago flexicaulis</i>	Zig-zag goldenrod	302
<i>Solidago riddellii</i>	Riddell's goldenrod	304
<i>Solidago rigida</i>	Stiff goldenrod	306
<i>Tradescantia ohioensis</i>	Ohio spiderwort	320

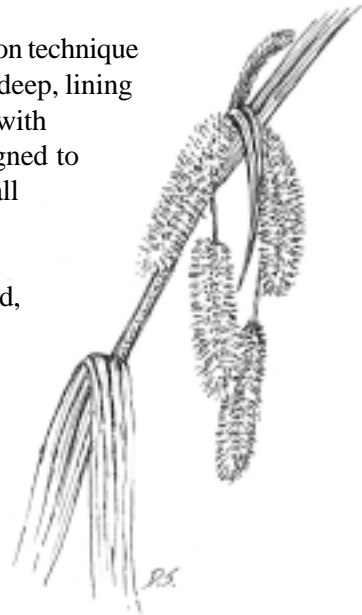


<b>Infiltration Basin Side Slopes <i>Cont.</i></b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<i>Zizia aurea</i>	Golden alexanders	336
<b>Grasses, Sedges and Rushes</b>		
<i>Andropogon gerardii</i>	Big bluestem	90
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Carex vulpinoidea</i>	Fox sedge	156
<i>Panicum virgatum</i>	Switchgrass	242
<i>Schizachyrium scoparium</i>	Little bluestem	280
<i>Sorghastrum nutans</i>	Indian grass	308

<b>Infiltration Basin Base</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b>Trees and Shrubs</b>		
<i>Aronia melanocarpa</i>	Black chokeberry	98
<i>Cephalanthus occidentalis</i>	Buttonbush	160
<i>Cornus sericea</i>	Red-osier dogwood	168
<i>Ilex verticillata</i>	Winterberry	204
<i>Viburnum trilobum</i>	High bush cranberry	334
<b>Forbs and Ferns</b>		
<i>Agastache foeniculum</i>	Giant hyssop	80
<i>Anemone canadensis</i>	Canada anemone	92
<i>Angelica atropurpurea</i>	Angelica	94
<i>Asclepias incarnata</i>	Marsh milkweed	102
<i>Aster novae-angliae</i>	New England aster	114
<i>Aster puniceus</i>	Red-stemmed aster	118
<i>Boltonia asteroides</i>	Boltonia	126
<i>Chelone glabra</i>	Turtlehead	162
<i>Equisetum fluviatile</i>	Horsetail	176
<i>Eupatorium maculatum</i>	Joe-pye-weed	180
<i>Eupatorium perfoliatum</i>	Boneset	182
<i>Gentiana andrewsii</i>	Bottle gentian	192
<i>Helenium autumnale</i>	Sneezeweed	198
<i>Iris versicolor</i>	Blueflag	208
<i>Liatris ligulistylis</i>	Meadow blazingstar	220
<i>Liatris pycnostachya</i>	Prairie blazingstar	222
<i>Lilium superbum</i>	Turk's-cap lily	224
<i>Lobelia cardinalis</i>	Cardinal flower	226
<i>Lobelia siphilitica</i>	Blue lobelia	228
<i>Lysimachia thrysiflora</i>	Tufted loosestrife	230
<i>Onclea sensibilis</i>	Sensitive fern	238

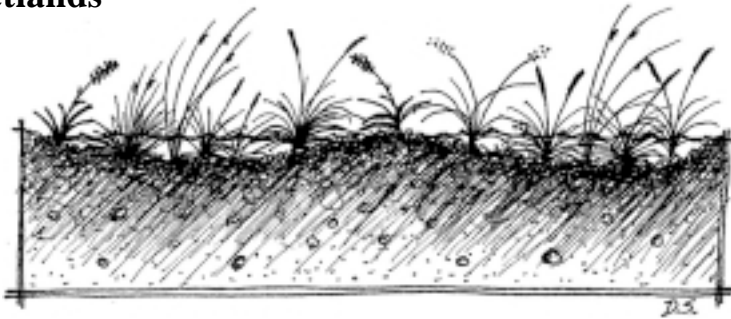
<i>Osmunda regalis</i>	Royal fern	240
<i>Physostegia virginiana</i>	Obedient plant	248
<i>Peridium aquilinum</i>	Bracken fern	260
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Rudbeckia subtomentosa</i>	Brown-eyed Susan	268
<i>Scutellaria lateriflora</i>	Mad-dog skullcap	294
<i>Silphium perfoliatum</i>	Cup plant	298
<i>Solidago rigida</i>	Stiff goldenrod	306
<i>Thalictrum dasycarpum</i>	Tall meadowrue	318
<i>Vernonia fasciculata</i>	Ironweed	328
<i>Veronicastrum virginicum</i>	Culver's root	330
<b>Grasses, Sedges and Rushes</b>		
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Carex comosa</i>	Bottlebrush sedge	138
<i>Carex crinita</i>	Caterpillar sedge	140
<i>Carex hystericina</i>	Porcupine sedge	142
<i>Carex vulpinoidea</i>	Fox sedge	156
<i>Glyceria striata</i>	Fowl manna grass	196
<i>Juncus effusus</i>	Soft rush	212
<i>Panicum virgatum</i>	Switchgrass	242
<i>Scirpus cyperinus</i>	Woolgrass	286
<i>Spartina pectinata</i>	Prairie cord grass	312

**Infiltration Trench.** This infiltration technique involves digging a trench 3 to 8 feet deep, lining it with filter fabric and then filling it with stone. Infiltration trenches are designed to receive clean sheet flow from a small area, such as a few residences or rooftops (Barr 2001). Although infiltration trenches are not vegetated, it is important that suspended solids be removed before they enter the trench. Grassed filter strips are often an effective tool for pretreatment (Barr 2001). Grass filter strips are discussed under filtration.





## Wetlands



Wetland systems are designed for flood control and the removal of pollutants from stormwater. Wetland systems covered in this guidebook include stormwater wetlands and wet swales.

**Stormwater Wetland.** Like natural wetlands, stormwater wetlands have the capacity to improve water quality through microbial breakdown of pollutants, plant uptake, retention of stormwater, settling and adsorption. Sediment forebays and micropools are often designed as part of stormwater wetlands to prevent sediment from filling the wetland. Stormwater from large areas can be diverted into these wetlands. If soils drain too quickly, liners can be used to hold water (Barr 2001). Stormwater wetlands will have zones and plants similar to wet ponds. They may have less fluctuation, though, and can maintain higher diversity. (For species list, see Wet Ponds and Extended Storage Ponds.)

**Wet Swale.** Wet swales consist of broad, open channels, used to temporarily store water. Wet swales are constructed on existing soils and are often at or slightly above the water table (Barr 2001). As a result, they can incorporate a wide variety of wetland and wet-meadow shrub, grass and flower species. The primary purpose of wet swales is to improve water quality and to slow runoff velocity. Check dams and berms are often used to slow and retain water.



Photo: Dan Shaw

<b>Wet Swale</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b><i>Trees and Shrubs</i></b>		
<i>Alnus incana</i>	Speckled alder	86
<i>Amorpha fruticosa</i>	Indigo bush	88
<i>Aronia melanocarpa</i>	Black chokeberry	98
<i>Betula nigra</i>	River birch	122
<i>Cephalanthus occidentalis</i>	Buttonbush	160
<i>Cornus amomum</i>	Silky dogwood	164
<i>Cornus racemosa</i>	Gray dogwood	166
<i>Cornus sericea</i>	Red-osier dogwood	168
<i>Ilex verticillata</i>	Winterberry	204
<i>Larix laricina</i>	Tamarack	216
<i>Physocarpus opulifolius</i>	Ninebark	246
<i>Salix discolor</i>	Pussy willow	272
<i>Salix exigua</i>	Sandbar willow	274
<i>Sambucus pubens</i>	Red-berried elder	278
<i>Spiraea alba</i>	Meadowsweet	314
<i>Viburnum lentago</i>	Nannyberry	332
<i>Viburnum trilobum</i>	High bush cranberry	334
<b><i>Forbs and Ferns</i></b>		
<i>Agastache foeniculum</i>	Giant hyssop	80
<i>Alisma trivale</i>	Water plantain	82
<i>Anemone canadensis</i>	Canada anemone	92
<i>Angelica atropurpurea</i>	Angelica	94
<i>Artemisia ludoviciana</i>	Prairie sage	100
<i>Asclepias incarnata</i>	Marsh milkweed	102
<i>Aster lanceolatus (simplex)</i>	Panicle aster	108
<i>Aster lucidulus</i>	Swamp aster	110
<i>Aster novae-angliae</i>	New England aster	114
<i>Aster puniceus</i>	Red-stemmed aster	118
<i>Boltonia asteroides</i>	Boltonia	126
<i>Caltha palustris</i>	Marsh marigold	132
<i>Chelone glabra</i>	Turtlehead	162
<i>Equisetum fluviatile</i>	Horsetail	176
<i>Eryngium yuccifolium</i>	Rattlesnake master	178
<i>Eupatorium maculatum</i>	Joe-pye-weed	180
<i>Eupatorium perfoliatum</i>	Boneset	182
<i>Euthannia graminifolia</i>	Grass-leaved goldenrod	184
<i>Gentiana andrewsii</i>	Bottle gentian	192
<i>Helenium autumnale</i>	Sneezeweed	198
<i>Helianthus grosseserratus</i>	Sawtooth sunflower	200
<i>Impatiens capensis</i>	Jewelweed	206



## Wet Swale *Cont.*

Scientific Name	Common Name	See Page
<i>Iris versicolor</i>	Blueflag	208
<i>Liatris ligulistylis</i>	Meadow blazingstar	220
<i>Liatris pycnostachya</i>	Prairie blazingstar	222
<i>Lilium superbum</i>	Turk's-cap lily	224
<i>Lobelia cardinalis</i>	Cardinal flower	226
<i>Lobelia siphilitica</i>	Blue lobelia	228
<i>Lysimachia thrysiflora</i>	Tufted loosestrife	230
<i>Monarda fistulosa</i>	Wild bergamot	236
<i>Onoclea sensibilis</i>	Sensitive fern	238
<i>Osmunda regalis</i>	Royal fern	240
<i>Physostegia virginiana</i>	Obedient plant	248
<i>Polygonum amphibium</i>	Water smartweed	250
<i>Pontederia cordata</i>	Pickerelweed	252
<i>Potentilla palustris</i>	Marsh cinquefoil	258
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Rudbeckia subtomentosa</i>	Brown-eyed Susan	268
<i>Sagittaria latifolia</i>	Broadleaved arrowhead	270
<i>Scutellaria lateriflora</i>	Mad-dog skullcap	294
<i>Silphium perfoliatum</i>	Cup plant	298
<i>Solidago rigida</i>	Stiff goldenrod	306
<i>Sparganium eurycarpum</i>	Giant burreed	310
<i>Symplocarpus foetidus</i>	Skunk cabbage	316
<i>Thalictrum dasycarpum</i>	Tall meadowrue	318
<i>Tradescantia ohioensis</i>	Ohio spiderwort	320
<i>Verbena hastata</i>	Blue vervain	326
<i>Vernonia fasciculata</i>	Ironweed	328
<i>Veronicastrum virginicum</i>	Culver's root	330
<i>Zizia aurea</i>	Golden alexanders	336
<b>Grasses, Sedges and Rushes</b>		
<i>Andropogon gerardii</i>	Big bluestem	90
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Calamagrostis canadensis</i>	Canada blue-joint grass	130
<i>Carex aquatilis</i>	Water sedge	134
<i>Carex bebbii</i>	Bebb's sedge	136
<i>Carex comosa</i>	Bottlebrush sedge	138
<i>Carex crinita</i>	Caterpillar sedge	140
<i>Carex hystericina</i>	Porcupine sedge	142
<i>Carex lacustris</i>	Lake sedge	144
<i>Carex languinosa</i>	Wooly sedge	146
<i>Carex lasiocarpa</i>	Wooly needle sedge	148
<i>Carex retrorsa</i>	Retorse sedge	150

<i>Carex stipata</i>	Awl-fruited sedge	152
<i>Carex stricta</i>	Tussock sedge	154
<i>Carex vulpinoidea</i>	Fox sedge	156
<i>Eleocharis obtusa</i>	Blunt spikerush	170
<i>Elymus virginicus</i>	Virginia wild rye	172
<i>Glyceria grandis</i>	Giant manna grass	194
<i>Glyceria striata</i>	Fowl manna grass	196
<i>Juncus balticus</i>	Baltic rush	210
<i>Juncus effusus</i>	Soft rush	212
<i>Juncus torreyi</i>	Torrey rush	214
<i>Leersia oryzoides</i>	Rice-cut grass	218
<i>Panicum virgatum</i>	Switchgrass	242
<i>Scirpus acutus</i>	Hardstem bulrush	282
<i>Scirpus atrovirens</i>	Green bulrush	284
<i>Scirpus cyperinus</i>	Woolgrass	286
<i>Scirpus fluviatilis</i>	River bulrush	288
<i>Scirpus pungens</i>	Three-square bulrush	290
<i>Scirpus validus</i>	Soft-stem bulrush	292
<i>Spartina pectinata</i>	Prairie cord grass	312
<i>Typha latifolia</i>	Broadleaved cattail	322

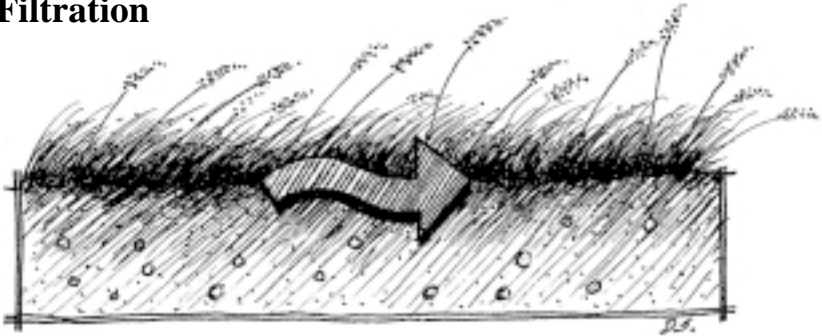


Photo: Dan Shaw

*OBEDIENT  
PLANT*



## Filtration



Filtration systems remain dry between storm events and are designed to remove pollutants from stormwater. Filtration MPs covered in this guidebook include bioretention systems and filter strips.

**Bioretention Basins.** Like rainwater gardens and infiltration basins, bioretention basins rely on plants to function effectively. Bioretention basins can be designed for infiltration but often have longer detention times and are often built with soils that have less infiltration capacity (Barr 2001). Generally the same species used for rain water gardens and infiltration basins can be used for bioretention areas (for species list, see Rain Water Gardens and Infiltration Basins).

**Filter Strips.** Filter strips are densely graded and uniformly vegetated areas designed to treat sheet flow (Barr 2001). Filter strips differ from natural buffers in that they are generally designed specifically for pollutant removal (MPCA 2000). In filter strips, native vegetation slows runoff, collects sediment and allows some infiltration. Dry- and mesic-prairie species, especially deep-rooted grasses, are well suited for filter strips. They produce many stems that slow water flow and have deep roots that increase infiltration and absorption. Tree and shrub species can be planted among the prairie species also, but they will inhibit growth of the prairie species if the shade they produce is dense. Dense stands of vegetation are required for filter strips to function effectively. As a result, monitoring is important to ensure the establishment and persistence of desirable vegetation. Excessive accumulation of sediment can affect plant growth and should be removed (MPCA 2000).

<b>Filtration Strips</b>		
<b>Scientific Name</b>	<b>Common Name</b>	<b>See Page</b>
<b><i>Trees and Shrubs</i></b>		
<i>Acer saccharinum</i>	Silver maple	76
<i>Aronia melanocarpa</i>	Black Chokeberry	98
<i>Betula nigra</i>	River birch	122
<i>Celtis occidentalis</i>	Hackberry	158
<i>Cornus racemosa</i>	Gray dogwood	166
<i>Fraxinus pennsylvanica</i>	Green ash	188
<i>Larix laricina</i>	Tamarack	216
<i>Physocarpus opulifolius</i>	Ninebark	246
<i>Populus deltoides</i>	Eastern cottonwood	254
<i>Populus tremuloides</i>	Quaking aspen	256
<i>Quercus bicolor</i>	Swamp white oak	264
<i>Salix nigra</i>	Black willow	276
<i>Spiraea alba</i>	Meadowsweet	314
<i>Viburnum lentago</i>	Nannyberry	332
<i>Viburnum trilobum</i>	High bush cranberry	334
<b><i>Forbs and Ferns</i></b>		
<i>Agastache foeniculum</i>	Giant hyssop	80
<i>Allium stellatum</i>	Prairie wild onion	84
<i>Anemone canadensis</i>	Canada anemone	92
<i>Angelica atropurpurea</i>	Angelica	94
<i>Artemisia ludoviciana</i>	Prairie sage	100
<i>Asclepias tuberosa</i>	Butterfly milkweed	104
<i>Aster laevis</i>	Smooth aster	106
<i>Aster lanceolatus (simplex)</i>	Panicle aster	108
<i>Aster macrophyllus</i>	Bigleaf aster	112
<i>Aster novae-angliae</i>	New England aster	114
<i>Aster pilosus</i>	Frost aster	116
<i>Athyrium filix-femina</i>	Lady fern	120
<i>Boltonia asteroides</i>	Boltonia	126
<i>Equisetum fluviatile</i>	Horsetail	176
<i>Eryngium yuccifolium</i>	Rattlesnake master	178
<i>Euthamia graminifolia</i>	Grass-leaved goldenrod	184
<i>Galium boreale</i>	Northern bedstraw	190
<i>Helianthus grosseserratus</i>	Sawtooth sunflower	200
<i>Heuchera richardsonii</i>	Prairie alumroot	202
<i>Liatris ligulistylis</i>	Meadow blazingstar	220
<i>Liatris pycnostachya</i>	Prairie blazingstar	222
<i>Lilium superbum</i>	Turk's-cap lily	224
<i>Matteuccia struthiopteris</i> var. <i>pennsylvanica</i>	Ostrich fern	234
<i>Monarda fistulosa</i>	Wild bergamot	236



## Filtration Strips *Cont.*

Scientific Name	Common Name	See Page
<i>Osmunda regalis</i>	Royal fern	240
<i>Pteridium aquilinum</i>	Bracken fern	260
<i>Pycnanthemum virginianum</i>	Mountain mint	262
<i>Smilacina racemosa</i>	False Solomon's seal	300
<i>Solidago flexicaulis</i>	Zig-zag goldenrod	302
<i>Solidago riddellii</i>	Riddell's goldenrod	304
<i>Solidago rigida</i>	Stiff goldenrod	306
<i>Tradescantia ohiensis</i>	Ohio spiderwort	320
<i>Zizia aurea</i>	Golden alexanders	336
<b>Grasses, Sedges and Rushes</b>		
<i>Andropogon gerardii</i>	Big bluestem	90
<i>Bromus ciliatus</i>	Fringed brome	128
<i>Carex vulpinoidea</i>	Fox sedge	156
<i>Panicum virgatum</i>	Switchgrass	242
<i>Schizachyrium scoparium</i>	Little bluestem	280
<i>Sorghastrum nutans</i>	Indian grass	308
<b>Other appropriate grasses not covered in this guidebook</b>		
<i>Bouteloua curtipendula</i>	Side-oats grama	---
<i>Bouteloua hirsuta</i>	Hairy grama	---
<i>Bromus kalmii</i>	Prairie brome	---
<i>Elymus canadensis</i>	Canada wild rye	---
<i>Koeleria cristata</i>	June grass	---
<i>Sporobolus heterolepis</i>	Prairie dropseed	---
<i>Stipa spartea</i>	Porcupine grass	---



Photo: Paul Jackson

**MOUNTAIN MINT**



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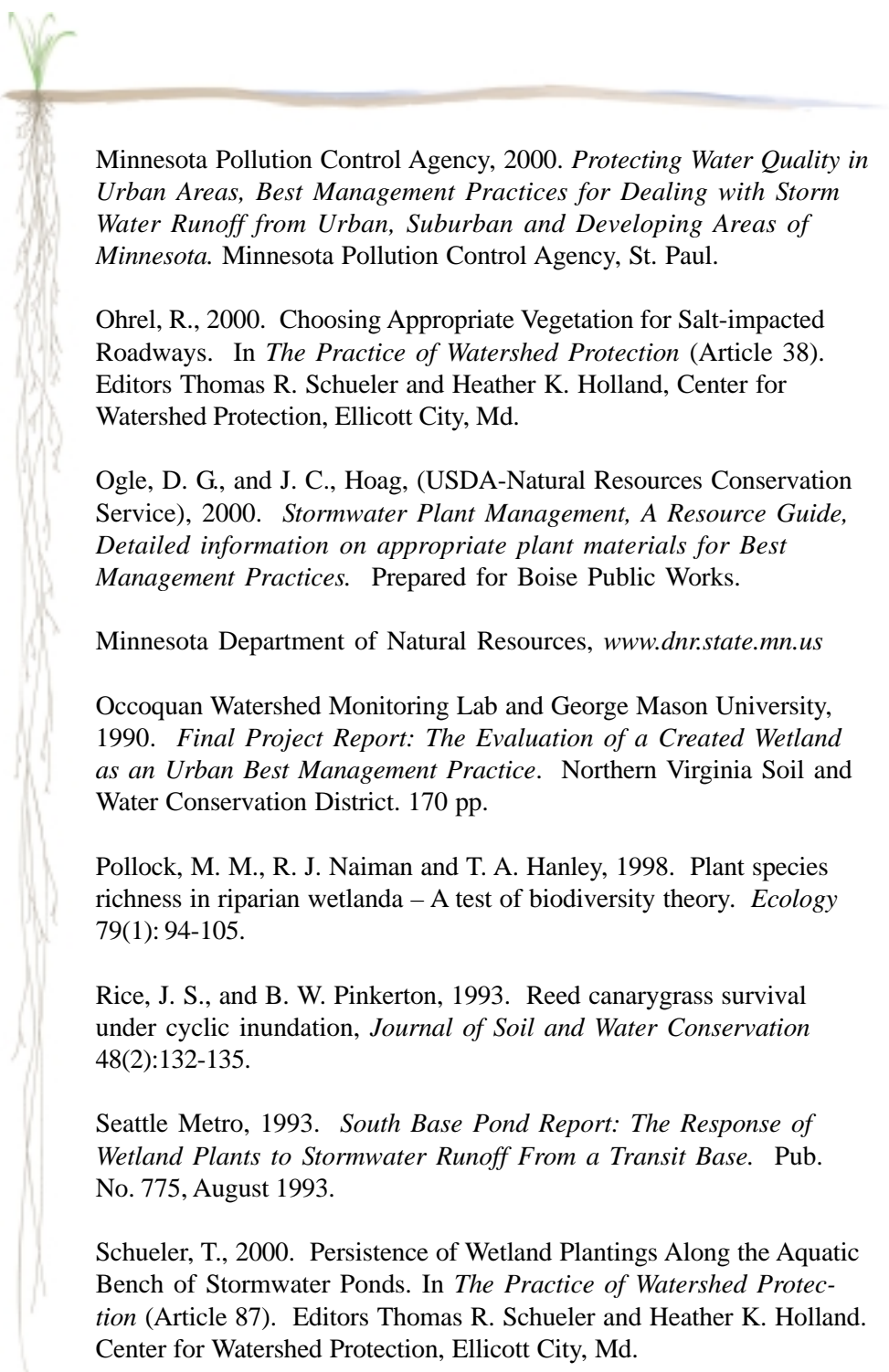
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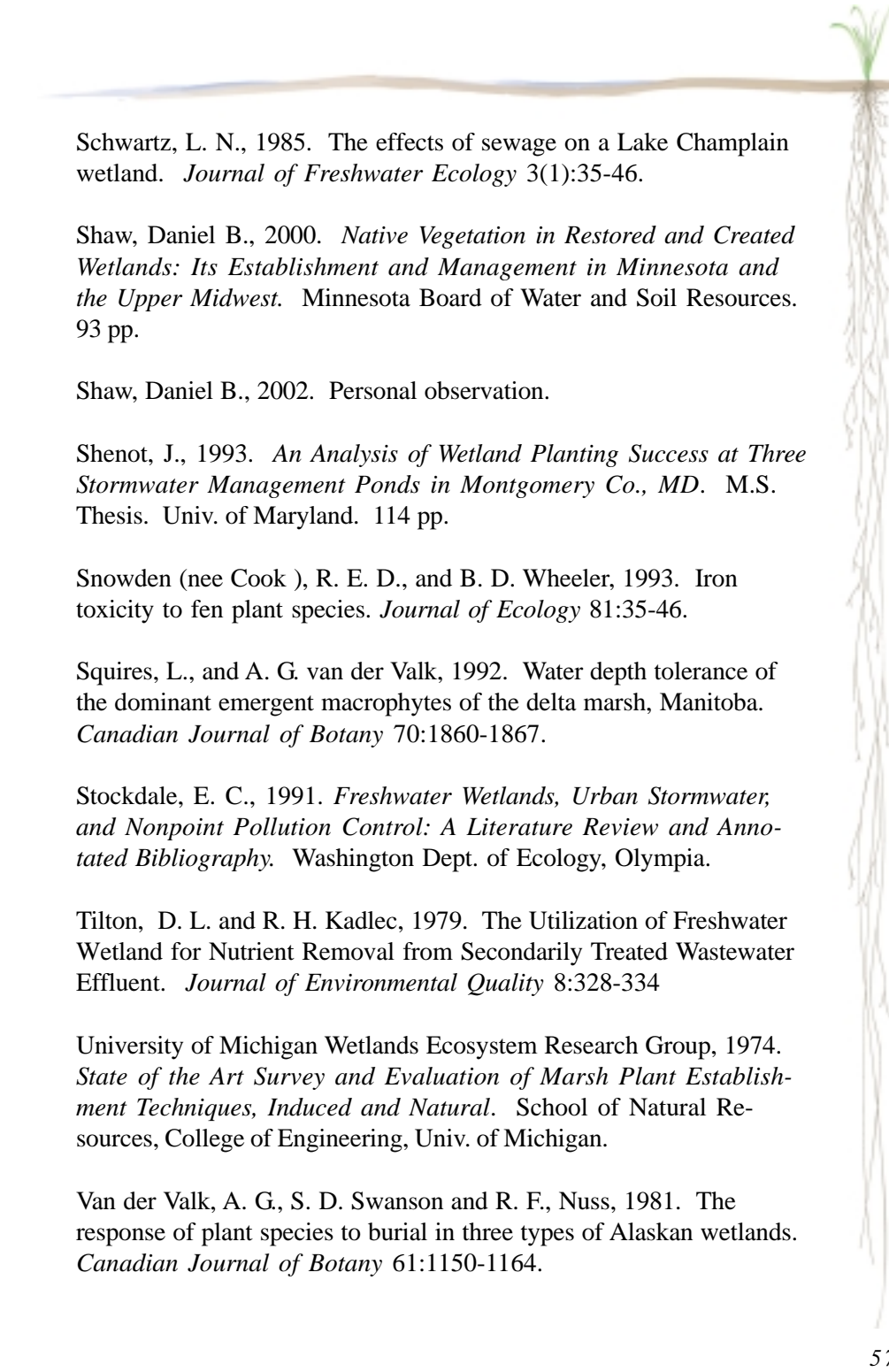
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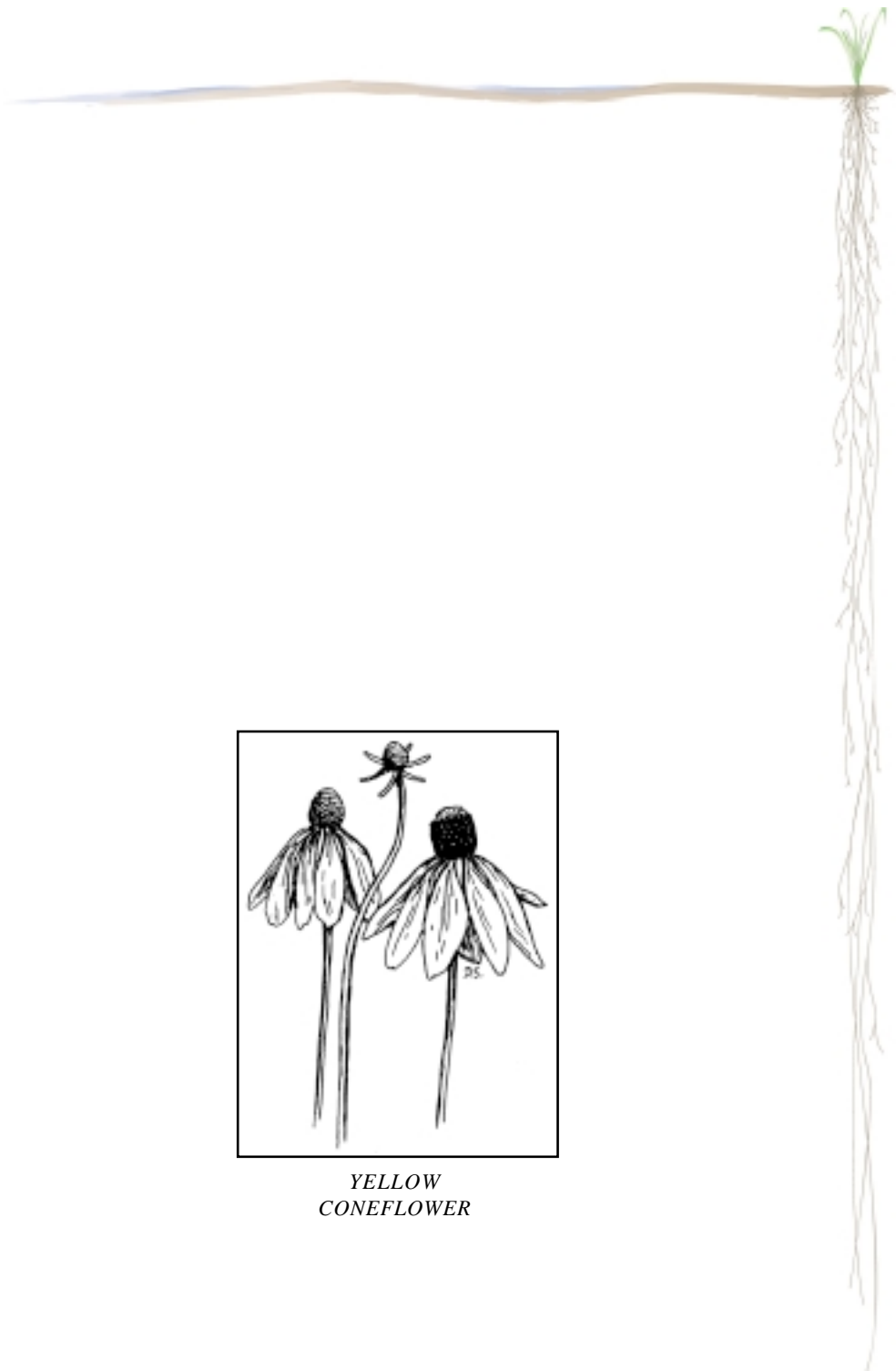
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*YELLOW  
CONEFLOWER*





## PLANT SPECIES INFORMATION



Photo: Beth Kunkel

The following table lists plant species included in this guidebook. The table presents generally recognized scientific and common names for each species as well as the current accepted scientific name references and common name references derived from the *Annotated Checklist of the Flora of Minnesota* from the University of Minnesota herbarium (available on the herbarium's Web site at <http://biosci.cbs.umn.edu/herbarium/checklis2.htm>) and from the Integrated Taxonomic Information System (ITIS). The ITIS is a collaborative effort between taxonomists in the United States, Canada and Mexico. The goal of the ITIS is to determine and support the most current taxonomic standing for flora and fauna in North America. Data records have been confirmed online at <http://www.itis.usda.gov>. Note that several names were current as of January 2003.

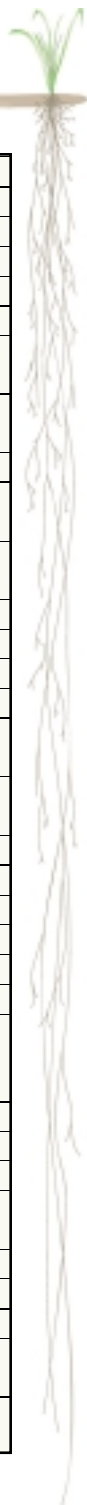
Also included in this section are two pages for each plant species.



<b>Plant Species Included in This Guidebook</b>		
<b>Currently Accepted Scientific Name</b>	<b>Accepted Common Name</b>	<b>Scientific Name Used in This Book</b>
<i>Acer saccharinum</i> L.	Silver maple	
<i>Acorus calamus</i> L.	Sweet flag	
<i>Agastache foeniculum</i> (Pursh) Kuntze	Giant hyssop	
<i>Alisma trivale</i> Pursh	Water plantain	
<i>Allium stellatum</i> Nutt. ex Ker-Gawl	Prairie wild onion	
<i>Alnus incana</i> ssp. <i>rugosa</i> (Du Roi) Clausen	Speckled alder	
<i>Amorpha fruticosa</i> L.	Indigo bush	
<i>Andropogon gerardii</i> Vitman	Big bluestem	
<i>Anemone canadensis</i> L.	Canada anemone	
<i>Angelica atropurpurea</i> L.	Angelica	
<i>Arisaema triphyllum</i> (L.) Schott	Jack-in-the-pulpit	
<i>Artemisia ludoviciana</i> Nutt.	Prairie sage	
<i>Asclepias incarnata</i> L.	Marsh milkweed	
<i>Asclepias tuberosa</i> L.	Butterfly milkweed	
<i>Aster macrophyllus</i> var. <i>macrophyllus</i> L.	Bigleaf aster	
<i>Aster pilosus</i> var. <i>pilosus</i> Willd.	Frost aster	
<i>Aster puniceus</i> var. <i>puniceus</i> L.	Red-stemmed aster	
<i>Athyrium filix-femina</i> ssp. <i>angustum</i> (Willd.) Clausen	Lady fern	
<i>Betula nigra</i> L.	River birch	
<i>Bidens cernua</i> L.	Beggarsticks	
<i>Boltonia asteroides</i> (L.) L'Hér.	Boltonia	
<i>Bromus ciliatus</i> L.	Fringed brome	
<i>Calamagrostis canadensis</i> (Michx.) Beauv.	Canada blue-joint grass	
<i>Caltha palustris</i> L.	Marsh marigold	
<i>Carex aquatilis</i> Wahlenb.	Water sedge	
<i>Carex bebbii</i> Olney ex Fern.	Bebb's sedge	
<i>Carex comosa</i> Boott	Bottlebrush sedge	
<i>Carex crinita</i> Lam.	Caterpillar sedge	
<i>Carex hystericina</i> Muhl. ex Willd.	Porcupine sedge	
<i>Carex lacustris</i> Willd.	Lake sedge	
<i>Carex languinosa</i> Michx.	Wooly sedge	
<i>Carex lasiocarpa</i> Ehrh.	Wooly needle sedge	
<i>Carex retrorsa</i> Schwein.	Retorse sedge	
<i>Carex stipata</i> Muhl. ex Willd.	Awl-fruited sedge	

Currently Accepted Scientific Name	Accepted Common Name	Scientific Names Used in This Book
<i>Carex stricta</i> Lam.	Tussock sedge	
<i>Carex vulpinoidea</i> Michx.	Fox sedge	
<i>Celtis occidentalis</i> L.	Hackberry	
<i>Cephalanthus occidentalis</i> L.	Buttonbush	
<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i> (L.) Holub	Fireweed	<i>Epilobium angustifolium</i> L.
<i>Chelone glabra</i> L.	Turtlehead	
<i>Comarum palustre</i> L.	Marsh cinquefoil	<i>Potentilla palustris</i> L. Scop.
<i>Cornus amomum</i> P. Mill	Silky dogwood	
<i>Cornus racemosa</i> Lam.	Gray dogwood	
<i>Cornus sericea</i> L.	Red-osier dogwood	
<i>Eleocharis obtusa</i> (Willd.) J. A. Schultes	Blunt spikerush	
<i>Elymus virginicus</i> L.	Virginia wild rye	
<i>Equisetum fluviatile</i> L.	Horsetail	
<i>Eryngium yuccifolium</i> Michx.	Rattlesnake master	
<i>Eupatorium maculatum</i> L.	Joe-pye-weed	
<i>Eupatorium perfoliatum</i> L.	Boneset	
<i>Euthamia graminifolia</i> var. <i>graminifolia</i> (L.) Nutt.	Grass-leaved goldenrod	
<i>Fraxinus nigra</i> Marsh.	Black ash	
<i>Fraxinus pennsylvanica</i> Marsh.	Green ash	
<i>Galium boreale</i> L.	Northern bedstraw	
<i>Gentiana andrewsii</i> Griseb.	Bottle gentian	
<i>Glyceria grandis</i> S. Wats.	Giant manna grass	
<i>Glyceria striata</i> (Lam.) A. S. Hitchc.	Fowl manna grass	
<i>Helenium autumnale</i> L.	Sneezeweed	
<i>Helianthus grosseserratus</i> Martens	Sawtooth sunflower	
<i>Heuchera richardsonii</i> R. Br.	Prairie alumroot	
<i>Ilex verticillata</i> (L.) Gray	Winterberry	
<i>Impatiens capensis</i> Meerb.	Jewelweed	
<i>Iris versicolor</i> L.	Blueflag	
<i>Juncus balticus</i> Willd.	Baltic rush	
<i>Juncus effusus</i> L.	Soft rush	
<i>Juncus torreyi</i> Coville	Torrey rush	
<i>Larix laricina</i> (Du Roi) K. Koch	Tamarack	
<i>Leersia oryzoides</i> (L.) Sw.	Rice-cut grass	
<i>Liatris ligulistylis</i> (A. Nels.) K. Schum.	Meadow blazingstar	

<i>Liatris pycnostachya</i> Michx	Prairie blazingstar	
<i>Lilium superbum</i> L.	Turk's-cap lily	<i>Lilium michiganse</i> L.
<i>Lobelia cardinalis</i> L.	Cardinal flower	
<i>Lobelia siphilitica</i> L.	Blue lobelia	
<i>Lysimachia thyrsoflora</i> L.	Tufted loosestrife	
<i>Lythrum salicaria</i> L.	Purple loosestrife	
<i>Maianthemum racemosum</i> ssp. <i>racemosum</i> (L.) Link	False Solomon's seal	<i>Smilacina racemosa</i> L.
<i>Matteuccia struthiopteris</i> (L.) <i>Todar</i>	Ostrich fern	
<i>Monarda fistulosa</i> L.	Wild bergamot	
<i>Oligoneuron riddellii</i> (Frank ex <i>Riddell</i> ) Rydb.	Riddell's goldenrod	<i>Solidago riddellii</i> Frank
<i>Oligoneuron rigidum</i> var. <i>rigidum</i> (L.) Small	Stiff goldenrod	<i>Solidago rigida</i> L.
<i>Onoclea sensibilis</i> L.	Sensitive fern	
<i>Osmunda regalis</i> L.	Royal fern	
<i>Panicum virgatum</i> L.	Switchgrass	
<i>Phalaris arundinacea</i> L.	Reed canary grass	
<i>Photinia melanocarpa</i> (Michx.) <i>Robertson &amp; Phipps</i>	Black chokeberry	
<i>Physocarpus opulifolius</i> (L.) <i>Maxim.</i>	Ninebark	
<i>Physostegia virginiana</i> (L.) <i>Benth.</i>	Obedient plant	
<i>Polygonum amphibium</i> L.	Water smartweed	
<i>Pontederia cordata</i> L.	Pickernelweed	
<i>Populus deltoides</i> Bartr. ex <i>Marsh.</i>	Eastern cottonwood	
<i>Populus tremuloides</i> Michx.	Quaking aspen	
<i>Pteridium aquilinum</i> (L.) <i>Kuhn</i>	Bracken fern	
<i>Pycnanthemum virginianum</i> (L.) <i>T. Dur. &amp; B. D. Jackson</i> ex <i>B. L. Robins. &amp; Fern.</i>	Mountain mint	
<i>Quercus bicolor</i> Willd.	Swamp white oak	
<i>Ratibida pinnata</i> (Vent.) <i>Barnh.</i>	Yellow coneflower	
<i>Rudbeckia subtomentosa</i> Pursh	Brown-eyed Susan	
<i>Sagittaria latifolia</i> Willd.	Broadleaved arrowhead	
<i>Salix discolor</i> Muhl.	Pussy willow	
<i>Salix exigua</i> Nutt.	Sandbar willow	
<i>Salix nigra</i> Marsh.	Black willow	
<i>Sambucus racemosa</i> var. <i>racemosa</i> L.	Red-berried elder	<i>Sambucus pubens</i> L.
<i>Schizachyrium scoparium</i> (Michx.) <i>Nash</i>	Little bluestem	



Currently Accepted Scientific Name	Accepted Common Name	Scientific Names Used in This Book
<i>Schoenoplectus acutus</i> var. <i>acutus</i> (Muhl. ex Bigelow) A. & D. Löve	Hardstem bulrush	<i>Scirpus acutus</i> Muhl.
<i>Schoenoplectus fluviatilis</i> (Torr.) M. T. Strong	River bulrush	<i>Scirpus fluviatilis</i> (Torrey) Gray
<i>Schoenoplectus pungens</i> var. <i>pungens</i> (Vahl) Palla	Three-square bulrush	<i>Scirpus pungens</i> Vahl.
<i>Schoenoplectus tabernaemontani</i> (K.C. Gmel.) Palla	Soft-stem bulrush	<i>Scirpus validus</i> Vahl.
<i>Scirpus atrovirens</i> Willd.	Green bulrush	<i>Scirpus atrovirens</i> Willd.
<i>Scirpus cyperinus</i> (L.) Kunth	Woolgrass	
<i>Scutellaria lateriflora</i> L.	Mad-dog skullcap	
<i>Silphium perfoliatum</i> L.	Cup plant	
<i>Solidago flexicaulis</i> L.	Zig-zag goldenrod	
<i>Sorghastrum nutans</i> (L.) Nash	Indian grass	
<i>Sparganium eurycarpum</i> Engelm. ex Gray	Giant burreed	
<i>Spartina pectinata</i> Bosc ex Link	Prairie cord grass	
<i>Spiraea alba</i> Du Roi	Meadowsweet	
<i>Symphotrichum laeve</i> var. <i>laeve</i> (L.) A. & D. Löve	Smooth aster	<i>Aster laevis</i> var. <i>laevis</i>
<i>Symphotrichum lanceolatus</i> var. <i>lanceolatum</i> (Willd.) Nesom	Panicle aster	<i>Aster lanceolatus</i> ( <i>simplex</i> ) willd.
<i>Symphotrichum novae-angliae</i> (L.) Nesom	New England aster	<i>Aster novae-angliae</i> L.
<i>Symphotrichum puniceum</i> var. <i>puniceum</i> (L.) A. & D. Löve	Swamp aster	<i>Aster lucidulus</i> (Gray)(Wieg.)
<i>Symplocarpus foetidus</i> (L.) Salisb. ex Nutt.	Skunk cabbage	
<i>Thalictrum dasycarpum</i> Fisch. & Avé-Lall.	Tall meadowrue	
<i>Tradescantia ohiensis</i> Raf.	Ohio spiderwort	
<i>Typha latifolia</i> L.	Broadleaved cattail	
<i>Typha x glauca</i> Godr. (pro sp.)	Hybrid cattail	
<i>Verbena hastata</i> L.	Blue vervain	
<i>Vernonia fasciculata</i> Michx.	Ironweed	
<i>Veronicastrum virginicum</i> (L.) Farw.	Culver's root	
<i>Viburnum lentago</i> L.	Nannyberry	
<i>Viburnum opulus</i> var. <i>americanus</i> Ait.	High bush cranberry	<i>Viburnum trilobum</i> L.
<i>Zizia aurea</i> (L.) W. D. J. Koch	Golden alexanders	

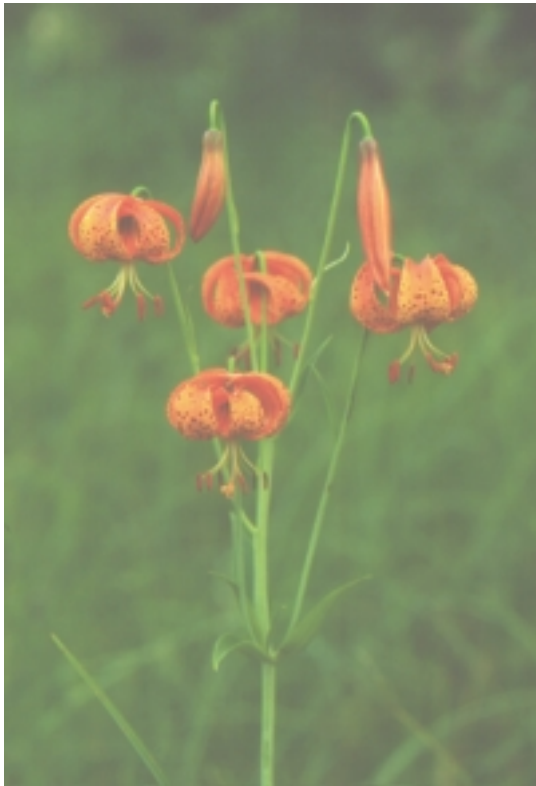
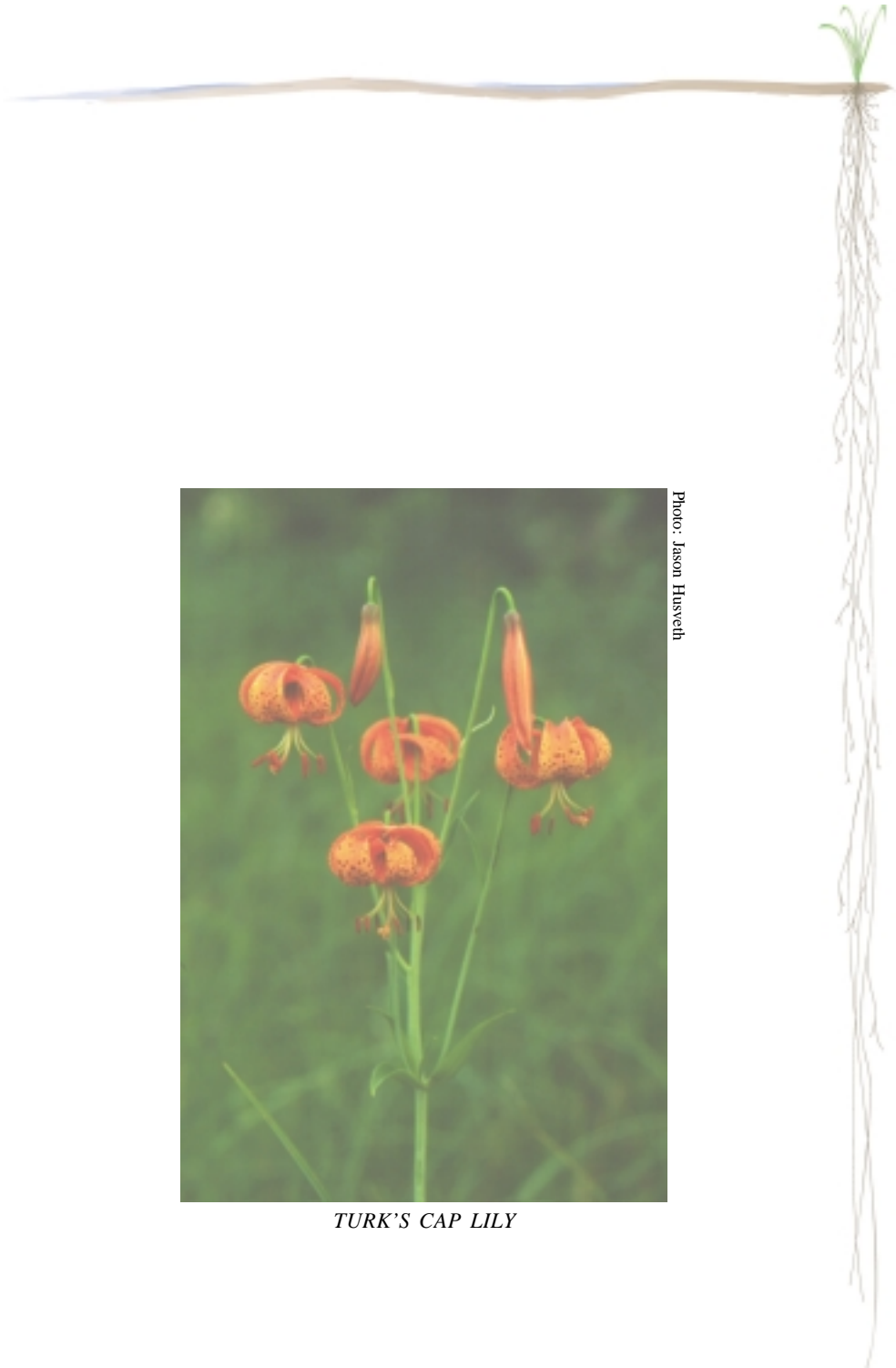


Photo: Jason Husveth

*TURK'S CAP LILY*



## Plant Matrix

This plant matrix summarizes information for plant species covered in the guidebook. Pages for individual species should be referred to for more detailed information. Within the matrix **Water Level** indicates the ideal moisture condition for the species. **Frequency** refers to the frequency of water fluctuation (frequency of inundation) that the species can handle without significant stress.

**Depth** refers to the depth of inundation that the species can handle for the time period listed under **Duration**.

**Design** refers to the type of BMP or other type of plating the species is suited to. The **Nursery** category provides information about the general availability of the plant species.

<sup>1</sup> **Water Level** is the water level of each plant as described in the Normal Water Level section: D = Dry soils, I = Inundation, M = Moist/mesic soils and S = Saturated soils.

<sup>2</sup> **Frequency** is the tolerance to frequency for each plant as described in the Fluctuation Tolerance section: H = High tolerance, L = Low tolerance and M = Moderate tolerance.

<sup>3</sup> **Depth** is the tolerance to depth in inches for each plant as described in the Fluctuation Tolerance section.

<sup>4</sup> **Duration** is the tolerance to duration for each plant as described in the Fluctuation Tolerance section followed by the number of days: H = High, ML = Medium Long, MS = Medium Short, S = Short.

<sup>5</sup> **Design Potentials** is the possibilities for this plant in designed landscapes as described in the Design Consideration section: A = Aromatic, BF = Butterfly/Nectar Source, CF = Cut/Dried Flowers, E = Erosion-control Plant, FC = Fall Color, GC = Ground Cover, GP = Garden Perennial, L = Landscape Design, NR = Use Not Recommended because this species is invasive, R = Restoration, RG = Rainwater Gardens, RO = Rock Garden, S = Shade, SW = Vegetated Swales, UB = Upland Buffer, W = Wave Buffer, WL = Wildlife.

<sup>6</sup> **Nursery** is the availability of the plant at nurseries with three categories of availability: L = Limited availability, NA = Not Available and

<sup>8</sup> W = Widely available.

Scientific Name	Common Name	Water Level <sup>1</sup> (in inches)	Frequency <sup>2</sup>	Depth <sup>3</sup> (in inches)	Duration <sup>4</sup>	Design Potentials <sup>5</sup>	Nursery <sup>6</sup>
<i>Acer saccharinum</i>	Silver maple	S	Mod	60	L 20	L, R, S	W
<i>Acorus calamus</i>	Sweet flag	S-I (6-20)	Low	12	MS 3	E, R, RG, SW, W, WL	W
<i>Agastache foeniculum</i>	Giant hyssop	M-D	Mod	12	S 2	A, CF, GP, RG, UB	W
<i>Alisma trivale</i>	Water plantain	M-I (6)	High	18	L 6	E, R, RP, SW, WL	W
<i>Allium stellatum</i>	Prairie wild onion	M-D	Mod	12	S 1	A, GP, RG, UB	W
<i>Alnus incana</i>	Speckled alder	M-S (6)	High	24	L 6	E, L, R, RP	L
<i>Amorpha fruticosa</i>	Indigo bush	M-D	High	18	MS 3	E, GP, L, R, RG	W
<i>Andropogon gerardii</i>	Big bluestem	M	Mod	12	S 2	E, FC, GP, L, R, UB	W
<i>Anemone canadensis</i>	Canada anemone	M-S	High	12	S 2	R, RG, RO, SW	W
<i>Angelica atropurpurea</i>	Angelica	S-I (3)	Mod-Low	18	MS 3	A, R	L
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	M-S	Mod	12	S 1	L, R, S	L
<i>Aronia melanocarpa</i>	Black chokeberry	M-S	Mod	12	S 2	FC, L, RG	W
<i>Artemisia ludoviciana</i>	Prairie sage	M-D	Mod	18	MS 3	A, GC, L, R, UB	W
<i>Asclepias incarnata</i>	Marsh milkweed	M-I (3)	Mod	18	MS 3	A, BF, L, R, RG, RP, SW, UB	W
<i>Asclepias tuberosa</i>	Butterfly milkweed	M-D	Low	12	S 1	BF, GP, L, R, RG, UB	W
<i>Aster laevis</i>	Smooth aster	M-D	High	12	S 1	BF, CF, R, RG, SW, UB	W
<i>Aster lanceolatus (simplex)</i>	Panicl aster	M-S	Mod	24	ML 4	BF, CF, R, RG, SW, UB	W
<i>Aster lucidulus</i>	Swamp aster	M-S	High	18	L 5	BF, CF, E, R, SW	L
<i>Aster macrophyllus</i>	Bigleaf aster	M-D	Low	12	S 1	GC, R, S, UB	L
<i>Aster novae-angliae</i>	New England aster	M-S	Mod	24	MS 3	BF, CF, GP, R, SW, UB	W
<i>Aster pilosus</i>	Frost aster	M-S	High	12	S 2	BF, CF, R, SW, UB	L
<i>Aster puniceus</i>	Red-stemmed aster	M-S	Mod	18	L 5	BF, R, RP	L
<i>Athyrium filix-femina</i>	Lady fern	M-S	Low	12	S 2	GC, GP, L, RG, S, UB	W
<i>Betula nigra</i>	River birch	M-S	High	60	L 5	E, L, RG, R, WL	W
<i>Bidens cernua</i>	Beggarsticks	M	High	24	ML 4	E, R, SW	L
<i>Boltonia asteroides</i>	Boltonia	M-S	Mod	18	MS 3	BF, CF, GP	L
<i>Bromus ciliatus</i>	Fringed brome	M-S	Mod	18	MS 3	CF, L, S	W
<i>Calamagrostis canadensis</i>	Canada blue-joint grass	M-I (6)	High	6	ML 4	E, L, R, SW, WL	W



Scientific Name	Common Name	Water Level <sup>1</sup> (in inches)	Frequency <sup>2</sup>	Depth <sup>3</sup> (in inches)	Duration <sup>4</sup>	Design Potentials <sup>5</sup>	Nursery <sup>6</sup>
<i>Caltha palustris</i>	Marsh marigold	S-I (6)	Mod	6	MS 3	R	W
<i>Carex aquatilis</i>	Water sedge	S-I (6)	High	12	MS 3	E, R, RG, S, SW	L
<i>Carex bebbii</i>	Bebb's sedge	M-S	High	12	MS 3	L, R, RG, RP	W
<i>Carex comosa</i>	Bottlebrush sedge	S-I (12)	High	36	MS 3	E, L, R, RG	W
<i>Carex crinita</i>	Caterpillar sedge	S-I (6)	High	12	MS 3	E, L, R, RG, S	L
<i>Carex hystericina</i>	Porcupine sedge	S-I (6)	High	36	MS 3	E, L, R, RG	L
<i>Carex lacustris</i>	Lake sedge	S-I (24)	Mod	24	L 8	R	W
<i>Carex languinosa</i>	Wooly sedge	M-I (3-6)	High	12	L 6	E, R, SW	L
<i>Carex lasiocarpa</i>	Wooly needle sedge	S-I (6)	Mod	12	MS 3	R	L
<i>Carex retrorsa</i>	Retrorsed sedge	S-I (6)	Mod	12	MS 3	R	L
<i>Carex stipata</i>	Awl-fruited sedge	M-I (6)	High	6	ML 4	E, R, S, SW	W
<i>Carex stricta</i>	Tussock sedge	S-I (6)	High	12	MS 3	L, R, RG, SW	W
<i>Carex vulpinoidea</i>	Fox sedge	S-I (6)	High	24	ML 4	E, L, R, RG, SW	W
<i>Celtis occidentalis</i>	Hackberry	M-D	Mod	60	L 5	E, L, R	W
<i>Cephalanthus occidentalis</i>	Buttonbush	S-I (36)	Mod	24	L 45+	E, L, R	W
<i>Chelone glabra</i>	Turtlehead	S-I (3)	Mod	9	S 2	BF, CD, L, R, RG	W
<i>Cornus amomum</i>	Silky dogwood	M-S	Low	36	L 30+	E, L, R, RG, WL	W
<i>Cornus racemosa</i>	Gray dogwood	D-S	Mod	6	S 2	E, R	W
<i>Cornus sericea</i>	Red-osier dogwood	M-S	Mod	36	L 30+	E, L, R, RG, WL	W
<i>Eleocharis obtusa</i>	Blunt spikerush	S-I (6)	High	18	L 30	E, R, SW	W
<i>Elymus virginicus</i>	Virginia wild rye	M-S	Mod	36	L 15	E, L, R, SW, WL	W
<i>Epilobium angustifolium</i>	Fireweed	M-S	Mod	12	S 2	E, WL	L
<i>Equisetum fluviatile</i>	Horsetail	S-I (36)	High	24	L 10	R, WL	L
<i>Eryngium yuccifolium</i>	Rattlesnake master	M-D	Mod	12	S 2	BF, CF, L, RG	W
<i>Eupatorium maculatum</i>	Joe-pye-weed	M-S	High	24	ML 3.5	BF, CF, E, GP, R, RG, SW	W
<i>Eupatorium perfoliatum</i>	Boneset	M-S	High	24	ML 3.5	E, GC, L, R, RG, SW	W

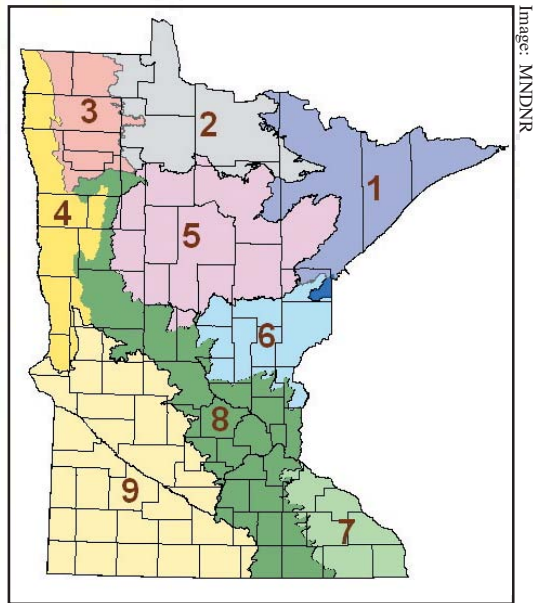
<i>Euthamia graminifolia</i>	Grass-leaved goldenrod	M-S	Mod	12	S 2	E, R, RG, SW	L
<i>Fraxinus nigra</i>	Black ash	M-S	High	60	L 5	R	W
<i>Fraxinus pennsylvanica</i>	Green ash	M-S	High	60/24	L 10/ML 4	E, R, S	W
<i>Galium boreale</i>	Northern bedstraw	M-S	Mod	12	S 1	CF, GC, L, RO	L
<i>Gentiana andrewsii</i>	Bottle gentian	M-S	Mod	12	S 1	CF, GP, L, R, RG, RO, SW	W
<i>Glyceria grandis</i>	Giant manna grass	S-I (12)	High	24	L 8	R, SW, WL	W
<i>Glyceria striata</i>	Fowl manna grass	M-I (6)	High	24	L 8	R, SW, WL	W
<i>Helenium autumnale</i>	Sneezeweed	M-S	Mod	18	MS 3	CF, E, L, R, SW	W
<i>Helianthus grosseserratus</i>	Sawtooth sunflower	M-S	High	18	MS 3	E, R, SW	W
<i>Heuchera richardsonii</i>	Prairie alumroot	M-D	High	6	S 1	RP, L, RG, RO	W
<i>Ilex verticillata</i>	Winterberry	M-S	Mod	18	MS 3	L, R, RG	W
<i>Impatiens capensis</i>	Jewelweed	S	High	18	L 30	R, WL	W
<i>Iris versicolor</i>	Blueflag iris	S-I (12)	Mod	12	ML 4	CF, E, L, R, RG, SW	W
<i>Juncus balticus</i>	Baltic rush	S-I (6)	High	24	L 10	E, R, SW, WL	L
<i>Juncus effusus</i>	Soft rush	S-I (12)	Mod	18	ML 4	L, R, RG, SW	W
<i>Juncus torreyi</i>	Torrey rush	M-I (3-6)	Mod	18	L 6	CF, E, L, R, SW	W
<i>Larix laricina</i>	Tamarack	M-S	Low	12	L 5	L, R, RG	W
<i>Leersia oryzoides</i>	Rice-cut grass	S-I (6)	High	30	L 6	E, R, SW, WL	W
<i>Liatris ligulistylis</i>	Meadow blazingstar	M-S	Low	12	S 1	BF, CF, GP, L, RG	W
<i>Liatris pycnostachya</i>	Prairie blazingstar	M-S	Low	18	MS 3	BF, CF, GP, L, R, RG	W
<i>Lilium superbum</i>	Turk's-cap lily	M-S	Low	12	S 2	BF, R	L
<i>Lobelia cardinalis</i>	Cardinal flower	M-S	High	18	L 5	CF, E, L, RG	W
<i>Lobelia siphilitica</i>	Blue lobelia	M-S	High	18	L 5	CF, GP, L, R, RG, WL	W
<i>Lysimachia thyrsoiflora</i>	Tufted loosestrife	I (3)	Mod	12	ML 4	R	L
<i>Lythrum salicaria</i>	Purple loosestrife	S-I (6)	High	36	L 10	NR	NA
<i>Matteuccia struthiopteris</i>	Ostrich fern	M-S	Mod	12	S 1	L, R, S	W
<i>Monarda fistulosa</i>	Wild bergamot	M-D	Mod	12	S 2	A, CF, E, L, R, UB, WL	W
<i>Oncoclea sensibilis</i>	Sensitive fern	S-I (3)	High	12	ML 4	CF, GC, L, R, RG, S	W

Scientific Name	Common Name	Water Level <sup>1</sup> (in inches)	Frequency <sup>2</sup>	Depth <sup>3</sup> (in inches)	Duration <sup>4</sup>	Design Potentials <sup>5</sup>	Nursery <sup>6</sup>
<i>Osmunda regalis</i>	Royal fern	S-I (3)	High	12	ML 4	GC, L, RG, S	W
<i>Panicum virgatum</i>	Switchgrass	M	High	18	MS 3	CF, E, L, WL	W
<i>Phalaris arundinacea</i>	Reed canary grass	S-I (12)	High	24	L 8	NR	L
<i>Physocarpus opulifolius</i>	Ninebark	D-S	Mod	18	MS 3	L, R	W
<i>Physostegia virginiana</i>	Obedient plant	S-I (3)	Mod	12	S 2	CF, GP, L, RG	W
<i>Polygonum amphibium</i>	Water smartweed	S-I (36)	High	12	S 2	E, R, W, WL	W
<i>Pontederia cordata</i>	Pickernelweed	I (12-18)	Mod	12	ML 4	L, R, RG, WL	W
<i>Populus deltoides</i>	Eastern cottonwood	M-S	High	60	L 30	L, R, S	W
<i>Populus tremuloides</i>	Quaking aspen	M-D	Low	18	MS 3	R, WL	W
<i>Potentilla palustris</i>	Marsh cinquefoil	S-I (6)	Low	12	S 2	R	NA
<i>Pteridium aquilinum</i>	Bracken fern	M-D	Mod	12	S 1	NR	NA
<i>Pycnanthemum virginianum</i>	Mountain mint	M-S	Mod	12	S 2	A, CF, E, GP, L, R, SW	W
<i>Quercus bicolor</i>	Swamp white oak	M-S	Mod	60	L 15	E, L, R, RG, UB	W
<i>Ratibida pinnata</i>	Yellow coneflower	M-D	Mod	12	S 1	CF, E, L, SW, UB	W
<i>Rudbeckia subtomentosa</i>	Brown-eyed-Susan	M	High	18	MS 3	BF, CF, L, R, RG, SW	W
<i>Sagittaria latifolia</i>	Broadleaved arrowhead	S-I (24)	Mod	18	MS 3	E, R, RP, W, WL	W
<i>Salix discolor</i>	Pussy willow	S-I (6)	Mod	24	L 6	CF, L, R	L
<i>Salix exigua</i>	Sandbar willow	S-I (6)	High	36	L 30+	E, R	W
<i>Salix nigra</i>	Black willow	S	High	60/24	L 10/ML 4	BF, E, R, SW	W
<i>Sambucus racemosa</i>	Red-berried elder	M	Mod	18	MS-3	E, R, S	W
<i>Schizachyrium scoparium</i>	Little bluestem	M-D	Low	12	S 1	E, FC, RG, UB, WL	W
<i>Scirpus acutus</i>	Hardstem bulrush	I (60)	High	24	ML 4	E, L, R, SW, W, WL	W
<i>Scirpus atrovirens</i>	Green bulrush	S-I (30)	High	30	MS 3	CF, E, R, SW	W
<i>Scirpus cyperinus</i>	Woolgrass	S-I (3)	High	18	L 5	E, L, R	W
<i>Scirpus fluviatilis</i>	River bulrush	S-I (30)	High	30	MS 3	E, R, SW, WL	W
<i>Scirpus pungens</i>	Three-square bulrush	S-I (30)	High	18	ML 4	E, R, SW, WL	W
<i>Scirpus validus</i>	Soft-stem bulrush	I (12-48)	High	24	L 42+	E, R, SW, W, WL	W

<i>Scutellaria lateriflora</i>	Mad-dog skullcap	S	Mod	24	MS 3.5	L, R, RG	L
<i>Silphium laciniatum</i>	Compass plant	M-S	Low	12	S 1	BF, E, R, RG	L
<i>Silphium perfoliatum</i>	Cup plant	M-S	Mod	18	MS 3	BF, E, R, RG, SW, UB, WL	W
<i>Smilacina racemosa</i>	False Solomon's seal	M	Low	12	S 1	CF, E, R, S, UB	W
<i>Solidago flexicaulis</i>	Zig-zag goldenrod	M-D	Low	12	S 1	R, RG, S, UB	W
<i>Solidago riddellii</i>	Riddell's goldenrod	M-S	Mod	12	S 2	BF, CF, L, R, WL	W
<i>Solidago rigida</i>	Stiff goldenrod	M-D	Low – Mod	12	S 2	BF, CF, E, R, RG, UB	W
<i>Sorghastrum nutans</i>	Indian grass	M-S	Mod	12	S 1	BF, E, L, R, RG, SW	W
<i>Sparganium eurycarpum</i>	Giant burreed	S-I (18)	High	12	S 2	E, R, W, WL	W
<i>Spartina pectinata</i>	Prairie cord grass	S-I (3)	High	24	ML 4	E, R, SW	W
<i>Spiraea alba</i>	Meadowsweet	S-I (3)	Mod	18	L 5	BF, L, R	W
<i>Symplocarpus foetidus</i>	Skunk cabbage	S	Mod	12	MS 3	R, S, WL	L
<i>Thalictrum dasycarpum</i>	Tall meadowrue	M-S	Mod	18	MS 3	L, R, S, UB	W
<i>Tradescantia ohiensis</i>	Ohio spiderwort	S-D	Low	12	S 2	BF, CF, E, GP, L, R, RG, UB	W
<i>Typha latifolia</i>	Broad-leaved cattail	S-I (18)	High	24	L 42	CF, E, WL	L
<i>Typha x glauca</i>	Hybrid cattail	S-I (24)	High	12	L 6	CF, E, WL	NA
<i>Verbena hastata</i>	Blue vervain	M-S	High	12	ML 4	BF, CF, E, RG, SW	W
<i>Veronica fasciculata</i>	Ironweed	M-S	Mod	18	ML 4	BF, CF, E, L, RG, W	W
<i>Veronicastrum virginicum</i>	Culver's root	M-S	Mod	18	MS 3	BF, CF, GP, L, R, RG, SW, UB	W
<i>Viburnum lentago</i>	Nannyberry	M-S	Mod	18	MS 3	E, L, R, UB, WL	W
<i>Viburnum trilobum</i>	High bush cranberry	M-S	High	18	MS 3	E, FC, L, R, UB, WL	W
<i>Zizia aurea</i>	Golden alexanders	M-S	High	12	S 1	BF, CF, E, L, R, SW	W

The following section provides detailed information for 131 plant species that are well suited to stormwater management practices (MPs). This information is intended to help designers narrow their species lists down to plants that are adapted to specific site conditions. Both wetland and upland species are included to cover a wide range of possible hydrologic conditions and to enhance the appearance and performance of upland areas adjacent to stormwater MPs. Information provided for each species includes:

- Habitat/Plant
- Community and Geographic Range
- Description
- Normal Water Level
- Flooding/Fluctuation Tolerance
- Sensitivities or Other Tolerances
- Design Considerations
- Wildlife Use
- Nursery/Plant Information
- Planting Techniques
- Additional Notes
- Indicator Status



*ECOLOGICAL CLASSIFICATION MAP*

The eco-region where each plant species is typically found in Minnesota is provided as part of the Geographic Range information. Eco-regions have been developed as part of the Minnesota Department of Natural Resources’ Ecological Classification System, or ECS (see at <http://www.dnr.state.mn.us>), by integrating climate, geological, hydrologic, topographic, soil and vegetation data for the state.

Flood tolerance charts are provided for each species. The charts were developed through a combination of available research, observations by the authors and review by professionals throughout the region. These

charts are intended to help designers select species that will be well adapted to the hydrologic conditions of their projects. The charts show the number of days the species can tolerate submersion at a specific water level in the middle of the growing season before experiencing “significant stress,” or the point where it begins to die. Water level is represented on the x-axis of the chart, and the y-axis represents the duration of inundation in one-half-day increments. The green line on the chart represents tolerances for adult plants, while the blue line represents the normal water level for the species. If the species is normally found in saturated-to-dry soils, no blue line is represented on the charts.

The native range of plants within the Twin Cities metropolitan area is 300 miles east and west and 200 miles north and south of the center of the Twin Cities metro area. This range also represents the area where the majority of plant information was collected for this guide.



Image: Jackie Newman



## **Botanical Name**

**Common Name** - a.k.a. – alternative names commonly recognized for this species

### **Habitat/Plant Community and Geographic Range**

The habitat/plant community and geographic range for each species is given in this section. Eco-Region numbers represent the Minnesota Department of Natural Resource ecological regions in Minnesota where the species is commonly found. Abbreviations used for compass directions are: c.-central; e.-east, eastern; n.-north, northern; nc.-north-central; ne.-northeast, northeastern; s.-south, southern; se.-southeast, southeastern; sw.-southwest, southwestern; w.-west, western.

Abbreviations used for geographic locations are: Ala.-Alabama, Alta.-Alberta, Amer.-America, Ariz.-Arizona, Ark.-Arkansas, B.C.-British Columbia, Calif.-California, Can.-Canada, Colo.-Colorado, Conn.-Connecticut, Del.-Delaware, Fla.-Florida, Ga.-Georgia, Ill.-Illinois, Ind.-Indiana, Kan.-Kansas, Ky.-Kentucky, La.-Louisiana, Labr.-Labrador, LP-Lower Peninsula, Man.-Manitoba, Mass.-Massachusetts, Md.-Maryland, Me.-Maine, Mex.-Mexico, Mich.-Michigan, Minn.-Minnesota, Miss.-Mississippi, Mo.-Missouri, Mont.-Montana, N.B.-New Brunswick, N.C.-North Carolina, N.D.-North Dakota, Neb.-Nebraska, New Engl.- New England, Nev.-Nevada, Nfld.-Newfoundland, N.H.-New Hampshire, N.J.-New Jersey, N.M.-New Mexico, N.S.-Nova Scotia, Nw. Terr.-Northwest Territories, N.Y.-New York, Okla.- Oklahoma, Ont.-Ontario, Ore.-Oregon, Pa.- Pennsylvania, P.E.I.-Prince Edward Island, Que.-Québec, R.I.-Rhode Island, Sask.-Saskatchewan, S.C.-South Carolina, S.D.-South Dakota, Tenn.-Tennessee, Tex.-Texas, UP-Upper Peninsula; USA-United States, Va.-Virginia, Vt.-Vermont, Wash.-Washington, Wis.-Wisconsin, W.Va.-West Virginia, Wyo.-Wyoming.

[#] – This symbol represents citation numbers in the Plant Pages Bibliography.

### **Description**

The species' physical features are broken down into eight categories for identification: general description, flower, leaf, stem or twig, bark, fruit, root and soil.

### **Normal Water Level**

This section describes where the species typically grows relative to soil moisture or normal level of inundation.

### **Flooding/Fluctuation Tolerances**

This section describes the tolerance to frequency, depth and duration of flooding. Special information about the species' sensitivity to water level fluctuation is given here also.

### **Sensitivities or Other Tolerances**

Other stresses and tolerances are described here. Stressors include salt, nutrient, siltation, insect tolerances as well as the species' preferred exposure. Tolerances are represented as high, medium or low. A high level indicates a high tolerance to the stress. "Unknown" indicates that the authors did not find information for that stress.

### **Design Considerations**

This section describes the optimal management practices appropriate for the species. Design concerns or considerations are presented here also.

**Exposure**



Full Sun



Partial Sun



Full Shade

**Indicator Status Categories:**

FAC (Facultative) — Equally likely to occur in wetlands or nonwetlands (estimated probability, or est. prob., 67-99%).

FACU (Facultative Upland) — Usually occurs in nonwetlands (est. prob. 67-99%), but is occasionally found in wetlands (est. prob. 1-33%).

FACW (Facultative Wetland) — Usually occurs in wetlands (est. prob. 67-99%), but is occasionally found in nonwetlands.

OBL (Obligate Wetland) — Under natural conditions, occurs almost always (est. prob. >99%) in wetlands.

UPL (Obligate Upland) — Occurs in wetlands in another region, but occurs almost always (est. prob. >99%) under natural conditions in nonwetlands in the region specified.

A positive (+) sign indicates that the species is more likely to be found in wetlands, and a negative (-) sign indicates that it is less likely to be found in wetlands. [38]

**Wildlife Use**

This section describes fauna species for which this plant species provides habitat and how the plant is used.

**Nursery/Plant Information**

This section provides information on the species' availability from nurseries and the types of plant material that are available.

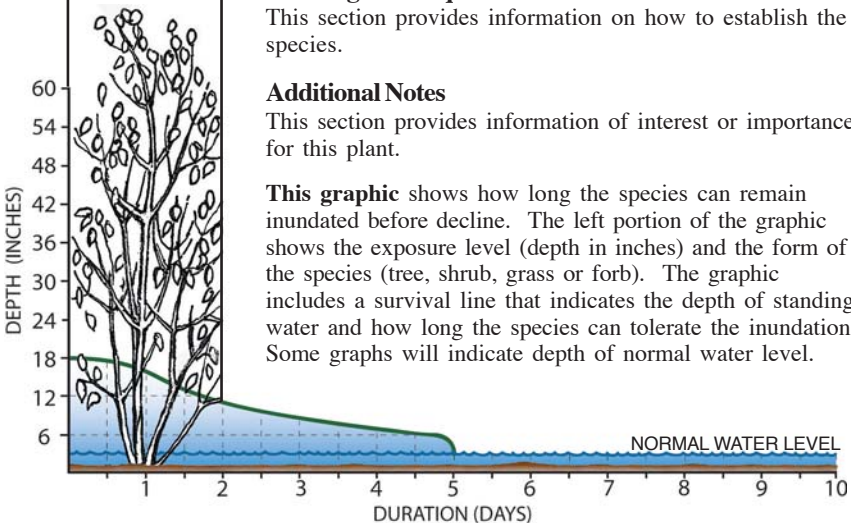
**Planting Techniques**

This section provides information on how to establish the species.

**Additional Notes**

This section provides information of interest or importance for this plant.

**This graphic** shows how long the species can remain inundated before decline. The left portion of the graphic shows the exposure level (depth in inches) and the form of the species (tree, shrub, grass or forb). The graphic includes a survival line that indicates the depth of standing water and how long the species can tolerate the inundation. Some graphs will indicate depth of normal water level.







# *Acer saccharinum*

Silver Maple - a.k.a. Soft Maple, White Maple

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Silver maple is a dominant tree in floodplain forests. It is also found in swamps, on stream banks, shores, and low areas of wet to mesic soils. It does well in upland plantings and is common in Midwest windbreak and farmstead plantings. [7, 11, 22, 32, 36] **Range:** Minn. (Eco-Regions 1, 2, 4-9), especially se., uncommon in far nw. Wis., especially s. LP of Mich.; N.B. and Que. to Minn. and e. S.D., s. to Ga., w. Fla., La. and Okla. [7, 21]

## Description

**General:** Large, deciduous tree with short, stout trunk, spreading open, irregular crown of curving branches that may grow to a height of 90'. This tree is the fastest growing native maple. **Flower:** February to March, usually ¼" long; clusters; male and female are separate. **Leaf:** Opposite 4-6" long, broadly ovate, deeply 5-lobed, green above and silvery white below. **Twigs:** light green to reddish, hairless with slightly unpleasant odor when crushed. **Bark:** Gray and smooth in young trees, becoming furrowed into long, scaly, shaggy ridges. **Fruit:** A winged samara. **Roots:** Shallow, very wide spreading, fibrous. **Soils:** Tolerates wide variety of soils, but reaches largest size in moist soils. [7, 11, 22, 36]

## Normal Water Level

This species prefers wet/saturated conditions. [21, 37]

## Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 5'. **Duration:** Long – 20 days (decreasing 6"/day for 8 days, leveling out at 18" for until the 20th day) during the growing season, although it tolerates weeks of inundation in the spring and is very resistant to drought/heat. [1, 22, 37]

## Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderately high for spray and moderately low for soil. **Nutrient:** Manganese chlorosis in calcareous or high-pH soils. **Siltation:** N/A. **Insect:** Frequent – ocellate leaf gall, cottony maple scale, borers, other scale. **Other:** Resistant to SO<sub>2</sub>, HCl, Cl, mine spoils and soil compaction. Sensitive to O<sub>3</sub> and alkaline soils, though intermediate to HFl. [1, 2, 10, 22, 24, 37]

## Design Considerations

Silver maple is frequently used in landscaping as a shade tree because of its rapid growth and toleration of a wide variety of soil types. A good tree for wetland use, restorations, stream edges and floodplains. **Concerns:** The branches are very weak and damage easily. Other issues are that it does not tolerate dense shade, fruit produces litter, and roots may grow at the surface and become exposed, creating tripping hazards. [11, 36]

## Indicator Status: FACW

### Wildlife Use

This species provides seeds and nesting cover for gamebirds, songbirds (especially bobwhite quail, cardinals, orioles, goldfinch and grosbeaks), waterbirds and waterfowl. Silver maple also provides food and cover for porcupine, raccoon, squirrel, chipmunk, mice, beaver, deer and moose.

[21, 22, 32, 37]

### Nursery/Plant Information

**Available:** Widely (though watch out for different varieties). **Types:** Balled-and-burlapped, potted and bareroot stock.

### Planting Techniques

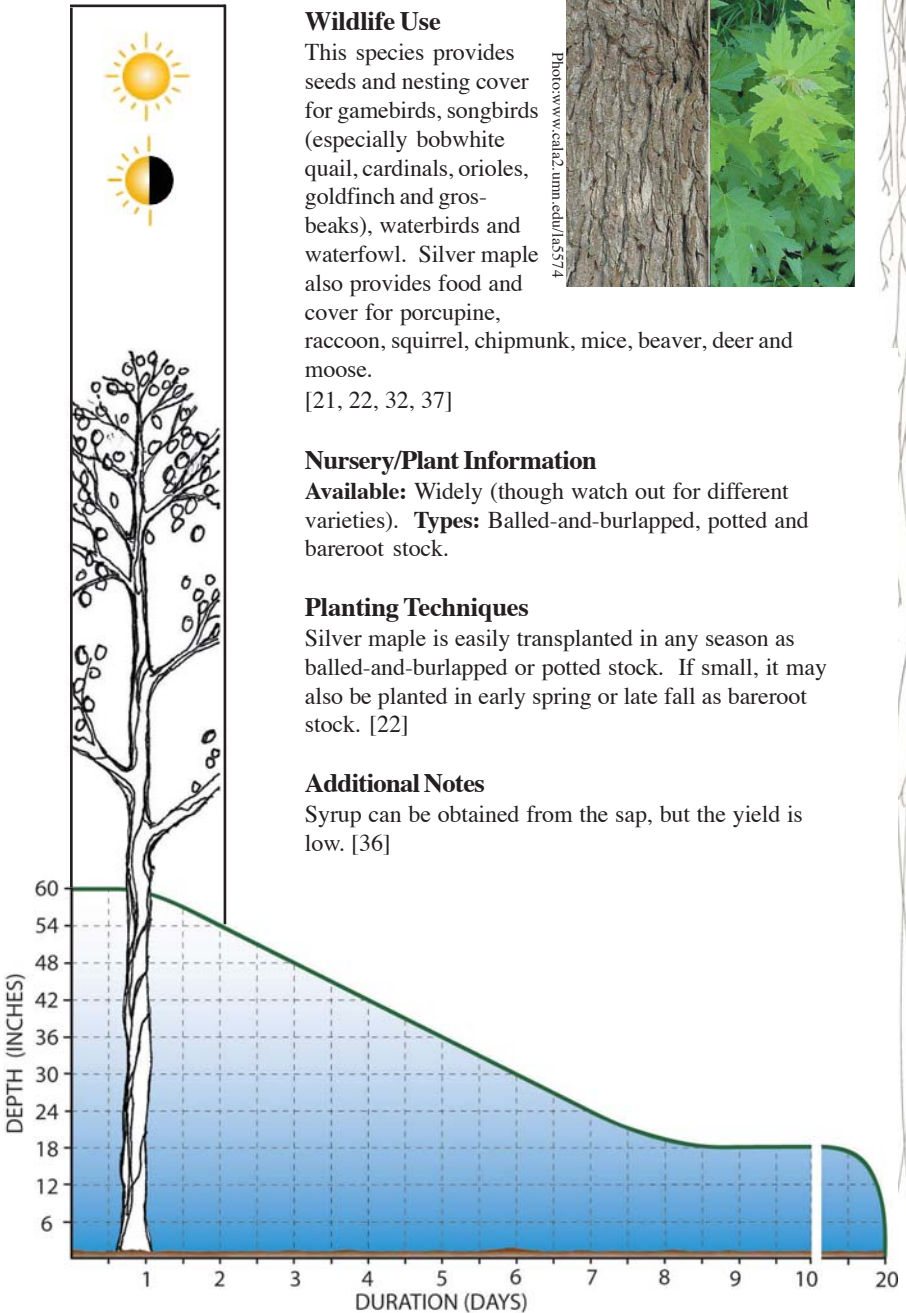
Silver maple is easily transplanted in any season as balled-and-burlapped or potted stock. If small, it may also be planted in early spring or late fall as bareroot stock. [22]

### Additional Notes

Syrup can be obtained from the sap, but the yield is low. [36]



Photo: www.cala2.umn.edu/hs574





## *Acorus calamus*

Sweet Flag - a.k.a. *Acorus americanus*

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Bogs, streambanks, marshes (often with cattails), swamps, shallow water, peatlands and sometimes in seasonally inundated wet meadows. Usually forming beautiful clumps. [4, 7, 16, 35] **Range:** Minn. (Eco-Regions: All), scattered throughout Wis., Mich. Native, though widely naturalized in N. Amer. from N.S. and Que. to Alta., s. to Fla., Tex., Colo., n. Idaho and Wash.; Asia. [7, 21]

### **Description**

**General:** Perennial, aromatic, emergent herb, growing in clumps or dense beds with tall, sword-like leaves. Mature height is 2-6'. **Flower:** Small, in a dense cluster (spadix) near the top of the flattened, leaflike stem. Color is green/brown from May 25 to June 30. **Leaf:** Its erect, swordlike leaves are much like those of blue flag, except they are yellowish-green and give off a sweet odor when bruised. **Stem:** The spathe is the tapering upper part of the stem with a 2-edged stalk. **Fruit:** Brown and persistent into late fall. **Root:** Stout, aromatic rhizomes. **Soil:** pH range 5.9-8.8; tolerates most wet soils in inundated conditions. [4, 7, 16, 35, 44]

### **Normal Water Level**

This species prefers shallow water of 20" of inundation or less to wet/saturated conditions, though it prefers depths of 6-20". [21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Low. **Depth:** 12". **Duration:** Medium short – 3 days (decreasing 4"/day). Prefers stable water levels and will decrease in abundance with flood depth increases, although will tolerate dry periods. [1, 6, 29, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Partial to full sun. **Salt:** Low to moderate. **Nutrient:** Low. **Siltation:** Low. **Insect:** N/A. **Other:** Tolerates acidic conditions and moderately tolerates general disturbance and stress. [1, 6, 37, 44]

### **Design Considerations**

Sweet flag is used in soil stabilization of lower shoreline zones and vegetated swales. Rhizomes and roots form a mat in upper 4-8" of soil, which prevents erosion, stabilizes sediment, and mitigates buffering wave action. Good for wetland restoration (wet meadow/wet woods) due to its aggressive behavior and rhizomatous growth – though it is moderate in spread rate. Good for rainwater and water gardens. Uses may also include wildlife cover and a food source. **Concerns:** This species is considered aggressive, although this may be beneficial to some sites. [16, 21, 44]

### **Wildlife Use**

Sweet flag provides food (seed) and cover for waterfowl (especially wood ducks). Muskrats will eat the rhizomes. Sweet flag is also considered an excellent feeding cover

**Indicator Status: OBL**



for woodcock, snipe and rodents. This perennial grows in clumps that provide nesting spots for waterfowl and shorebirds. [4, 21, 37, 44]

### **Nursery/Plant Information**

**Available:** Widely.

**Types:** Transplants, rhizomes and seeds.

### **Planting Techniques**

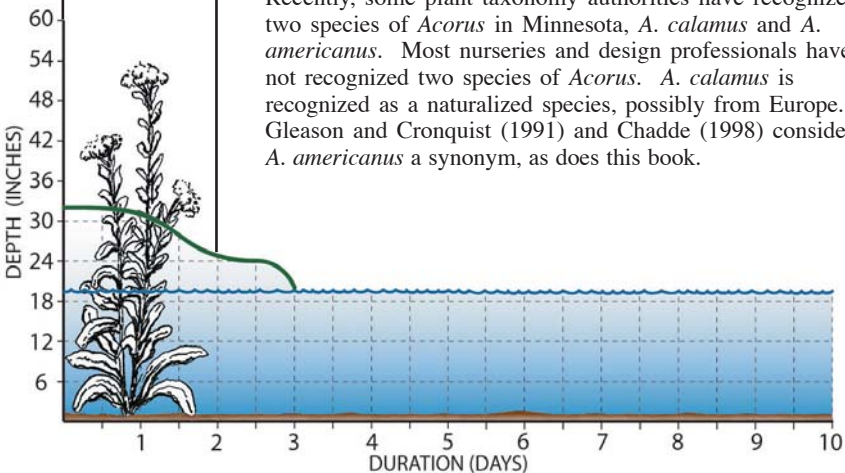
Rhizomes and transplants are generally more successful than seeds. Expose freshly harvested seed to cold, moist stratification for 60-90 days or soak seed in a bucket of water outside all winter, let freeze. Seed can be stored 9 months to 2 years. Fall sowing provides better germination than spring sowing by providing this cold treatment naturally. Sow in saturated soils. Avoid flooding of newly established plants. Transplants can tolerate some bounce in water levels. This species requires drawdown until plants are established. Seeding rate is .006-0.25 lb/acre or spacing of 1-3' centers at minimum of 1,000/acre. 12,000 seeds/lb. Plant in muddy soils to 1' of water. [4, 16, 44]

### **Additional Notes**

Recently, some plant taxonomy authorities have recognized two species of *Acorus* in Minnesota, *A. calamus* and *A. americanus*. Most nurseries and design professionals have not recognized two species of *Acorus*. *A. calamus* is recognized as a naturalized species, possibly from Europe. Gleason and Cronquist (1991) and Chadde (1998) consider *A. americanus* a synonym, as does this book.



Photo: Jason Husveit





## *Agastache foeniculum*

**Giant Hyssop** - a.k.a. Wonder Honey Plant; **Fragrant, Fragrant Giant, Giant Blue or Anise Hyssop**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Mesic to dry prairies and open or semishady woodlands (savanna), often along roads. [16, 17, 35, 41] **Range:** Minn. (Eco-Region: 1-6, 8, 9), Wis. Wis. to n. Iowa and Man., s. to Colo. and Alta., and occasionally e. to Que. **Endangered in Iowa.** [17, 21]

### **Description**

**General:** One of the more ornamental and larger of our native mints. Giant hyssop is a perennial, commonly 2-4' tall. **Flower:** A thick spike with dense, often interrupted, whorls of bright blue flowers ¼" long, June to October. **Leaf:** Sharply pointed, lance-shaped, toothed, opposite, glossy, dark green with fine hairs underneath and 2-3" long. Leaves have an anise or licorice odor when crushed; can be used for tea. **Stem:** Square. **Fruit:** Light to dark brown. **Roots:** Fibrous, shallow. **Soil:** Medium (mesic) to dry loam soil. [17, 35, 41, 47]

### **Normal Water Level**

This species prefers upland moist/mesic to dry conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day).

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate; low to 2,4-D. **Nutrient:** Unknown. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** Giant hyssop has a moderate tolerance to general disturbance and stress. [1, 47]

### **Design Considerations**

Giant hyssop is an ornamental perennial that grows well in gardens and produces excellent cutflowers. This plant has use as an aromatic and as a herb for teas. Will work well in shallow rain gardens and upland buffers. **Concerns:** Giant hyssop self-seeds readily and may spread in gardens. It survives poorly in northern Minnesota. [41]

### **Wildlife Use**

Flowers are very attractive to bees and butterflies throughout the summer. [21, 41]

### **Nursery/Plant Information**

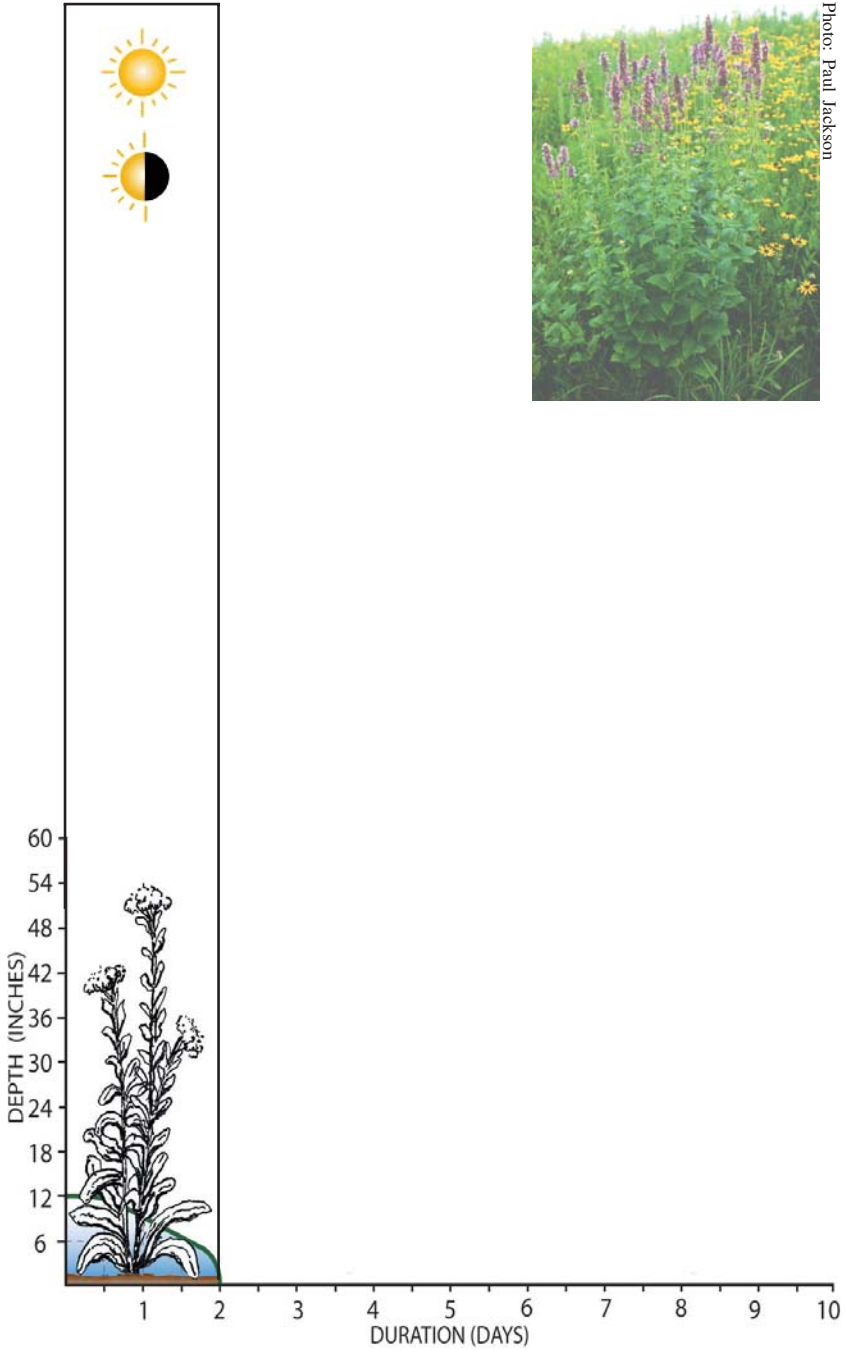
**Available:** Widely. **Types:** Plants and seed.

### **Planting Techniques**

Spreads by producing hundreds of tiny, black seeds. Seeds need no treatment, but moist, cold stratification may help. 1,040,000 seeds/lb. [16, 21, 41]

**Indicator Status: UPL**

Photo: Paul Jackson





## *Alisma trivale*

**Water Plantain - a.k.a. Common Water Plantain or Mud Plantain**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Shallow water and in saturated soils, marshes, shrub swamps, wooded swamps, shores of lakes and streams, and ditches. It rapidly invades exposed mud flats and is common in farmed wetlands. [4, 7, 11, 16, 21]

**Range:** Minn. (Eco-Region: All), n. Wis., Mich. N.S. to s. B.C., s. to Pa., Mo. and Calif. [4, 7, 21]

### **Description**

**General:** A decorative, perennial herb, usually emergent with a mature height of 3-4'.

**Flower:** Inflorescence is highly branched with perfect flowers of 3 sepals and 3 white or pinkish petals from May to September. Pistils are in a single whorl on a small, flat receptacle. **Leaf:** Broad, flat blades that may be rounded or tapered at the base; however, submerged forms with only ribbon-like leaves are also produced. The leaves are olive-green in color. **Fruit:** A group of minute, flat-sided achenes borne in a whorl. Achenes are not quite 1/8" long. **Root:** Submerged bulb. **Soil:** The pH range is 7.0-8.8. Tolerates saturated to inundated conditions on many soil types. [4, 7, 11, 16, 44, 47]

### **Normal Water Level**

This species prefers shallow water, 6" or less, to wet/saturated conditions of 36" of inundation or less, though it prefers 0-6" of water depth. [11, 21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Long – 6 days (decreasing 6"/day). This species tolerates periodic inundation of short durations during the early part of the growing season. It will increase in abundance with increases in flood depth. Tolerant of late-season drawdowns. [1, 21, 16, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Moderate. **Siltation:** High. **Insect:** Infrequent. **Other:** It has a moderate-to-high tolerance of general disturbance and stress. [1, 44, 47]

### **Design Considerations**

Water plantain is well adapted for use in upper and lower shoreline zones, for streambank stabilization, and in vegetated swales. It is also well suited for restorations of wetlands, low spots in wet prairies and wet meadows. Seed is common in seedbanks of hydric soils. Well adapted for habitat as wildlife cover and food.

**Concerns:** This long-lived species can be invasive. [16, 44]

### **Wildlife Use**

Waterfowl (mallard, pintail, scaup, blue-winged and green-winged teal), songbirds, pheasants and rodents eat the achenes and tubers. Plants provide shade for fish.

Rabbits and deer sometimes eat the leaves. The leaves also provide an excellent

Indicator Status: OBL

feeding cover for frogs. The sturdy stalk may become a perch for songbirds. [4, 21, 44]

### Nursery/Plant Information

**Available:** Widely.

**Types:** Achenes, transplants and rootstocks.

### Planting Techniques

Achene production is high, about 144,000/plant.

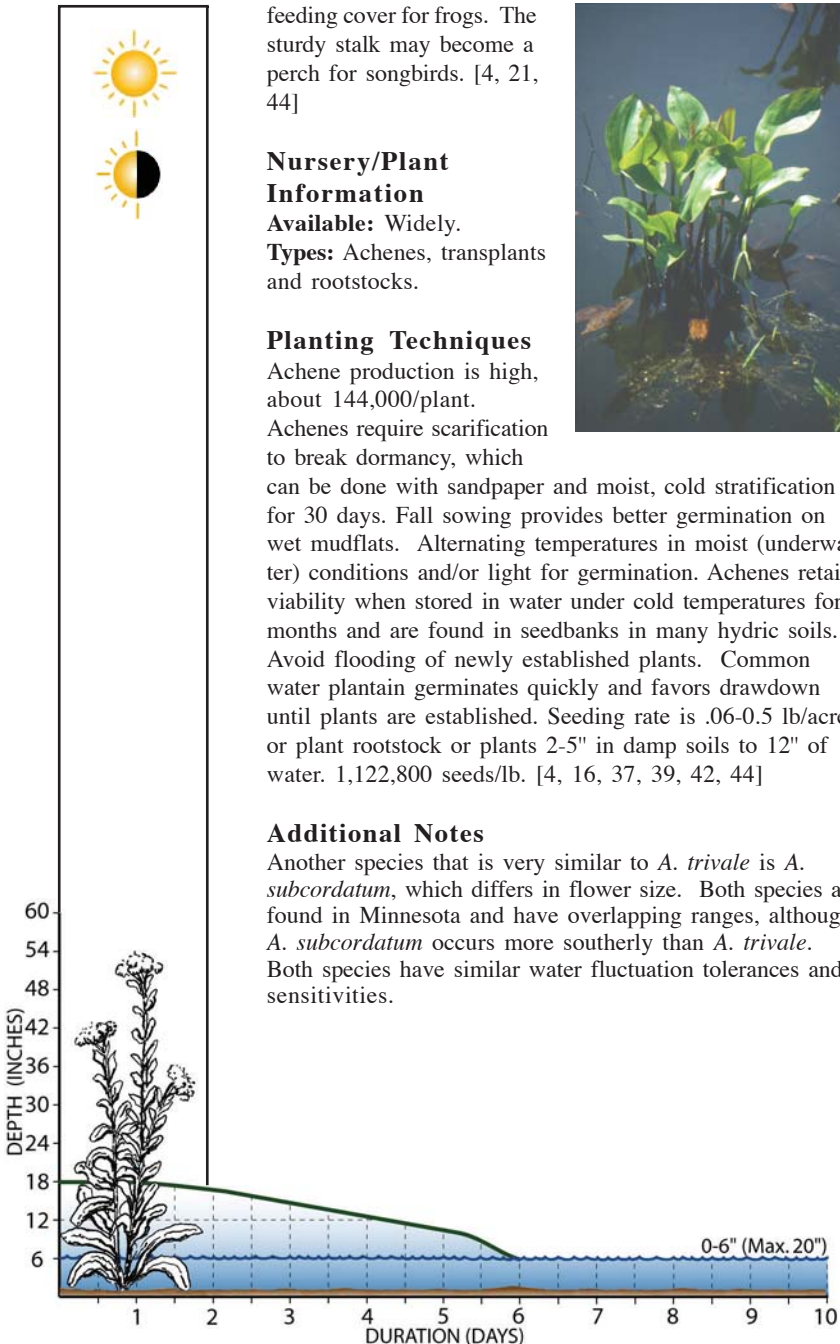
Achenes require scarification to break dormancy, which can be done with sandpaper and moist, cold stratification for 30 days. Fall sowing provides better germination on wet mudflats. Alternating temperatures in moist (underwater) conditions and/or light for germination. Achenes retain viability when stored in water under cold temperatures for 6 months and are found in seedbanks in many hydric soils. Avoid flooding of newly established plants. Common water plantain germinates quickly and favors drawdown until plants are established. Seeding rate is .06-0.5 lb/acre or plant rootstock or plants 2-5" in damp soils to 12" of water. 1,122,800 seeds/lb. [4, 16, 37, 39, 42, 44]

### Additional Notes

Another species that is very similar to *A. trivale* is *A. subcordatum*, which differs in flower size. Both species are found in Minnesota and have overlapping ranges, although *A. subcordatum* occurs more southerly than *A. trivale*. Both species have similar water fluctuation tolerances and sensitivities.



Photo: Dan Shaw







## *Allium stellatum*

**Prairie Wild Onion - a.k.a. Prairie Onion, Cliff Onion**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Prairies, meadows and rocky soils. [16, 17, 35, 41]

**Range:** Most common in s. and w. Minn. (Eco-Region: All), Wis. (except for n. ¼), Mich. W. Ont. to Ill., w. to Sask., Wyo. and Okla. [17, 21]

### **Description**

**General:** A native perennial herb that grows to 1-2'. The entire plant has a strong onion fragrance. **Flower:** A round cluster, 1-2" wide, that stands atop a single, erect umbel at the end of the stem; pink to rose with yellow centers, summer to fall.

**Leaf:** Slender and solid in a basal clump of thin grass-like leaves. **Stem:** Slender, solid stem. **Root:** A small, papery-scaled bulb. **Soil:** Moist to dry, sometimes rocky soils. [16, 17, 35, 41, 47]

### **Normal Water Level**

This species prefers upland moist/mesic to dry conditions, which sometimes are rocky. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 1 day (decreasing 12" in 1 day). This plant does not tolerate long periods of saturation.

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun. **Salt:** Moderate. **Nutrient:** Low. **Siltation:** Low.

**Insect:** Infrequent. **Other:** N/A. It is tolerant to general disturbance and stressors. [47]

### **Design Considerations**

Prairie onion can be used for the edges of rainwater gardens and upland buffers. Plant in groups for more visibility. **Concerns:** Prairie wild onion does not compete well with aggressive native grasses. Even though this plant can be used for food, please do not pick or dig up this plant from natural conditions. [16, 21]

### **Wildlife Use**

This species attracts butterflies and bees and is edible to humans. [16, 21]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants and seed.

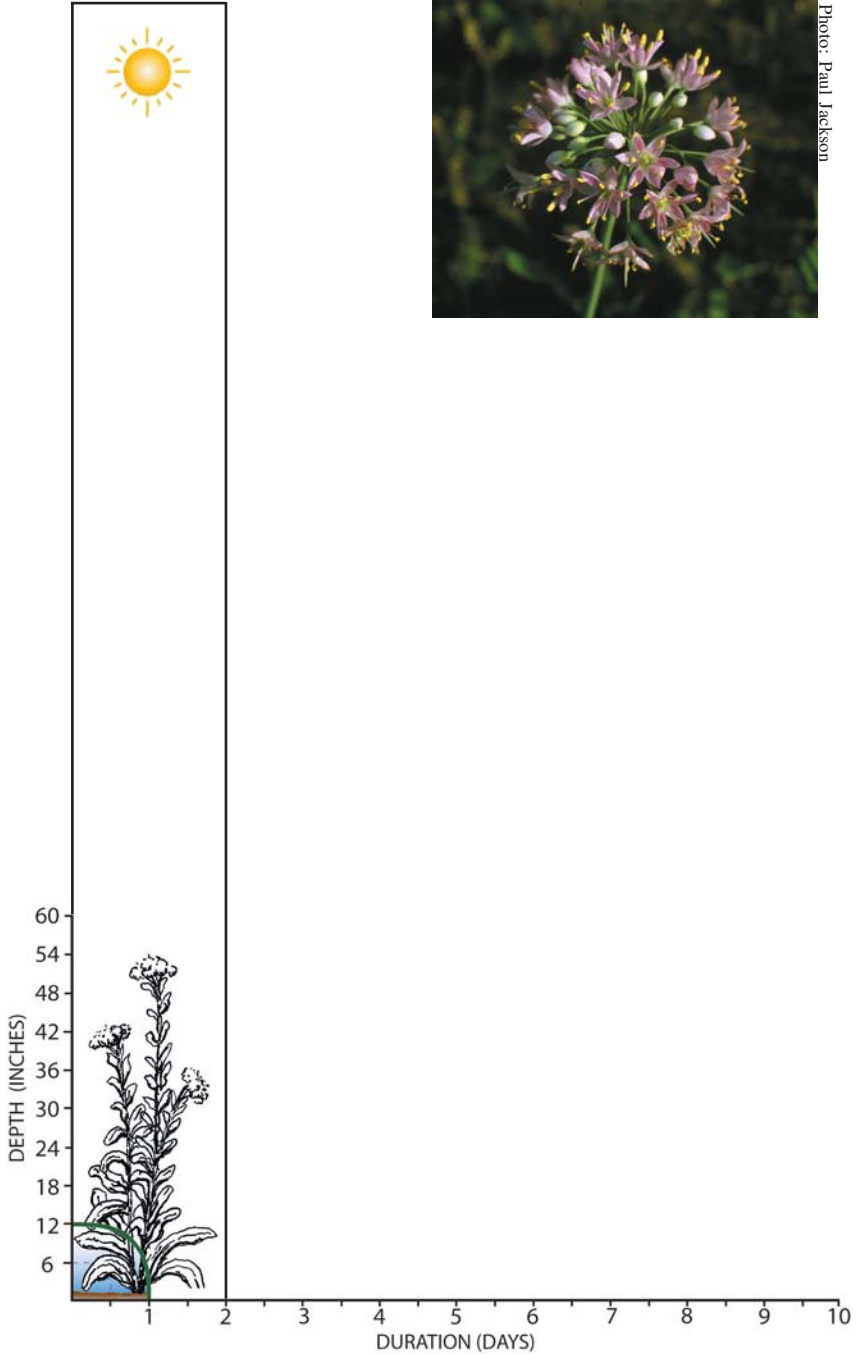
### **Planting Techniques**

Seeds need to be moist, cold stratified. Fall planting is ideal. 162,000 seeds/lb. Seeds self sow. [16]

### **Additional Notes**

The flower always grows on erect stalks, which distinguishes it from the nodding onion (*A. cernuum*), whose flowers always hang downward. [41]

**Indicator Status: UPL**





## *Alnus incana*

Speckled Alder - a.k.a. *Alnus rugosa* – Hazel, Tag or Gray Alder

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Speckled alder is found in swamps, thickets (especially alder thickets), bog margins, shores, moist meadows and is common on stream banks and floodplains. This species is also found in lowland wet areas such as openings in low, wet woods and low alluvial flats. It may also be present in bogs and coniferous swamps on neutral to acidic soils. [7, 11, 22, 36] **Range:** All but sw. Minn. (Eco-Region: 1-8), but local in sw. Wis., and se. Mich. Widespread across Can. from Nfld. to Alaska, s. to Md., Ohio, n. Ind., Minn., N.D., N.M., Ariz. and Calif.; Eurasia. This is the dominant species in alder thickets of Minn. and Wis. [7, 21]

**Endangered in Illinois.**

### Description

**General:** A deciduous, thicket-forming shrub or small tree sometimes growing to 16' tall. **Flower:** Tiny; in early spring before leaves. Male in drooping catkins 1½-3" long. Female in cones ¼" long. **Cones:** ½-5/8" long; elliptical, blackish, hard, short-stalked. **Leaf:** Leaves are dull, dark green with network of sunken veins and often hairy above; whitish-green with hairy veins beneath. Leaves are alternate, simple and elliptical or ovate. **Bark:** Gray, smooth. **Stem:** 4" maximum diameter. **Twigs:** Gray-brown, slender, slightly hairy when young. **Fruit:** Purple-black fruit persisting into winter. **Root:** Roots are very shallow and narrow spreading. **Soil:** Prefers deep loams to loamy sands that are wet to moist. [7, 11, 22, 36]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions and is able to tolerate inundation to 6" or less. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 2'. **Duration:** Long – 6 days (decrease of 1' in first 2 days and a steady 6½ days thereafter). This species is very tolerant of flooding, somewhat tolerant to flood duration, and moderately tolerant to increases in flood depth. [1, 2, 22, 25]

### Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. Very intolerant to shade. **Salt:** Moderate. **Nutrient:** Low to moderate. **Siltation:** Moderate. **Insect:** frequent – several borers, alder bark beetle, tent caterpillar. **Other:** Sensitive to drought/heat. Sensitive to mine spoils, though tolerant to soil compaction. Sensitive to O<sub>3</sub>. The root system gives little wind support, especially in wet, spongy soils; weak wooded. It has a moderate tolerance for general disturbance and stress. [1, 22]

### Design Considerations

This species has been planted as an ornamental at water edges. Its root mass prevents erosion on stream banks and enriches soil by making nitrogen available to other plants. Use this plant in restorations (see community section above), pond edges and acidic soil conditions. **Concerns:** Weak-wooded, shade-intolerant, insect-damage-

**Indicator Status: OBL**

prone and sensitive to drought and heat. [21, 36]

### **Wildlife Use**

Wildlife value is high for songbirds (especially the seeds for redpoles,

siskins, and goldfinches), gamebirds, waterbirds, small mammals (rabbits, muskrats, beavers) and hoofed browsers (deer and moose). The thickets provide excellent cover from predators and weather for many animals, especially ruffed and sharp-tailed grouse. [11, 21, 22, 32, 36]

### **Nursery/Plant Information**

**Available:** Limited. **Types:** Bareroot and potted plants.

### **Planting Techniques**

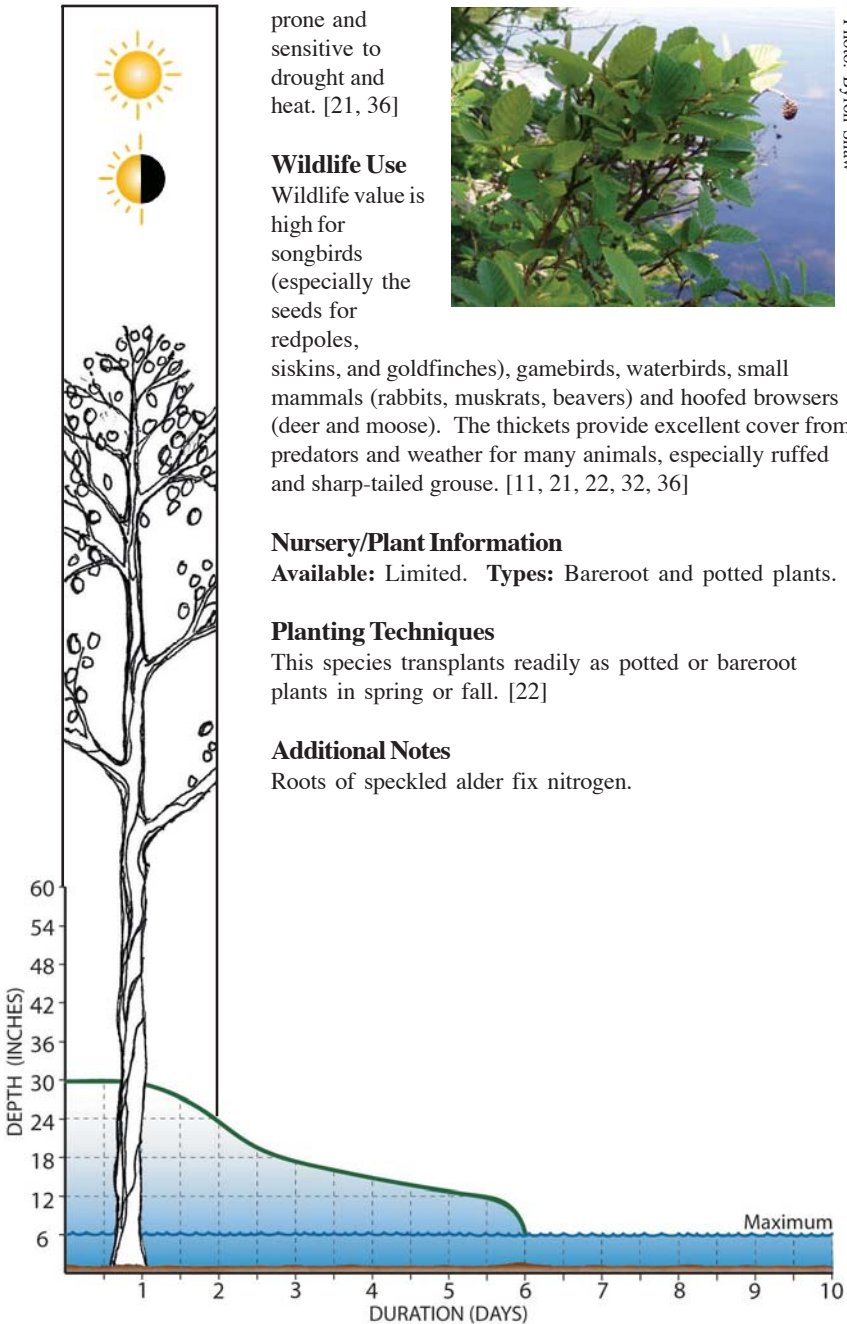
This species transplants readily as potted or bareroot plants in spring or fall. [22]

### **Additional Notes**

Roots of speckled alder fix nitrogen.



Photo: Byron Shaw





# *Amorpha fruticosa*

**Indigo Bush - a.k.a. False Indigo, Indigo Bush Amorpha, Bastard Indigo**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Wet meadow, stream banks, shores and ditches. This species may also be found in bogs, swamps, dunes in lowland wet to wet-mesic conditions of flood plain depressions, hummocks, wet clearings and lakeshores. Grows well in river bottoms and floodplains. [7, 16, 22] **Range:** Nw., c. and s. Minn. (Eco-Region: 3-9); wc. and sw. and along St. Croix and Mississippi rivers of Wis., local in s. LP of Mich. Pa. to Sask., s. to Ala. and n. Mex. [7, 21]

## **Description**

**General:** A multiple-branched shrub that can grow 12" tall. **Flower:** Attractive, purple flower spikes blooming from June to August, turning to a seedpod. **Leaf:** Pinnately compound leaves. **Stem:** Many branches. **Fruit:** Interesting brown seed pods in autumn. **Root:** This species has fibrous, shallow lateral roots, somewhat suckering. **Soil:** Prefers sandy loams that are wet to dry. [7, 17, 22]

## **Normal Water Level**

This species prefers upland moist/mesic to dry conditions, though the soil may be saturated in spring. [21, 37]

## **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). Indigo bush is very tolerant to floods, especially in the spring, though can handle short periods of inundation during the growing season. [22, 37]

## **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun; intolerant to shade. **Salt:** Salinity resistant. **Nutrient:** Unknown. **Siltation:** Unknown. **Insect:** Occasional – inflorescence galls; generally free of insect problems. **Other:** Sensitive to 2,4-D and resistant to mine spoils, drought and heat. It has a moderate tolerance to general disturbance. [1, 22, 37]

## **Design Considerations**

Indigo bush is a good ornamental landscaping plant and is suited well for wetland or floodplain restorations. This plant works well in erosion control and rain gardens. **Concerns:** Weak-wooded plant that is easily broken. [16, 21]

## **Wildlife Use**

This species provides food and cover for waterfowl, marshbirds, shorebirds and small mammals. Its fruits are poisonous to humans. [21, 22, 37]

## **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants only.

**Indicator Status: FACW+**

### Planting Techniques

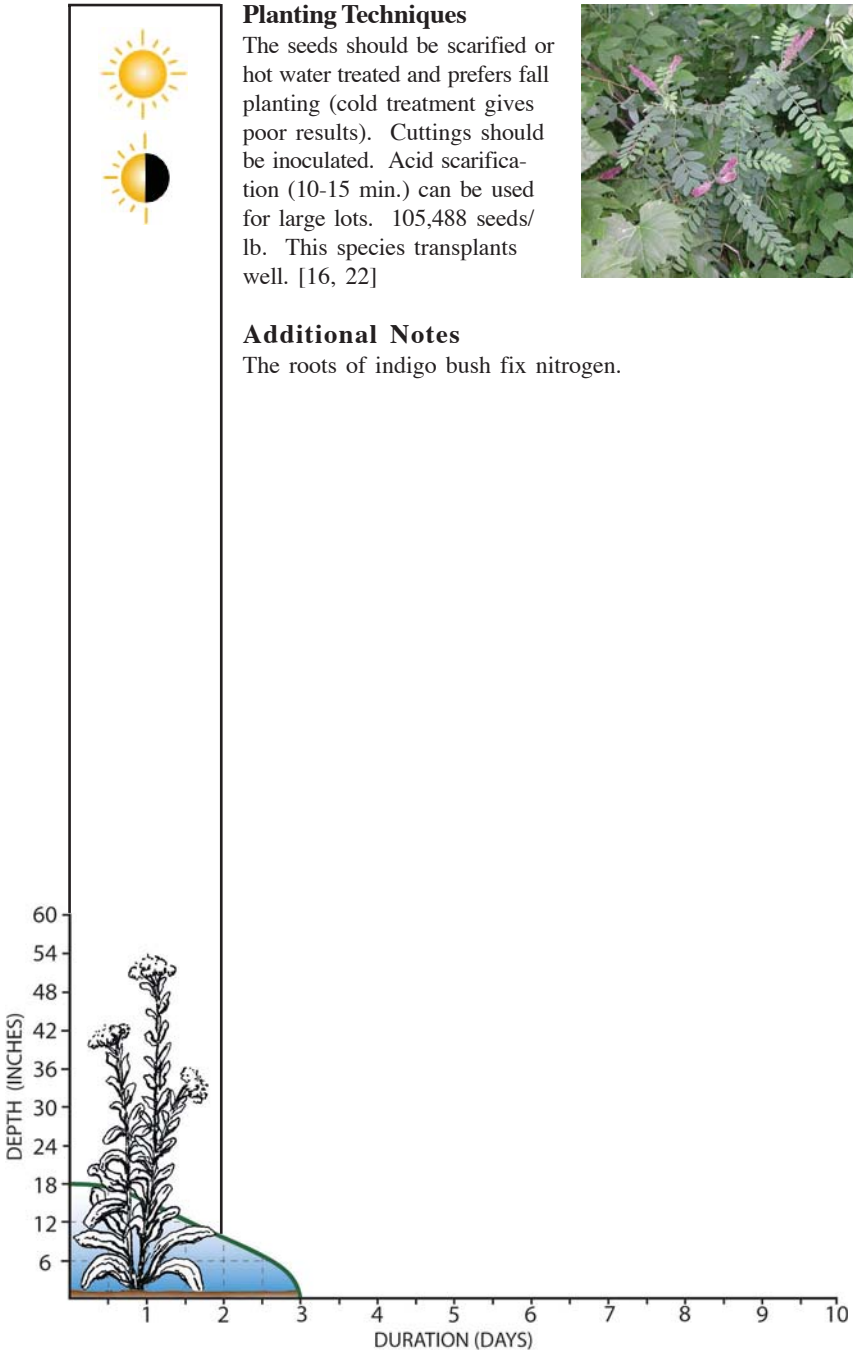
The seeds should be scarified or hot water treated and prefers fall planting (cold treatment gives poor results). Cuttings should be inoculated. Acid scarification (10-15 min.) can be used for large lots. 105,488 seeds/lb. This species transplants well. [16, 22]



Photo: Rusty Schmidt

### Additional Notes

The roots of indigo bush fix nitrogen.





## *Andropogon gerardii*

**Big Bluestem** - a.k.a. *A. furcatus*, Turkey Foot

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Big bluestem is one of the more dominant of the tallgrass prairie grasses in mesic prairies, savannas and woodlands. It often occurs in wet to wet-mesic prairies and may occur in calcareous fens and the other extreme of dry sand plains and bluffs. This species seems to be limited only by shade and excessive soil moisture. [11, 16, 17] **Range:** Minn. (Eco-Region: All), Wis., Mich. Me., s. Can. to Sask., s. to N.M., Tex., n. Fla. [17, 21]

### **Description**

**General:** A perennial, clump-forming, warm-season grass that grows 3-9'.

**Flower:** Flowers are arranged in fingerlike spikes that resemble turkey feet. Flower color is bronze turning to steely gray-blue as autumn advances. Blooms in July.

**Leaf/Stem:** The foliage is purplish on stout stems. The leaves and stems turn bright yellow, red, orange or purple in the fall. **Fruit:** The inflorescence contains 2-10 finger-like racemes with 2 types of spikelets: perfect, stalkless spikelets and staminate, stalked spikelets. **Root:** Fibrous; can extend over 10' deep. **Soil:** Wet-dry loam/clay soils with a wide pH range. This species will tolerate a variety of soil conditions. [8, 11, 16, 17, 44, 47]

### **Normal Water Level**

This species prefers upland moist/mesic conditions. [21, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing by 6"/day). Big bluestem is not tolerant of flooding, but it is tolerant of saturated soils for short periods and is drought tolerant. [1, 8, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Low.

**Insect:** Unknown. **Other:** This species will tolerate a variety of soil conditions and is moderately tolerant to general disturbance and stress. [1, 44]

### **Design Considerations**

This species is used to stabilize soil and slow surface runoff, especially in upland buffer zones. Big bluestem is a major grass component in any prairie restoration and a successional species. Provides wonderful fall color throughout the winter, making a nice touch for landscaping in areas where its height is not a problem, and is becoming more common as an ornamental grass in gardens. A good clump former. Will perform well in well drained rain garden situations. **Concerns:** Big bluestem can be moderately aggressive. [16, 21, 44]

### **Wildlife Use**

Big bluestem provides food for Delaware skipper and forage for antelope, bison, deer and livestock. Also provides cover and some food for upland gamebirds and songbirds

**Indicator Status:** FAC-

(especially tree and field sparrows, finches and juncos). [16, 32, 37]

Photo: Paul Jackson



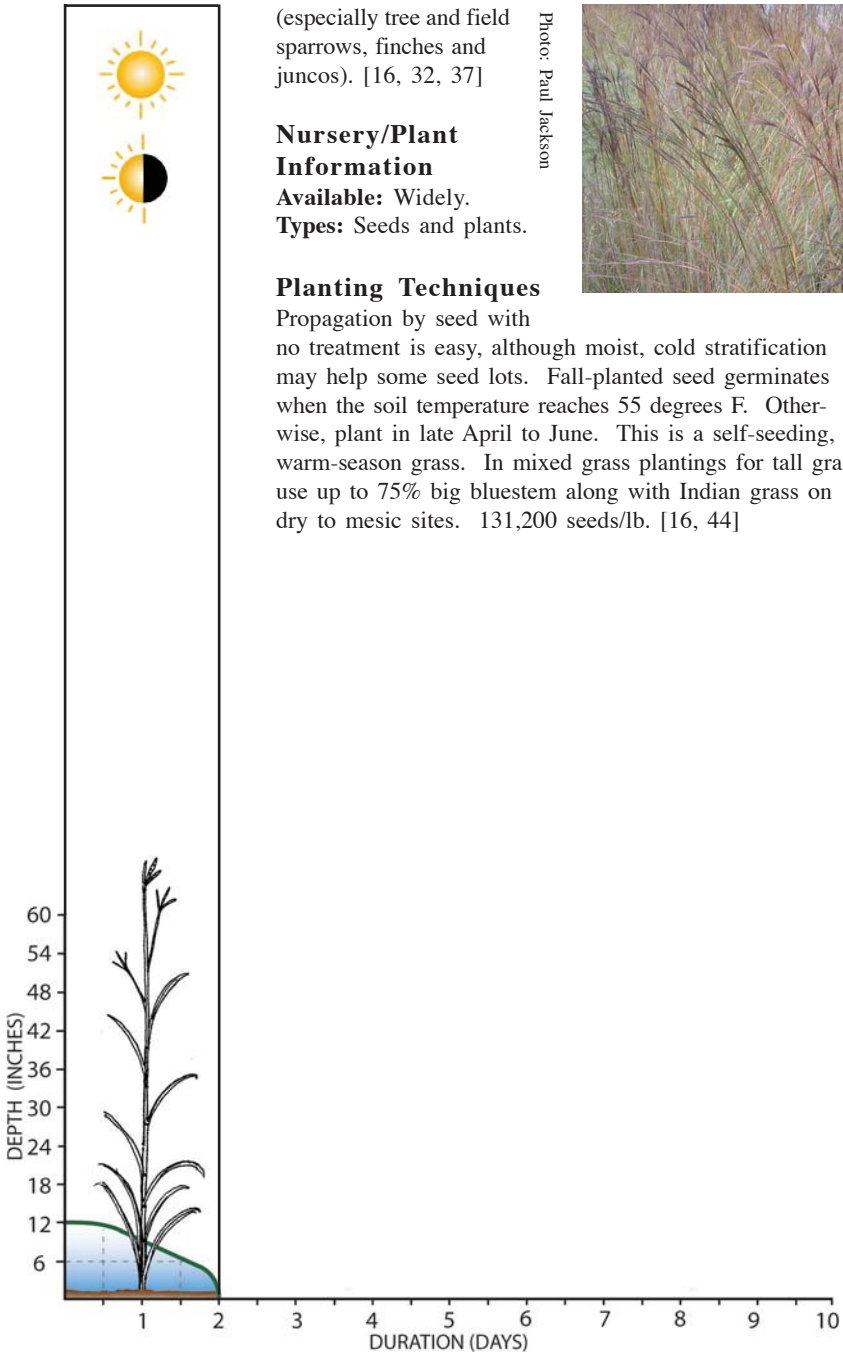
### **Nursery/Plant Information**

**Available:** Widely.

**Types:** Seeds and plants.

### **Planting Techniques**

Propagation by seed with no treatment is easy, although moist, cold stratification may help some seed lots. Fall-planted seed germinates when the soil temperature reaches 55 degrees F. Otherwise, plant in late April to June. This is a self-seeding, warm-season grass. In mixed grass plantings for tall grass, use up to 75% big bluestem along with Indian grass on dry to mesic sites. 131,200 seeds/lb. [16, 44]







## *Anemone canadensis*

Canada Anemone - a.k.a. Canada Windflower, Round-leaved or Meadow Anemone

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Moist-to-wet openings, stream banks, thickets, wet meadows, low prairies (mesic prairies and savannas), ditches, roadsides and railways; usually growing in patches. [7, 16, 21, 35, 41] **Range:** Minn. (Eco-Region: 1-8), Wis., Mich. E. from Que. to Alta., s. to Md., W.Va., Mo., Kan. and N.M. [7, 21]

### Description

**General:** A native, perennial herb that grows 1-2' tall from slender rhizomes that usually form large patches. **Flower:** White, arising from a long stem, blooming May to August. The flowers are 1-1½" across, have 5 petal-like sepals and a yellow center. **Leaf:** This species has deeply lobed and basal leaves with a long stem with whorled leaves forming the flower cluster. Leaves appear hairy, especially on the lower surface. **Stem:** Flowers and leaves arise from a long, hairy stalk. **Fruit:** Light to dark brown late in fall. **Root:** Rhizomatous. **Soil:** Medium soil from mesic to wet (hydric). [7, 35, 41, 47]

### Normal Water Level

This species does well in moist to wet (saturated) soils, spreading as a good groundcover. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species is somewhat tolerant to flood duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Partial to full sun. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** It has a moderate tolerance to general disturbance and stress. [1, 47]

### Design Considerations

A good plant for restorations (wet meadow, low prairies and woodland openings) and revegetation sites such as roadsides and vegetated swales. This species has a use in rock gardens and rainwater gardens in shallow inundation conditions. **Concerns:** This species is an aggressive underground spreader for gardens and other formal landscaping areas, though this may be desirable in restorations. [16]

### Wildlife Use

This plant is sometimes used by waterfowl, muskrats and small rodents. [21]

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and plants.

### Planting Techniques

The seed should be stored dry for about 180 days. Approximately 97,600 seeds/lb. [16]

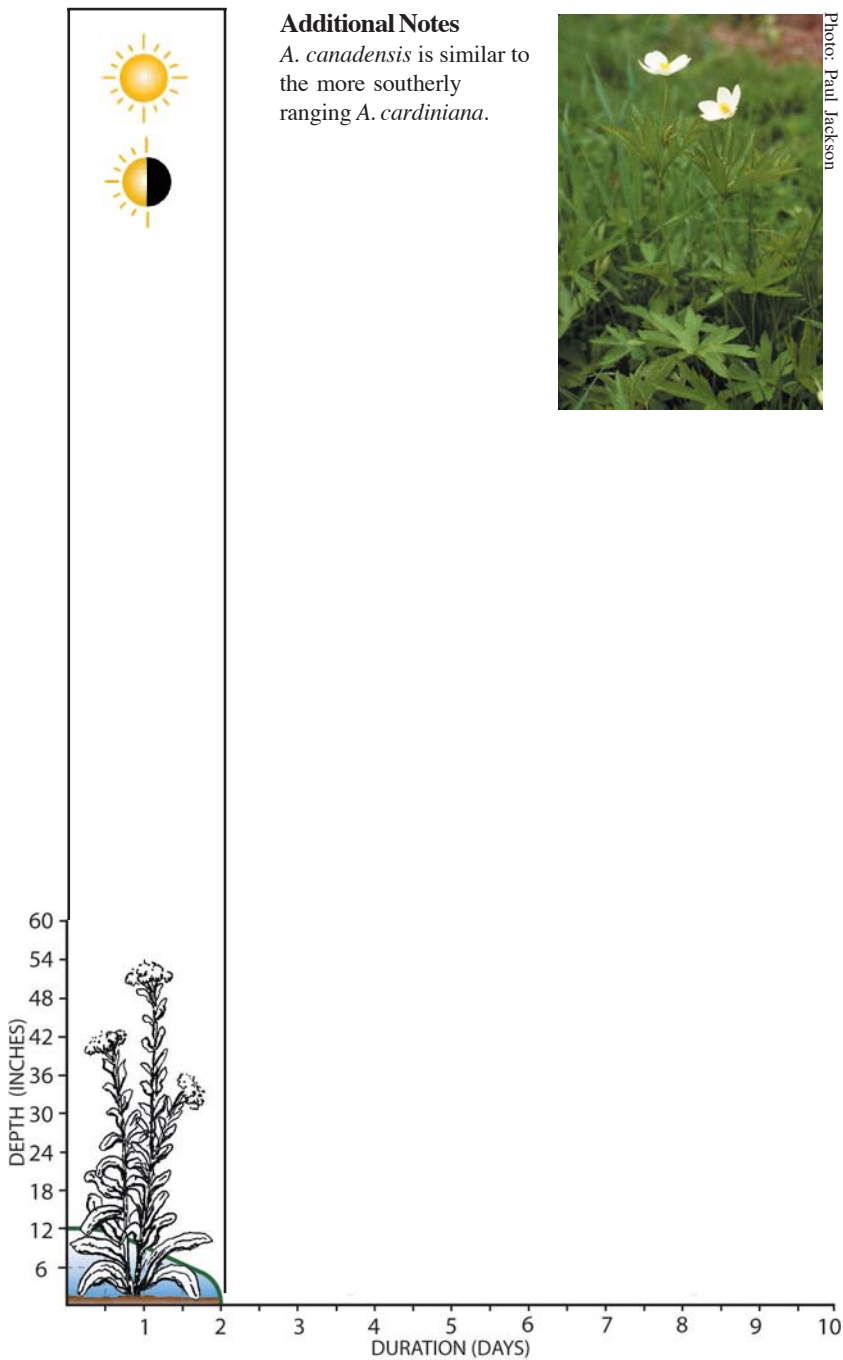
Indicator Status: FACW

**Additional Notes**

*A. canadensis* is similar to the more southerly ranging *A. caroliniana*.



Photo: Paul Jackson





## *Angelica atropurpurea*

*Angelica* - a.k.a. Alexanders; Purplestem, Great or Great High Angelica

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Springs, seeps, calcareous fens, stream banks, shores, marshes, sedge meadows, wet depressions in forests in calcium-rich soils. [7, 11, 16] **Range:** E. though local in ne. Minn. (Eco-Region: 1,6-8), ec. and s. Wis., mostly s. LP of Mich.

This species is generally in the n. from Lbdr. to Minn. and s. to Del., W.Va. and Ill. [7, 21]

**Endangered in Iowa.**

### Description

**General:** A native perennial herb that can grow to 8" tall, this species is a member of the carrot family. **Flower:** The inflorescence is a large 4" in diameter, compound umbel. Flowers are white or greenish-white and bloom around the first week in June.

**Leaf:** Basal leaves are pinnately more than once divided, and upper leaves are progressively reduced, with broadly sheathing leaf stalks and serrate, pointed leaflets.

**Stem:** The stout, round stems are purplish, aromatic and hollow. **Fruit:** Thin, flat lateral wings occur on the hairless fruit, which fall by midsummer. **Root:** Fibrous, shallow. **Soil:** This species prefers calcareous-rich soils. [7, 11, 16]

### Normal Water Level

This species prefers shallow water of 3" of inundation or less to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate to low. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing in water depth 6"/day). Can survive early-summer flooding while dormant.

### Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** Low to moderate. **Nutrient:** Unknown.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

### Design Considerations

This is a good species for wetland restorations (especially in calcareous situations, seeps and springs). It is underutilized for landscaping. **Concerns:** This species can be aggressive in some soils, though this may be desirable. [16]

### Wildlife Use

*Angelica* provides good habitat for upland gamebirds and songbirds. It is also a bee and butterfly attractant. [16, 21]

### Nursery/Plant Information

**Available:** Limited. **Types:** Only seed is widely available.

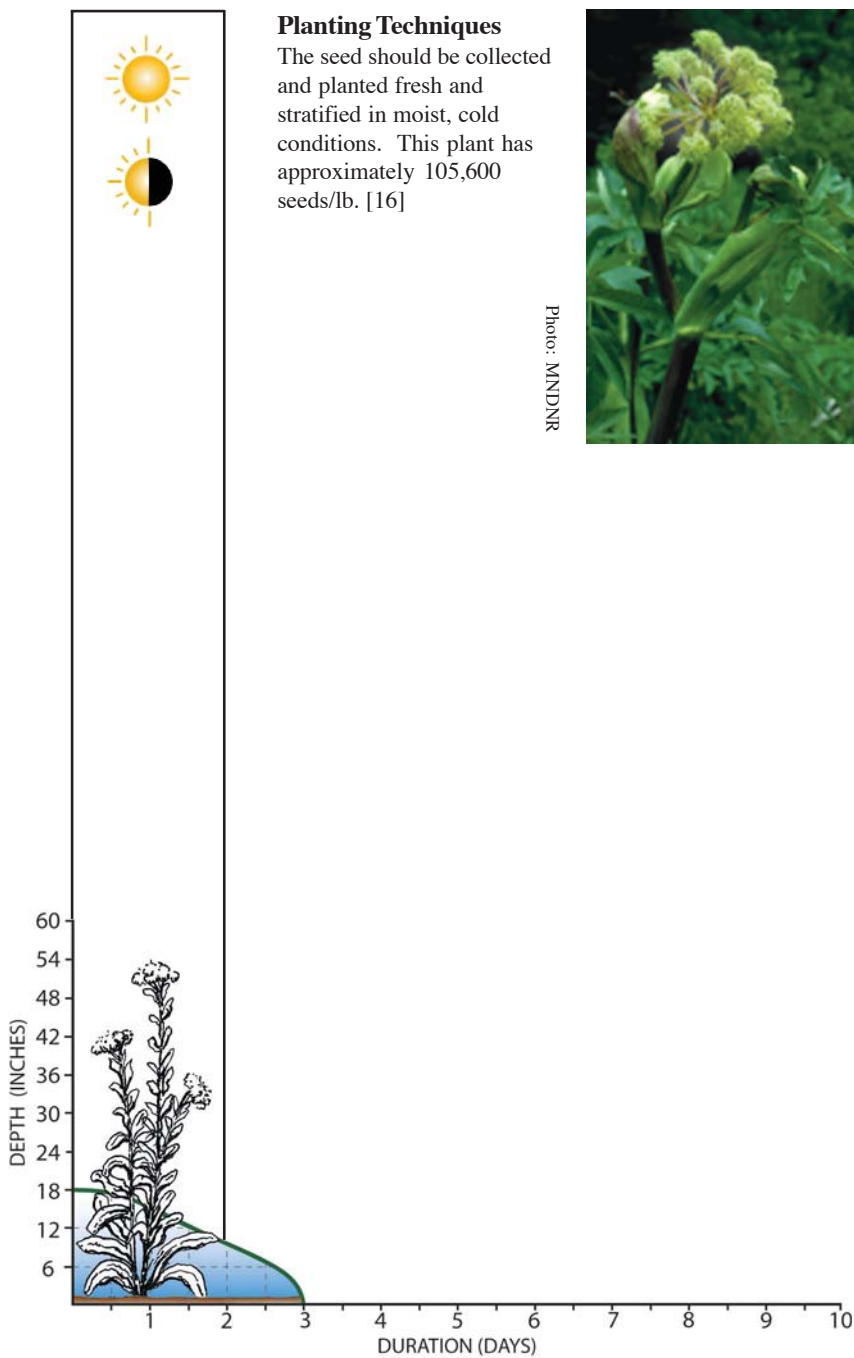
Indicator Status: OBL

### Planting Techniques

The seed should be collected and planted fresh and stratified in moist, cold conditions. This plant has approximately 105,600 seeds/lb. [16]



Photo: MNDNR





## *Arisaema triphyllum*

Jack-in-the-pulpit - a.k.a. *A. atropubens* - Indian Turnip

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet, shady, moist deciduous forests and cedar swamps. [7, 16, 35, 41] **Range:** Minn. (Eco-Region: All), Wis., Mich.; N.S. to Ont., s. to Fla., La. and Kan. [7, 21]

### Description

**General:** This native perennial herb of rich, moist woods is an attractive member of the arum family. It can grow 1-2' tall. **Flower:** Small flowers crowd near the base of a club-like spadix (Jack) 2-3" long, enclosed by a narrow, funnel-shaped structure (spathe) that has an overhanging flap at the top, the "pulpit." **Leaf:** Compound with 3 pointed leaflets. **Stem:** Upright, single stem. **Fruit:** In late summer, the withering of the spathe exposes in shiny, green berries that turn bright red. **Root:** Bitter-tasting corm. **Soil:** Rich, moist woodland soils. [7, 35, 41, 47]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 1 day (decreasing all 12" in 1 day). This species does tolerate seasonal inundation or short, irregularly timed periods of inundation. [1, 37]

### Sensitivities or Other Tolerances

**Exposure:** Partial sun to full shade. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Low. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 37, 47]

### Design Considerations

This plant has been used in landscaping in shady or deciduous woodland areas. It may also be used in woodland restorations as a successional species, especially in cedar swamps and wet deciduous forests. This species self seeds. **Concerns:** The fresh root is poisonous but edible after it has been cooked. If disturbed or affected by other stress, the female plant declines in vigor and may stop producing fruit. [16]

### Wildlife Use:

Gamebirds (ring-necked pheasants and turkeys), wood thrushes, wood ducks and mammals, such as raccoons and chipmunks, eat the fruit and leaves. The fruit is toxic to humans. [21, 32, 37]

### Nursery/Plant Information

**Available:** Limited. **Types:** Plants only.

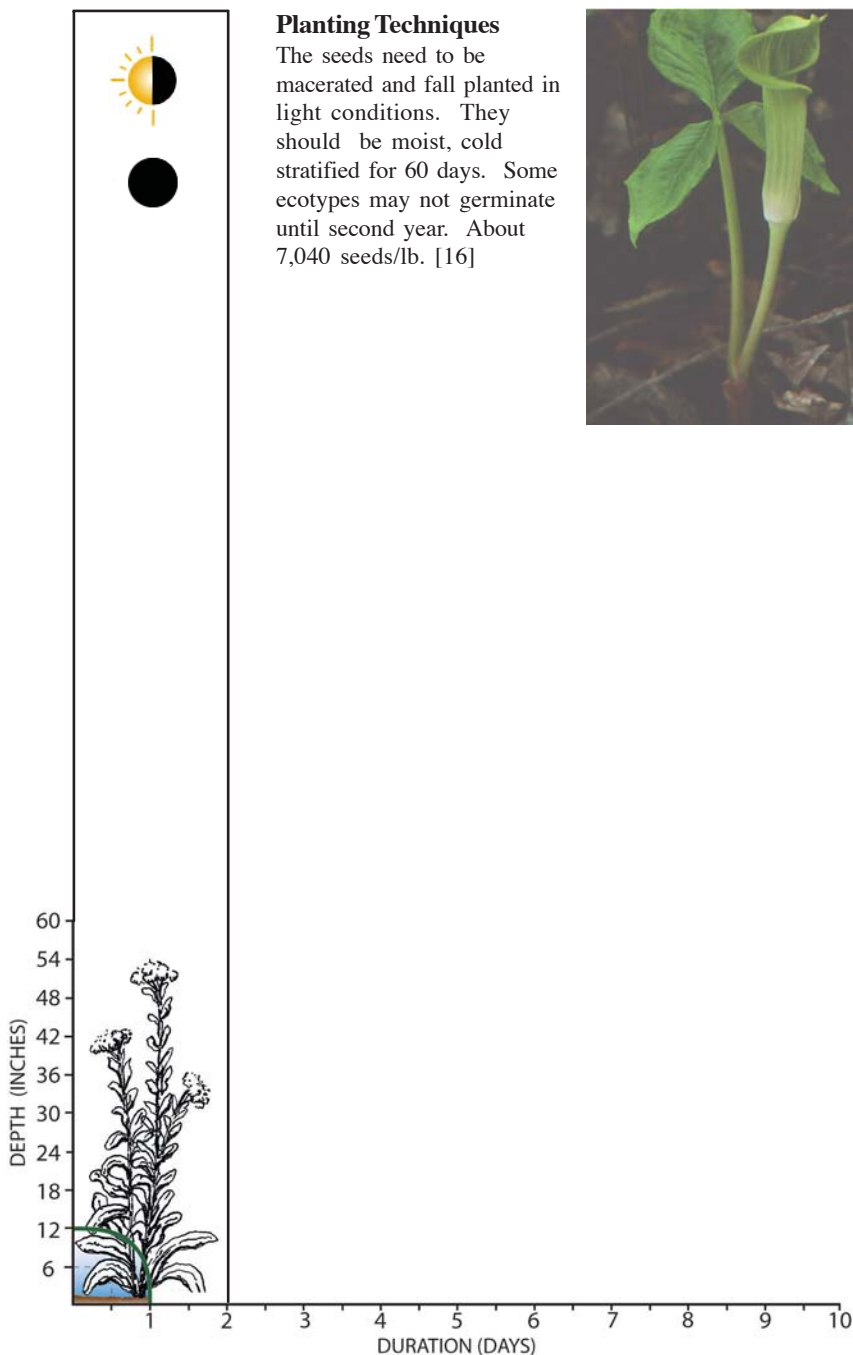
**Indicator Status:** FACW-

### Planting Techniques

The seeds need to be macerated and fall planted in light conditions. They should be moist, cold stratified for 60 days. Some ecotypes may not germinate until second year. About 7,040 seeds/lb. [16]



Photo: Jeff Shaw





# *Aronia melanocarpa*

**Black Chokeberry** - a.k.a. Glossy Black Chokeberry or Indigo Bush

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Tamarack swamps, open bogs, wet thickets, marshes, springs, prairies, dunes, old fields, creek banks, and shores. [7, 16, 22] **Range:** Nc., ne. and ec. Minn. (Eco-Regions: 1-3, 5, 6), Wis., Mich. Nfld. and Labr. to Minn., Iowa and se. Mo., s. to n. Ga. and Ala. [7, 21] **Endangered in Iowa.**

## **Description**

**General:** Black chokeberry is a very attractive, spreading shrub of the rose family that grows 3-6' tall. **Flower:** Nice clusters of white flowers in May. **Leaf:** Excellent, deep red fall foliage. **Stem:** Suckering, upright habit. **Fruit:** Black to blue-black berries. **Root:** Shallow fibrous, fine textured, suckers profusely. **Soil:** Wet-to-dry soils, although it prefers sandy wet or boggy. [7, 22]

## **Normal Water Level**

This species prefers upland moist/mesic to wet/saturated conditions and tolerates dry conditions and salty soil and water. [6, 21]

## **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). Black chokeberry is very tolerant to floods early in the season and somewhat tolerant to flood duration. [1, 22]

## **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate (Tolerates salty soil and water). **Nutrient:** Low to moderate. **Siltation:** Moderate. **Insect:** Infrequent – round-headed apple borer; rarely serious. **Other:** Resistant to drought/heat, compacted soils, mine spoils and infrequently damaged by ice and wind. It has a moderate tolerance to general disturbance and stress. [1, 6, 22]

## **Design Considerations**

This species is excellent for wet, lake edge plantings. Black chokeberry is also used as an ornamental for its showy white flowers, black fruit and fall color. Good in massing, borders and backgrounds in landscaping. This species does well in rain gardens with well drained conditions. **Concerns:** Black chokeberry Spreads aggressively under favorable conditions. [16]

## **Wildlife Use**

The fruit are of some importance, as they persist through the winter. The fruit is consumed by upland gamebirds (sharp-tailed and ruffed grouse), songbirds (cedar waxwings, chickadees, and meadowlarks), large and small mammals (bear and white-footed mice), hoofed browsers eat twigs, leaves, fruits edible to humans. [21, 22]

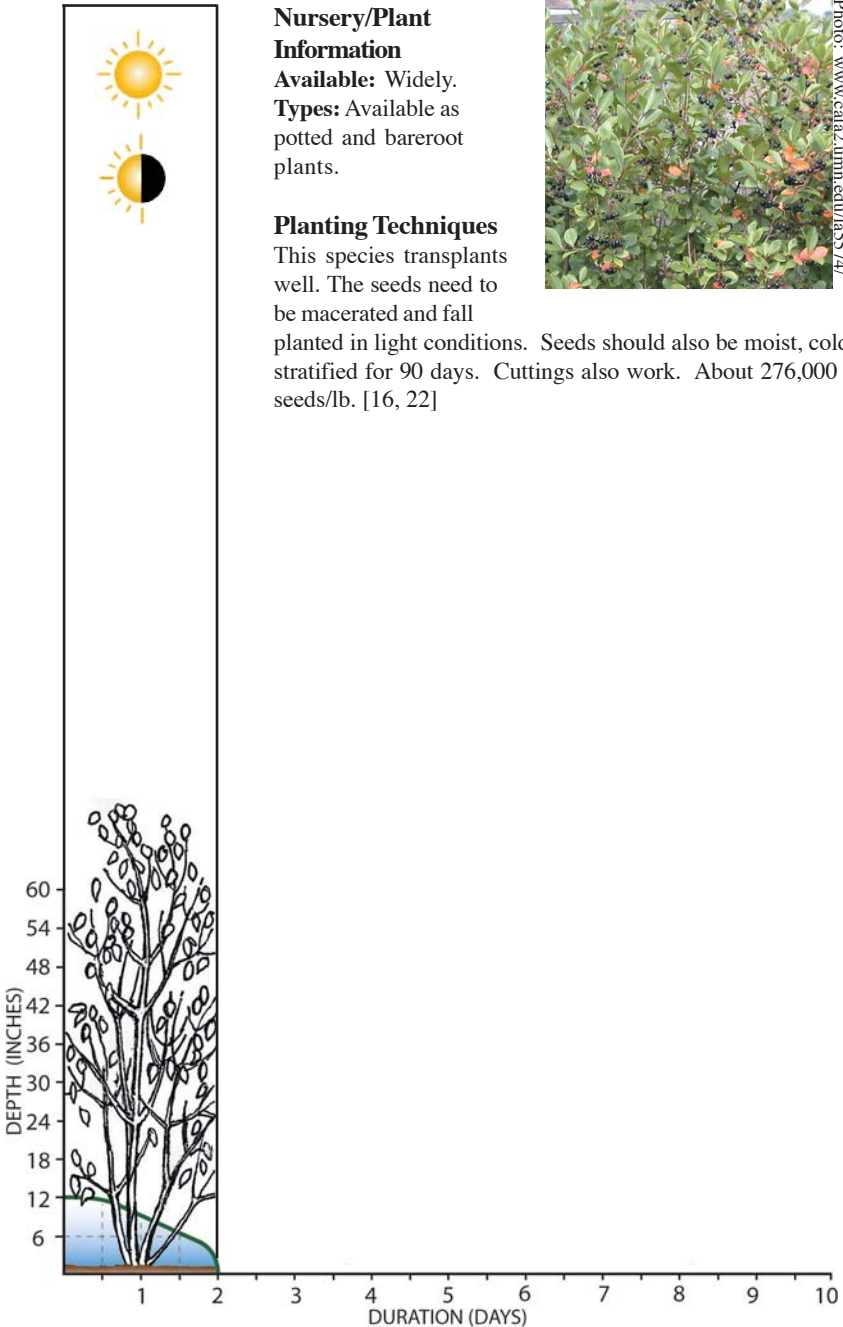
**Indicator Status:** FACW-

**Nursery/Plant Information**

**Available:** Widely.  
**Types:** Available as potted and bareroot plants.

**Planting Techniques**

This species transplants well. The seeds need to be macerated and fall planted in light conditions. Seeds should also be moist, cold stratified for 90 days. Cuttings also work. About 276,000 seeds/lb. [16, 22]







## *Artemisia ludoviciana*

Prairie Sage - a.k.a. White Sage or Dark-leaved Mugwort

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Prairie sage often grows in patches in sand and dry prairies, primarily near major rivers, pastures and savannas. [16, 17, 35] **Range:** Especially s. and w. Minn. (Eco-Region: All), Wis.; Man. to Ala., s. to Mont., N.M., n. Tex., Ark., n. to w. Ind., s. Wis. and Minn. [17, 21]

### Description

**General:** Prairie sage is a native perennial that is grown for its silvery gray foliage. **Flower:** The inconspicuous flowers are arranged in an elongated, pyramidal inflorescence. **Leaf:** Leaves of this plant are oblong and up to 3" in length. They appear white because they are covered with soft, white hairs on both sides. The leaves have an aromatic, sagebrush odor when crushed. **Stem:** Spreading. **Fruit:** Light brown achene at the end of fall. **Root:** Aggressive, rhizomatous roots. **Soil:** Medium (mesic) to dry (xeric) soils. [17, 35, 47]

### Normal Water Level

This species prefers upland moist/mesic to dry conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day).

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Unknown. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

### Design Considerations

Prairie sage is a good groundcover for sunny, dry slopes because of its aggressive habit. This species is also good for restorations, as a contrast plant in landscapes and for aromatic use. **Concerns:** Spreads quickly in gardens. [21]

### Wildlife Use

Provides habitat and cover in prairies for small birds and mammals. [21, 32]

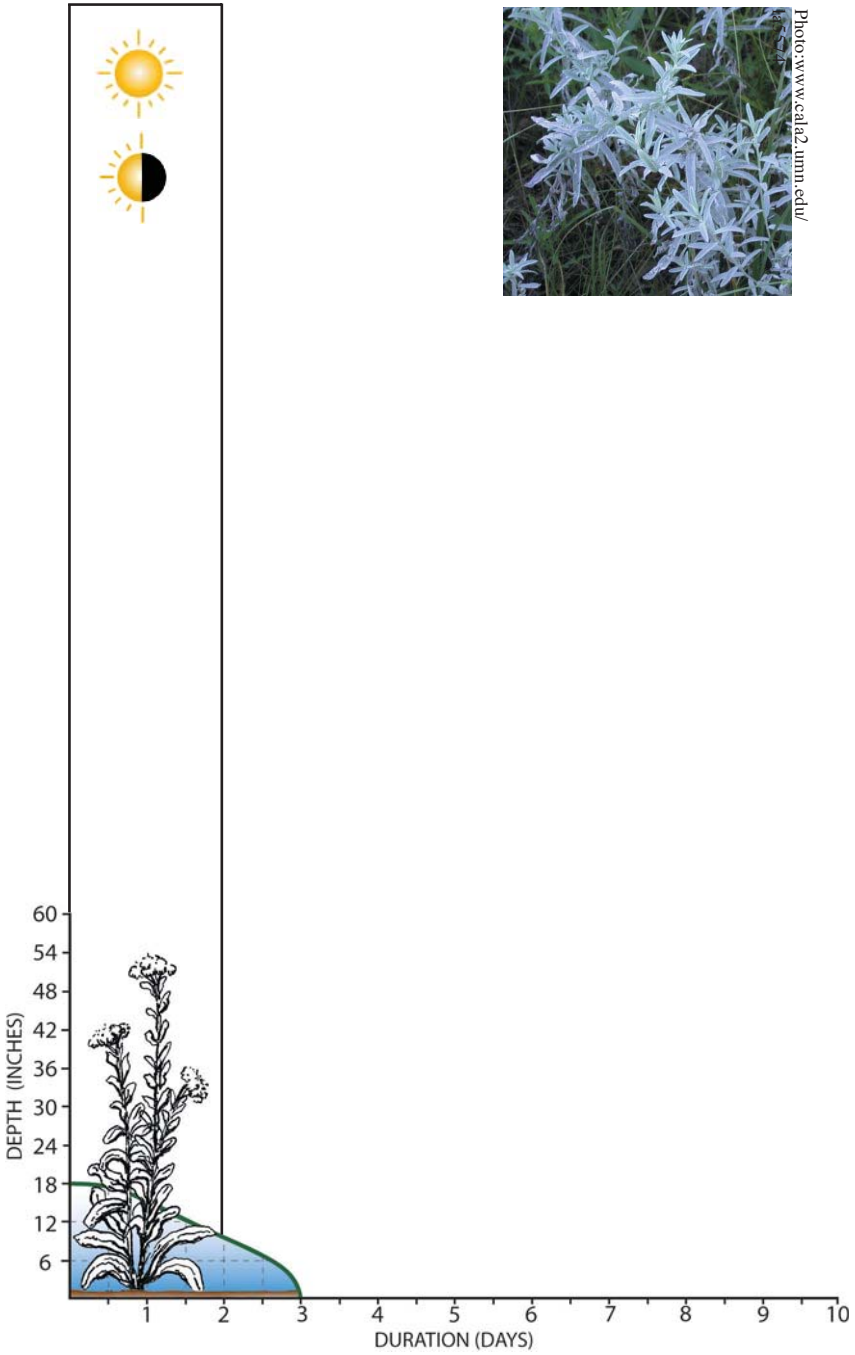
### Nursery/Plant Information

**Available:** Widely. **Types:** Plants only.

### Planting Techniques

The seed needs no treatment other than light. [16]

Indicator Status: UPL





## *Asclepias incarnata*

Marsh Milkweed - a.k.a. Swamp or Red Milkweed

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Marsh milkweed is a common wetland and lakeshore milkweed found in openings in conifer swamps, sedge meadows, shallow marshes, stream banks, ditches, open bogs, open fens, often in shallow water and will tolerate moist prairie conditions. [7, 11, 16, 35, 41] **Range:** Minn. (Eco-Region: All), Wis., Mich. N.S. to Sask., s. to Fla., Tex. and N.M. [7, 21]

### Description

**General:** A common, native, erect, perennial herb usually 3-4' tall that has milky juice when the stem or leaf is cut. Often the entire plant is reddish. **Flower:** Clusters of pink to rose-purple flowers from June to August. The inflorescence is comprised of several flat umbels, the individual flowers have 5 downward-curving petals and 5 upward petals, resembling a crown. **Leaf:** Opposite, lance-shaped to linear to oblong on short leaf stalks. **Stem:** Usually 1 long stem that branches near the top, and is erect decorative deep red-brown. **Fruit:** Pointed 3" seedpods, which open up in late summer with downy, airborne seeds. **Root:** Thick rhizomes. **Soil:** Prefers wet to moist wetland or loamy soils. [7, 11, 35, 41]

### Normal Water Level

This species prefers shallow water of 3" of inundation or less to wet/saturated to upland moist conditions. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 3"/day). Tolerant of spring flooding when dormant. This species prefers wet meadows and tolerates seasonal inundation or short periods of inundation during the growing season. [1, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Low to moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species has a moderate to low tolerance to general disturbance and stress. [1, 37, 47]

### Design Considerations

A good plant for butterfly gardens and landscaping due to its aromatic and decorative qualities. This species also is used well in restorations of wetlands, wet woods, marshes and wet prairies. Also recommended for rain gardens, pond edges and vegetated swales. **Concerns:** This species can be short lived. [16, 21, 41]

### Wildlife Use

This species is a host and nectar plant for monarch butterflies. Many birds use the fibers from old stems to build nests. Many insects use this plant; it is particularly attractive to bees and butterflies. Flowers often conceal crab spiders lying in wait for pollinators. [11, 37, 41]

Indicator Status: OBL

**Nursery/Plant Information**

**Available:**

Widely.

**Types:** Seeds and plants.

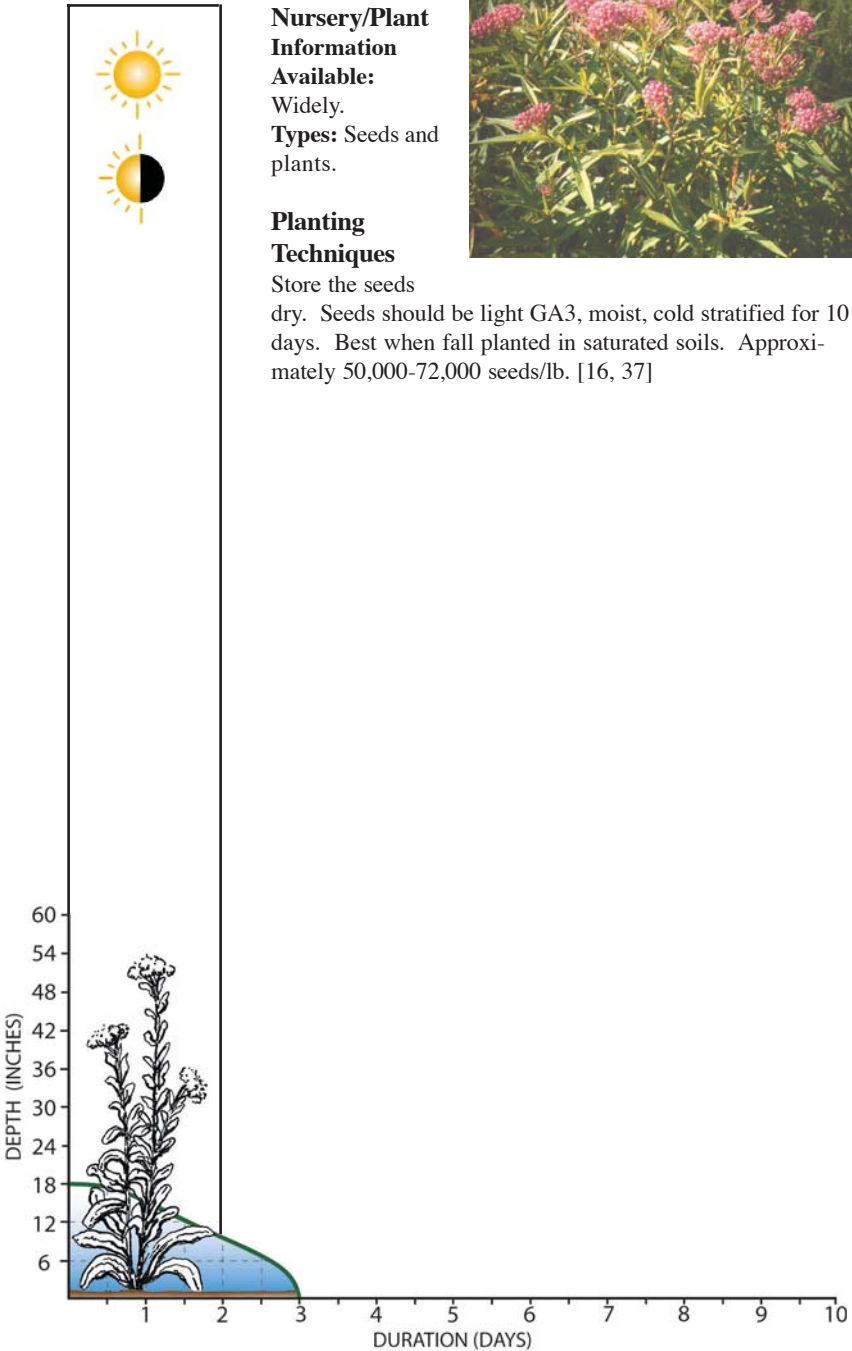


Photo: Dan Shaw

**Planting Techniques**

Store the seeds

dry. Seeds should be light GA3, moist, cold stratified for 10 days. Best when fall planted in saturated soils. Approximately 50,000-72,000 seeds/lb. [16, 37]





## *Asclepias tuberosa*

**Butterfly Milkweed** - a.k.a. Butterflyweed, Pleurisy Root or Chigger-flower

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Dry, sunny prairies and savannas, prefers sandy soils. Found along railroad beds and roadsides high on the outside berm, growing in clumps in open places, often on sand. [16, 17, 35, 41] **Range:** Mostly s. and e. Minn. (Eco-Region: 3-9), mostly s. and w. Wis.; Me. to Minn., s. to Ariz., Fla. [17, 21]

### **Description**

**General:** One of the brightest and most conspicuous native perennials, growing usually 1-2' tall. This plant, unlike other milkweeds, has no milky juice, instead, its stem and leaves bleed clear sap. **Flower:** Spreading clusters of flowers ranging from bright yellow to blazing orange. Flowers are arranged in a large, flat-topped umbel 2-3" wide, blooming from late June to September. **Leaf:** Hairy, toothless, narrow, alternate leaves 2-6" long, widen at tip. **Stem:** Often clumped with a single stem that branches only near the top. **Fruit:** Erect small cluster of narrow pods, 6" long, covered in fine hairs; pods contain large, brown seeds with silken "parachutes." **Root:** A large taproot. **Soil:** Sand/loam soils, will tolerate dry, sandy soils. [17, 35, 41]

### **Normal Water Level**

This species prefers upland moist/mesic to dry conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 1 day (Inundation is acceptable if in sandy soils that infiltrates quickly in less than 1 day). This species is somewhat tolerant to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun, not tolerating a lot of shade. **Salt:** Low to 2,4-D; moderate to soil salt and high to spray. **Nutrient:** Low to moderate. **Siltation:** Low. **Insect:** Infrequent. This species has moderate tolerance to general disturbance and stress. [1, 47]

### **Design Considerations**

Butterflyweed is a wonderful landscaping garden perennial though it can be short lived. As the name indicates, it is a good butterfly garden plant and is used in prairie and upland restorations. This plant can be used in rain gardens on the edge or areas that are not inundated frequently, dry quickly and do not exceed depths greater than 3". **Concerns:** Many cultivars exist, some of which do not have disease resistance. [16, 35]

### **Wildlife Use**

A host plant for gray hairstreak and monarch butterfly caterpillars. This species is an excellent nectar source for all butterflies, often attracting hords of butterflies. [21, 41]

Indicator Status: UPL

### Nursery/Plant Information

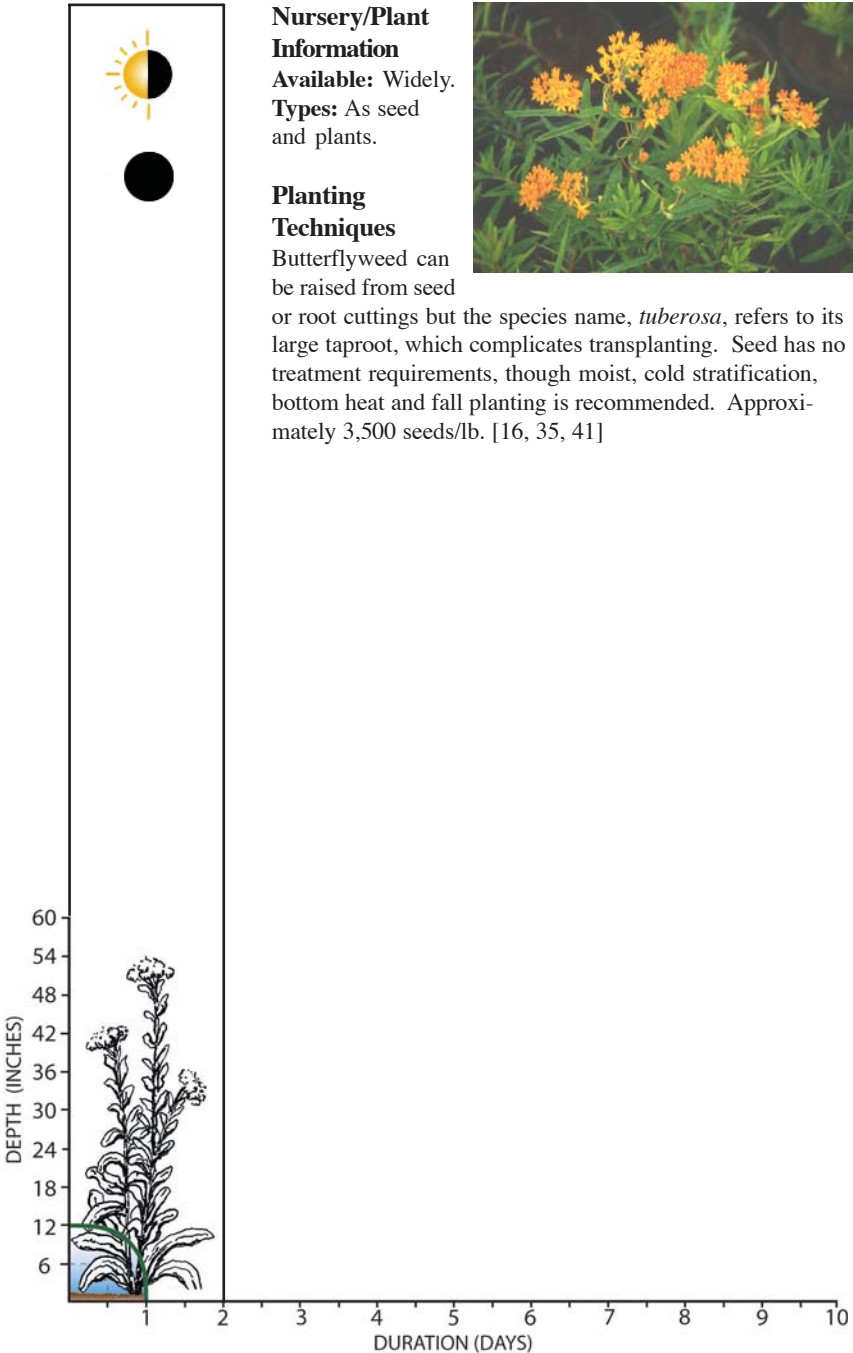
**Available:** Widely.  
**Types:** As seed and plants.



Photo: Jeff Shaw

### Planting Techniques

Butterflyweed can be raised from seed or root cuttings but the species name, *tuberosa*, refers to its large taproot, which complicates transplanting. Seed has no treatment requirements, though moist, cold stratification, bottom heat and fall planting is recommended. Approximately 3,500 seeds/lb. [16, 35, 41]





## *Aster laevis*

**Smooth Aster - a.k.a Smooth Blue Aster**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** A beautiful aster of mesic open or brushy places such as prairies, savannas, woodlands, swales and roadsides. [16, 17, 35] **Range:** All but ne. Minn. (Eco-Region: All), Wis., Mich. Mass., N.Y., s. Ont., s. Man. to Alaska, s. to N.D., S.D., Iowa, Mo., Tenn.; n. to Ohio, Pa., R.I. [7, 21]

### **Description**

**General:** A showy, vibrant blue-flowered perennial herb that has a mature height of 2-4'. **Flower:** Color is lavender-blue, blooms from August to October. The flowers are 1" across with 15 to 25 rays. **Leaf:** Blue-green, thick leaves that clasp the stem throughout the plant. **Stem:** Upright, single stem. **Fruit:** Light brown achene at the end of autumn. **Root:** Fibrous, shallow. **Soil:** The pH range is 5.0 to 6.5, dry to mesic soil. [17, 35, 44, 47]

### **Normal Water Level**

This species prefers upland moist/mesic to dry conditions. [21, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 12". **Duration:** Short – 1 day (decreases 6" every 12 hours). Smooth aster can tolerate wet conditions for short durations and seasonal inundation. [1, 44]

### **Sensitivities or Other Tolerances:**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Low to moderate. **Insect:** Infrequent. [1, 44, 47]

### **Design Considerations**

Smooth blue aster is well suited for upland slope buffer stabilization, vegetated swales, rainwater gardens and stormwater runoff situations that drain well. It is also good in landscaping situations for butterflies, cut flowers and birds. **Concerns:** The plant is aggressive, which is favorable for some restorations. Several cultivated varieties exist. [16, 35, 44]

### **Wildlife Use**

This aster attracts the orange sulphur butterfly. [21, 32, 44]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Seeds and plants. Several cultivars exist.

### **Planting Techniques**

Smooth aster is easily propagated from seed. No germination treatments are needed. Seed should be stored dry and cool. Cuttings can be rooted, and this species self sows well. Seeding rate is 0.02-0.125 lb/acre and approximately 768,000 seeds/lb. [16, 44]

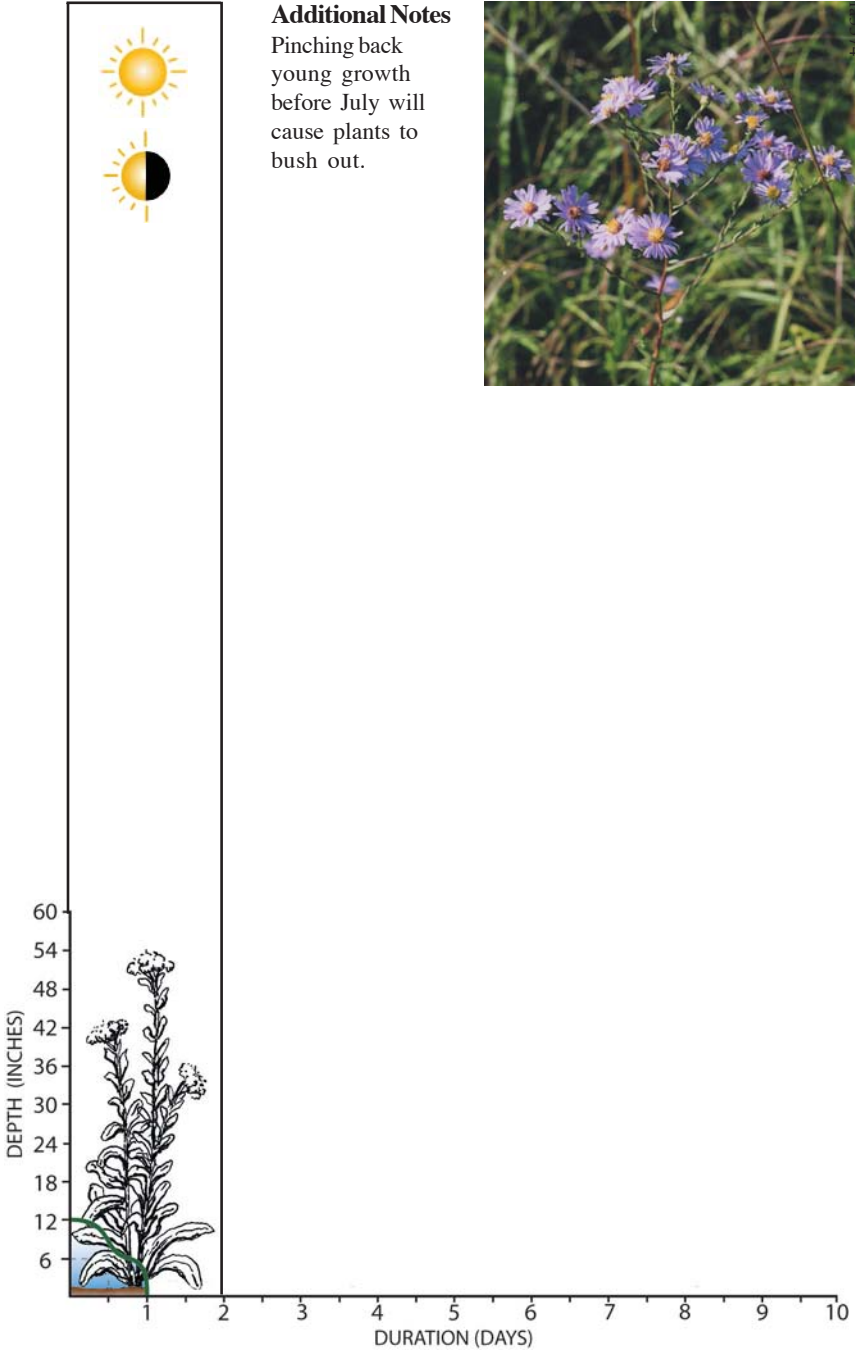
Indicator Status: UPL

**Additional Notes**

Pinching back young growth before July will cause plants to bush out.



Photo: www.calia2.mn.edu/







## *Aster lanceolatus (simplex)*

Panicle Aster - a.k.a. *Aster simplex* – White Panicle, Marsh or Eastern Lined Aster

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Panicked aster is one of our more common asters found in drier, open marshes, wet meadows, sedge meadows, fens, swamp openings, low prairies, old fields, stream banks and shores. [7, 11, 16, 35] **Range:** Minn. (Eco-Region: All), Wis., Mich. N.S. to N.D., s. to Va. and Tex. [7, 21]

### Description

**General:** This large, stout, perennial herb has a mature height of 2-4" and may form dense colonies. **Flower:** Flowers are about  $\frac{3}{4}$ " wide with 20 or more white rays, usually blooming from August to October. The inflorescence is leafy and forms a panicle. Although similar to the redstem and swamp asters (*A. puniceus* and *A. lucidulus*) the ray flowers of white panicle aster are always white and smaller. **Leaf:** Stem leaves are sessile or slightly clasping. Leaf undersides are smooth with the exception of occasional small hairs along the margins. Leaves are mostly serrate, longer than wide. **Stem:** Large, stout plant producing multiple branches toward the top. **Fruit:** Light brown achene maturing at the end of fall. **Root:** Forming colonies from long rhizomes. **Soil:** Prefers moist to saturated soils. [7, 11, 35, 44, 47]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [21, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 24". **Duration:** Medium long – 4 days (decreasing 6" daily). Panicked aster seedlings are killed by 2 days of inundation, though mature plants tolerate shallow flooding for short periods. This aster has a better tolerance to inundation than New England aster and is moderately to somewhat tolerant to flood duration. [1, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low to moderate. **Nutrient:** Low to moderate. **Siltation:** High. **Insect:** Infrequent. **Other:** This species is moderately tolerant to general disturbance and stress. [1, 44, 47]

### Design Considerations

Panicked aster is used well in the upper shoreline zone and for slope buffer stabilization. It also does well in vegetated swales and restorations. It is used for cutflowers and attracts butterflies. This species will work well in infiltration basins and rain gardens. **Concerns:** Can be very weedy and aggressive, though this may be a benefit against other invaders in restorations. [16, 44]

### Wildlife Use

This aster provides waterfowl cover and will attract butterflies and bees. [21, 32, 44]

Indicator Status: FACW

### Nursery/Plant Information

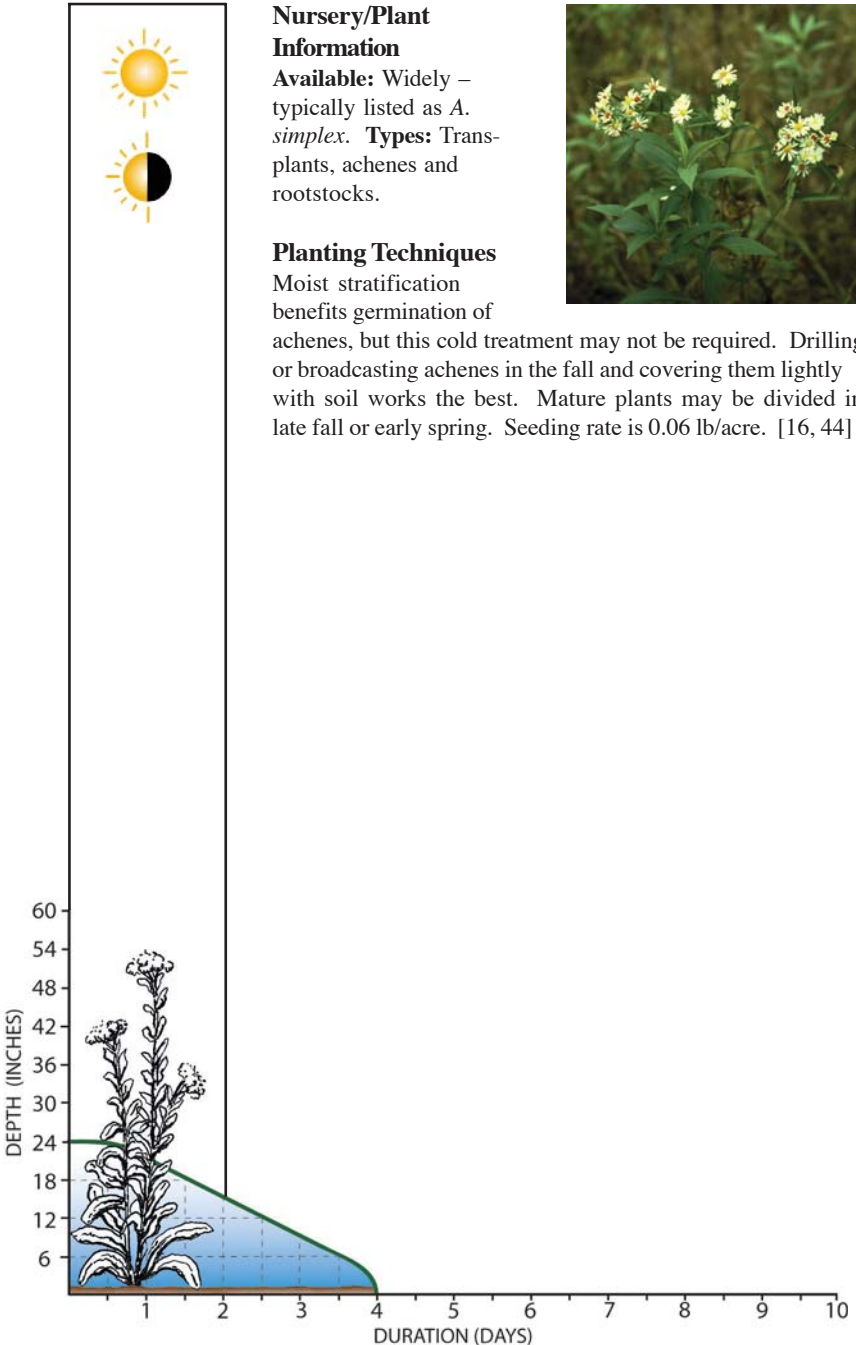
**Available:** Widely – typically listed as *A. simplex*. **Types:** Transplants, achenes and rootstocks.

### Planting Techniques

Moist stratification benefits germination of achenes, but this cold treatment may not be required. Drilling or broadcasting achenes in the fall and covering them lightly with soil works the best. Mature plants may be divided in late fall or early spring. Seeding rate is 0.06 lb/acre. [16, 44]



Photo: MNDNR





## *Aster lucidulus*

Swamp Aster - a.k.a. Shining Aster

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** One of the more common wetland asters, found in swamps, stream banks, shores, sedge meadows, calcareous fens, marshes, thickets, roadsides and ditches. This aster sometimes forms large colonies and seems to respond to disturbances, such as grazing and drainage by increasing or spreading. [7, 11]

**Range:** Minn. (Eco-Region: All), Wis., Mich., w. N.Y. to Minn. and S.D., s. to W.Va. and s. Mo. [7]

### **Description**

**General:** Swamp aster is a colonial, perennial herb, which may grow 15"-8' tall.

**Flower:** The inflorescence may be hairy or smooth, but does not have glands. Ray flowers are usually pale blue to lavender and bloom from August to October.

**Leaf:** Stem leaves are lobed at the base and clasp the stem. They are conspicuously crowded, especially toward the inflorescence. **Stem:** Green stems with mahogany marks at the nodes, or streaked. The stems are smooth to sparingly covered with stiff, straight hair. **Fruit:** Hairy achenes. **Root:** Long, creeping rhizomes.

**Soil:** Prefers moist-to-saturated soil. [7, 11, 47]

### **Normal Water Level**

This species prefers upland moist/mesic to wet/saturated conditions.

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Long – 5 days (decreasing 6" the first day and 12" over the next 4 days).

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun to part shade. **Salt:** Low. **Nutrient:** Unknown.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** Swamp aster has low tolerance to general disturbance and stress. [46]

### **Design Considerations**

Swamp aster is useful in the wet meadow zone and for slope buffer stabilization. It does well in vegetated swales and restorations and infiltration basins.

**Concerns:** Swamp aster can be aggressive and form monocultures in grazing- and drainage-disturbed areas.

### **Wildlife Use**

This aster provides waterfowl cover and will attract butterflies and bees. [32]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Seed only.

Indicator Status: FACW+

### Planting Techniques

Swamp aster is easily propagated from seed. No germination treatments are needed. Seed should be stored dry and cool.

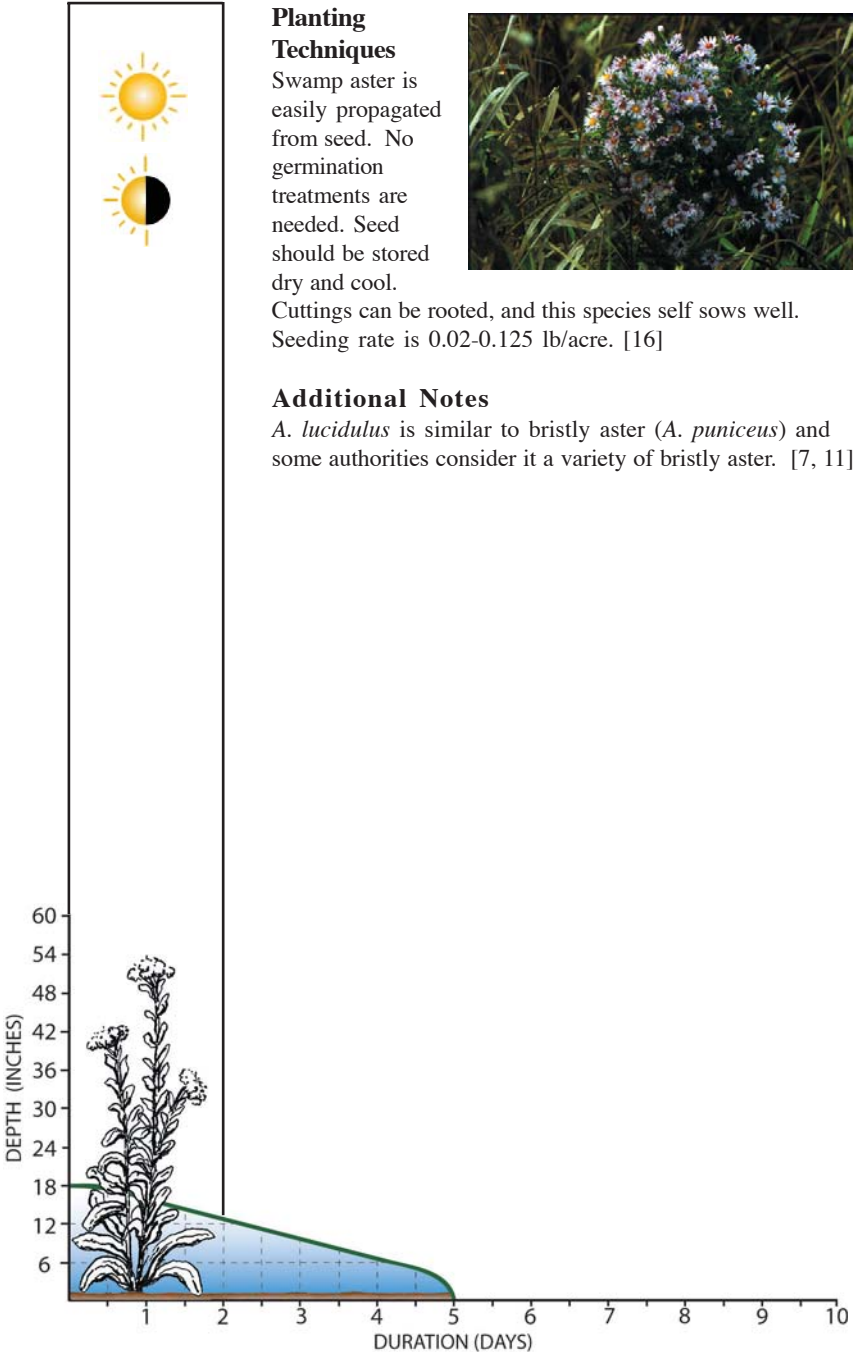
Cuttings can be rooted, and this species self sows well. Seeding rate is 0.02-0.125 lb/acre. [16]



Photo: Paul Jackson

### Additional Notes

*A. lucidulus* is similar to bristly aster (*A. puniceus*) and some authorities consider it a variety of bristly aster. [7, 11]





## *Aster macrophyllus*

**Bigleaf Aster - a.k.a Large Leaf Aster**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** One of the more common asters found in northern forests, a common groundcover in dry, shady savannas, woodlands and forests. May form a ground cover. [17, 35, 41] **Range:** Throughout northern upland forests of Minn. (Eco-Region: 1, 2, 5-8), Wis., Mich. N.S., N.B. and Que. to Wis., Minn. and se. Man., s. to Pa. and Ky., and in the mountains of Ga. [17, 21]

### **Description**

**General:** Native perennial, with a height of 8-18". Only a few plants send up flower stalks each year. **Flower:** Inflouescence is a loose cluster of lilac-to-purple flowers with yellow anthers that turn red with age. Blooms from Aug. to Oct. **Leaf:** Basal leaves are broad heart-shaped; coarsely toothed and rough to the touch, 4-8" long, that are deeply notched where they attach to the stalk. **Stem:** Long flowering stems, 1-2' tall, which are sticky to the touch because of miniature glands. **Fruit:** Light brown achene at the end of the growing season. **Root:** Rhizomes. **Soil:** All soil types. [17, 35, 41, 47]

### **Normal Water Level**

This species prefers upland moist/mesic to dry conditions and is usually an indicator of the upland side of wetland boundaries. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 1 day (decreasing all 12" in 1 day). This species is somewhat tolerant to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun to shade. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Low. **Insect:** Infrequent. [1, 47]

### **Design Considerations**

Bigleaf aster is a great groundcover for shaded slopes or dry, shaded edges of rainwater gardens, forested wetlands or upland buffers. **Concerns:** This species can be aggressive and form monocultures within the groundcover of the forest floor. [21]

### **Wildlife Use**

This aster provides cover and nesting habitat for songbirds of the forest floor. [21, 32]

### **Nursery/Plant Information**

**Available:** Limited. **Types:** Only as plants.

### **Planting Techniques**

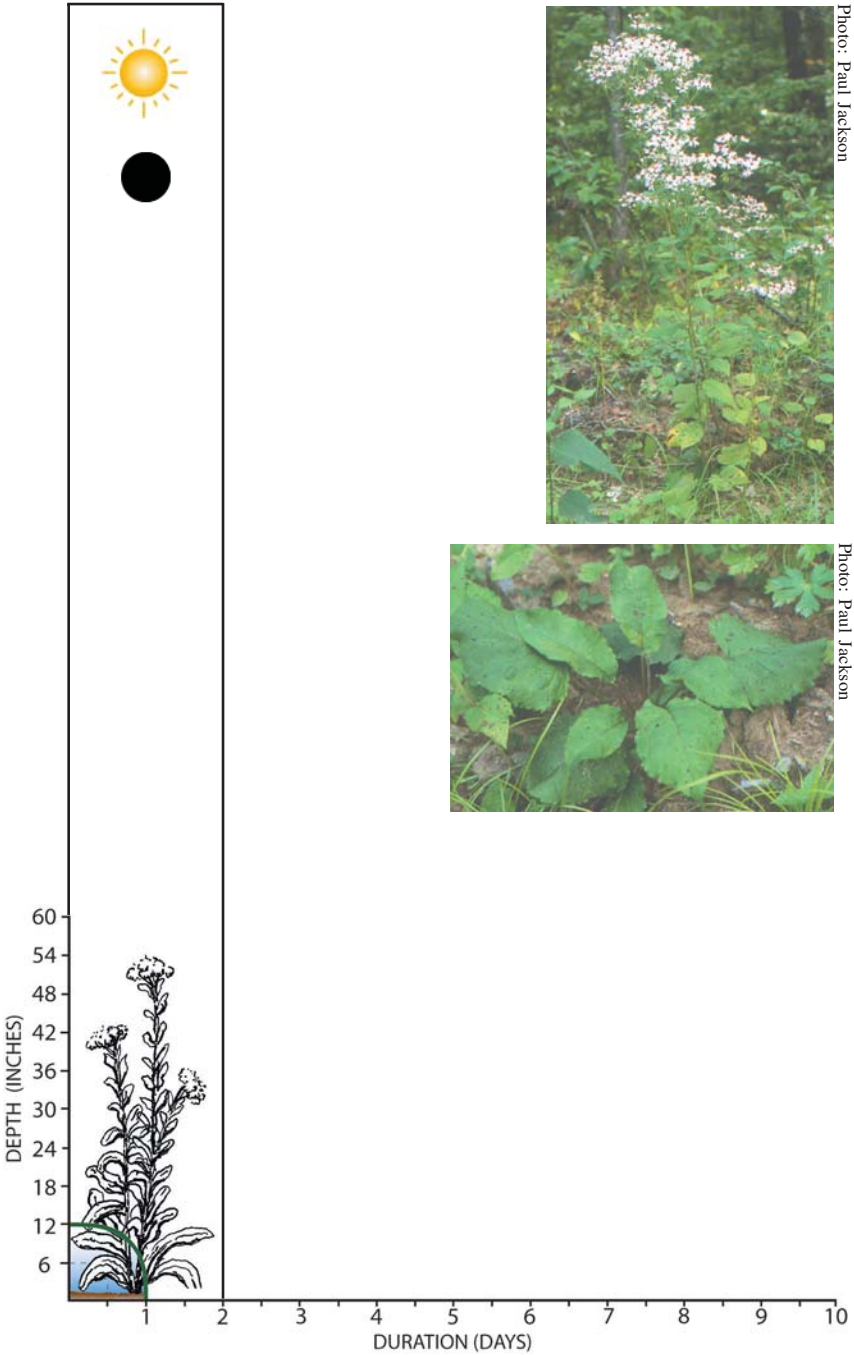
Plant containerized plants in spring or fall.

**Indicator Status: UPL**

Photo: Paul Jackson



Photo: Paul Jackson





## *Aster novae-angliae*

New England Aster - a.k.a. False Indigo

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadow, low prairie, shores, thickets, calcareous fens, and roadsides, usually in moist or wet, open areas. This species is a common aster of wet to wet-mesic prairies. [7, 11, 16, 35, 41] **Range:** Mostly w. and s. Minn. (Eco-Region: 3-9); Wis., especially s. LP of Mich.; Mass. to N.D. and Wyo., s. to Ala., Okla. and N.M. [7, 21]

### Description

**General:** A native, perennial herb with clustered stems reaching 1-6½', which is easily grown and makes a robust, colorful garden plant. **Flower:** Individual flowers, flower stalks and modified leaves subtending the flowers have hairy glands. The ray flower is very variable in color, from amethyst to rosy, rarely blue or white. The distinctive disc flower is yellow. The flower heads are 1-2" wide and bloom from late summer until frost. **Leaf:** Bases of the oblong (lance-shaped) stem leaves are clasping and entire, while the lower leaves tend to be deciduous. **Stem:** Usually clumped and much branched and often covered with glandular hairs (use a 10-15X lens). **Fruit:** The achenes are densely covered with stiff hairs. **Root:** A short rhizome or crown. **Soil:** Moist to wet habitats with a pH range of 5.5-7.0. [7, 11, 35, 41, 44]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 24". **Duration:** Moderate short – 3 days (decreasing 1' in the first day and 6" the following 2 days). Germinating seedlings are killed within 2 days of inundation. Mature plants appear to be more tolerant of short periods of shallow flooding in natural areas but not in reconstructed wet areas. [1, 37, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** High. **Insect:** Infrequent. **Other:** This species has a moderate-to-high tolerance to general disturbance and stress. [1, 37, 44, 45, 47]

### Design Considerations

New England aster is a good soil stabilizer for prairies, shorelines and upland buffer areas. It is often a garden perennial of cultivated varieties. It provides good cut flowers and is very good for lakeside plantings. It is also a good butterfly plant. Slight disturbances often benefit this aster. **Concerns:** This species can be aggressive and form monocultures. It spreads by seed. Many cultivars exist. [16, 21, 35, 41, 44]

### Wildlife Use

This aster provides waterfowl cover. A great nectar source because of its long bloom time in autumn, during which it is heavily visited by migrating monarch butterflies. [21, 32, 41, 44]

**Indicator Status:** FACW

**Nursery/Plant Information**

**Available:** Widely; often a garden perennial with a white variety.

**Types:** Transplants, seed and rootstocks.

**Planting Techniques**

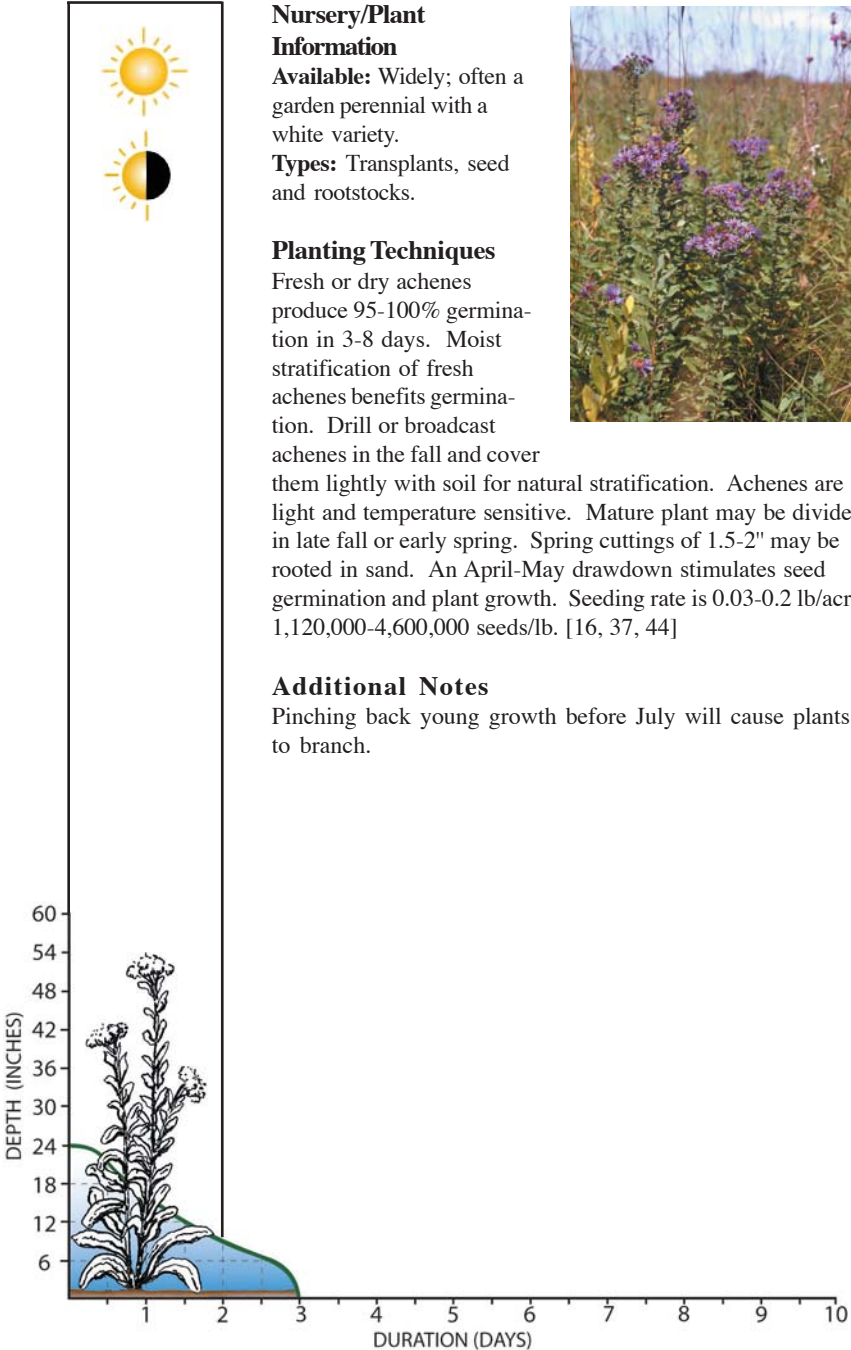
Fresh or dry achenes produce 95-100% germination in 3-8 days. Moist stratification of fresh achenes benefits germination. Drill or broadcast achenes in the fall and cover them lightly with soil for natural stratification. Achenes are light and temperature sensitive. Mature plant may be divided in late fall or early spring. Spring cuttings of 1.5-2" may be rooted in sand. An April-May drawdown stimulates seed germination and plant growth. Seeding rate is 0.03-0.2 lb/acre. 1,120,000-4,600,000 seeds/lb. [16, 37, 44]

**Additional Notes**

Pinching back young growth before July will cause plants to branch.



Photo: Paul Jackson







## *Aster pilosus*

Frost Aster - a.k.a. Hairy Aster, White Oldfield Aster

### Habitat/Plant Community & Geographic Range

**Habitat/Community:** Sandy and gravelly shores, interdunal swales, wet meadows, widely adapted to prairie habitats and moist-to-wet marshes. This species is often in calcium-rich soil, and may become weedy in disturbed fields and roadsides. [7, 16]

**Range:** Se. Minn. (Eco-Region: 7-8), Wis., Mich.; N.S. to s. Minn. and Neb., s. to n. Fla., La. and Kan. [7]

### General Description

**General:** Frost aster is a spreading perennial herb, from a large crown that grows between 16-24". **Flower:** This species has green-tipped, white ray flowers and yellow disc flowers that bloom from August to November. **Leaf:** Alternate, basal and lower leaves oblong lance-shaped, with stalks that soon are deciduous. The upper leaves are smaller, linear, stalkless. Leaf margins are entire or slightly toothed and the petioles are fringed with hairs. **Stem:** Sometimes smooth or stems and leaves with spreading hairs. **Fruit:** An achene; pappus white. **Root:** Fibrous, shallow. **Soil:** Widely adapted to moist-to-wet soils. [7, 16, 17, 47]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions.

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species is somewhat tolerant to flood duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Unknown. **Nutrient:** Low to moderate.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate-to-high tolerance to general disturbance and stress. [1, 47]

### Design Considerations

Frost aster makes wonderful cutflowers and is a good nectar source with strong tolerance to sandy and gravel soil types. **Concerns:** Aggressively self-seeds. May become weedy in disturbed sites though it may be used beneficially in restorations to defend against invasive plants. [16]

### Wildlife Use

This aster provides waterfowl cover and will attract butterflies and bees. [7, 32]

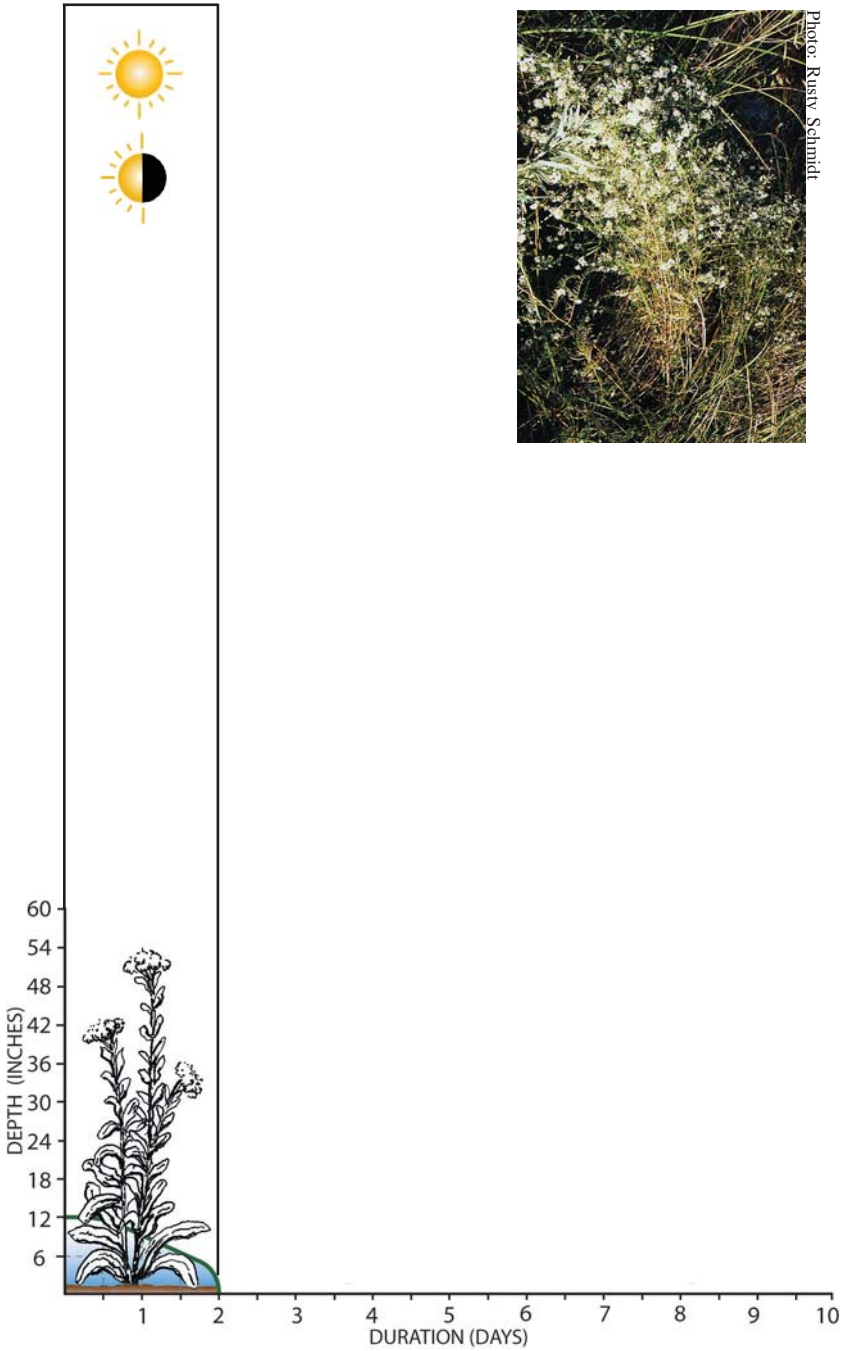
### Nursery/Plant Information

**Available:** Limited. **Types:** Plants only.

### Planting Techniques

Achenes should be kept in dry storage before planting. [16]

**Indicator Status: FACU+**





## *Aster puniceus*

**Red-stemmed Aster** - a.k.a. Purplestem, Red-stalked, Bristly or

Swamp Aster

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** A stout aster of open and brushy swamps, sedge meadows, shrub-carrs, alder thickets, calcareous fens, stream banks, shores and springs. [7, 11, 35] **Range:** Minn. (Eco-Region: 1–8), Wis., Mich.; Nfld. to N.D., s. to Ga., Ala., Ill. and Neb. [7, 21]

### **Description**

**General:** Large, perennial herb commonly 1-5' tall. **Flower:** The flower heads have pale blue to deep lavender or violet ray flowers and yellow disc flowers. This species blooms from August to October. The inflorescence is hairy or smooth, but does not have glands. **Leaf:** Stem leaves are lobed, clasping the stem, and usually toothed. The leaves are not conspicuously crowded. **Stem:** The stem is often reddish, with scattered coarse, stiff, white hairs. **Fruit:** Achenes are smooth. **Root:** Short rhizomes or crowns and sometimes has short stolons. **Soil:** Hardy and tolerant of wet soils. [7, 11, 35]

### **Normal Water Level**

This species prefers moist/mesic to wet/saturated conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 18". **Duration:** Long – 5 days (decrease of 6" in the first day and then 12" in the next 4 days). This species has a moderate tolerance to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Unknown. **Nutrient:** Low to moderate.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1]

### **Design Considerations**

Red-stemmed aster is used in wetland restorations as well as in restorations of shores and streams. Also consider this plant for stormwater detention areas. This species is a wonderful source of nectar. **Concerns:** Can be very weedy and aggressive, though this may be a benefit against other invaders for restorations. [16, 21]

### **Wildlife Use**

This aster provides waterfowl cover and will attract butterflies and bees. [21, 32]

### **Nursery/Plant Information**

**Available:** Limited. **Types:** Seed and plants.

**Indicator Status: OBL**

**Planting Techniques**

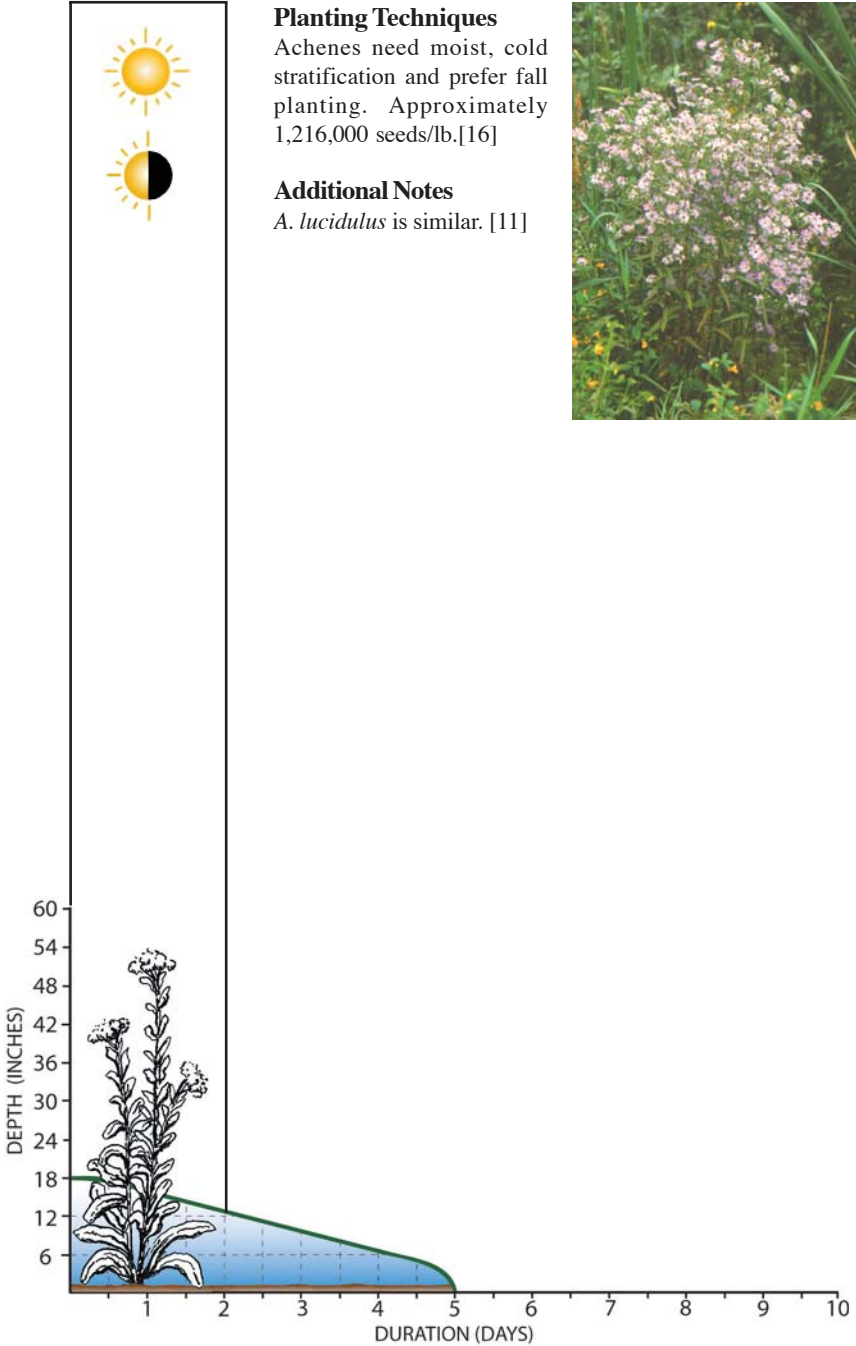
Achenes need moist, cold stratification and prefer fall planting. Approximately 1,216,000 seeds/lb.[16]

**Additional Notes**

*A. lucidulus* is similar. [11]



Photo: Paul Jackson





# *Athyrium felix-femina*

Lady Fern - a.k.a. *Athyrium angustum*

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Moist, rich soils of forests, wooded swamps and a dominant fern in midwestern woodlands. [17] **Range:** Minn. (Eco-Region: All), Wis., Mich.; N.S. and N.B. to Ont., Minn.; s. to Ga., La. and Okla. [17, 21]

## Description

**General:** A perennial, native fern that may grow to 36". **Leaf:** Lady fern is a vigorous, semi-spreading fern with lime-green, lacy, cut fronds. **Fruit:** Light brown spore in August. **Root:** Rhizome, short-creeping to suberect. **Soil:** Moist, rich soils of forests. [17, 21, 47]

## Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [21]

## Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species is moderately tolerant to flood duration. [1]

## Sensitivities or Other Tolerances

**Exposure:** Part sun to full shade. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Low. **Insect:** Infrequent. **Other:** Sensitive to wind. This species has a moderate tolerance to general disturbance and stress. [1]

## Design Considerations

Lady Fern makes a very useful groundcover for shady restorations, gardens, rain water gardens and replacement for hostas to deter deer. This species is also a good indicator for wetland boundaries in northern woodlands. **Concerns:** Ferns are susceptible to excess wind and sun exposure. [21]

## Wildlife Use

Ferns are widespread, especially in moist woodlands. Yet as a wildlife food source, they are used only to a minor extent. Their leaves are eaten by deer, hares and grouse when other green plants are scarce. Ferns are a good cover plant for small mammals and songbirds. [21]

## Nursery/Plant Information

**Available:** Widely. **Types:** Available as plants or rhizomes.

## Planting Techniques

Plants or rhizomes should be planted in the spring or fall and adequately watered. Ripened spores can also be spread on top of exposed soil, but this technique is most successful under greenhouse conditions.

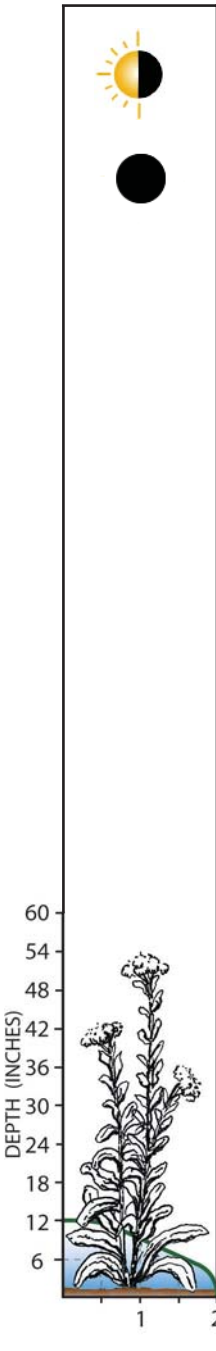
Indicator Status: FAC

**Additional Notes**

Lady fern is highly variable in its form.



Photo: Rusty Schmidt





## *Betula nigra*

River Birch - a.k.a. Red Birch, Black Birch

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Flood plain forest, river banks, swamps, lowland wet and wet mesic forests, ox-bows, lakes, swampy bottomlands and low, open sites of recent disturbance along streamsides. Its preferred germination sites are sandbars exposed after spring floods have receded or silty loam bottomlands. [7, 11, 22, 32, 36] **Range:** Se. along Mississippi River in Minn. (Eco-Region: 7), c. and s. Wis., Mich.; N.H. to Ohio and s. Minn., s. to Fla. and Tex. [7, 21]

### Description

**General:** Medium-sized tree that may grow to a mature height of 50–75' and width of 35–40'. Can grow 20–30' in 10 years. Often slightly leaning and forked tree with irregular, rounded, spreading crown. **Flower:** Male yellowish, with 3 stamens, many in long, drooping catkins near tip of twigs. Female greenish, in short, upright catkins back of tip of same twig during April and May. **Leaf:** Alternate, simple, deltoid-to-wedge-shaped that is doubly serrated. Shiny, dark-green above, whitish and usually hairy beneath; turning dull yellow in autumn. **Bark:** Cinnamon-to-reddish, papery, horizontal exfoliation, blocky scales at base; adult trunks, red-brown to black, becoming thick, fissured and shaggy. **Twigs:** Cherry-like, with conspicuous, horizontal striped lenticels. **Bud:** Stalked, woolly through summer, small, just a bit over ½", light chestnut brown. **Fruit:** Oblong elliptic strobiles, erect, medium green becoming tan-brown at maturity. Cones are 1-½" long; cylindrical, brownish, upright, short-stalked, with many hairy scales and hairy, 2-winged nutlets; maturing in late spring or early summer. **Root:** Shallow, fibrous, wide-spreading roots. **Soil:** Tolerates most soils, including fine, heavy clays that are poor to moderately well drained; prefers wet-to-average moisture, acid soils, pH 6.5 or lower. [7, 8, 11, 22, 36]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [8, 21, 36, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 60". **Duration:** Long – 5 days (prefers a rapid water decrease of 12"/day). This species can survive dry summer/fall seasons and can tolerate seasonal or irregularly inundated-to-saturated conditions. Seedlings somewhat tolerate flood duration and flood depth increases, while adults have a moderate tolerance. [1, 8, 22, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full sun to part shade. **Salt:** Low. **Nutrient:** Moderate.

**Siltation:** Moderate. **Insect:** Infrequent: unlike other birch species not susceptible to bronze birch borer. **Other:** Sensitive to 2,4-D and to lighting. Resistant to drought/heat. Resistant to mine spoils and soil compaction. This species has a moderate tolerance to oil/grease and metals. It has a moderate tolerance for general disturbance, from which seedlings decrease in abundance. [1, 8, 22, 37, 47]

### Design Considerations

River birch is well suited for bank stabilization, shoreland and floodplain restorations on mesic-to-wet soils. Its ability to thrive on moist sites makes it useful for erosion control and rain gardens. This species is long lived and fairly disease resistant. It is used in yards and landscape designs.

## Indicator Status: FACW

**Concerns:** This tree can be messy in manicured gardens because of its many drooping branches and because its weak wood is easily damaged by wind and ice. [6, 36]

### Wildlife Use

Wildlife that benefit are songbirds (especially cavity nesters, redpolls and siskins) and waterfowl. This species provides seeds for upland gamebirds (sharp-tailed, ruffed and spruce grouse) and songbirds. Moose and white-tailed deer eat the twigs and foliage, and beavers, hares and porcupines eat various other parts. [6, 21, 22, 37]

### Nursery/Plant Information

**Available:** Widely. **Types:** Balled-and-burlapped, bareroot and potted stock.

### Planting Techniques

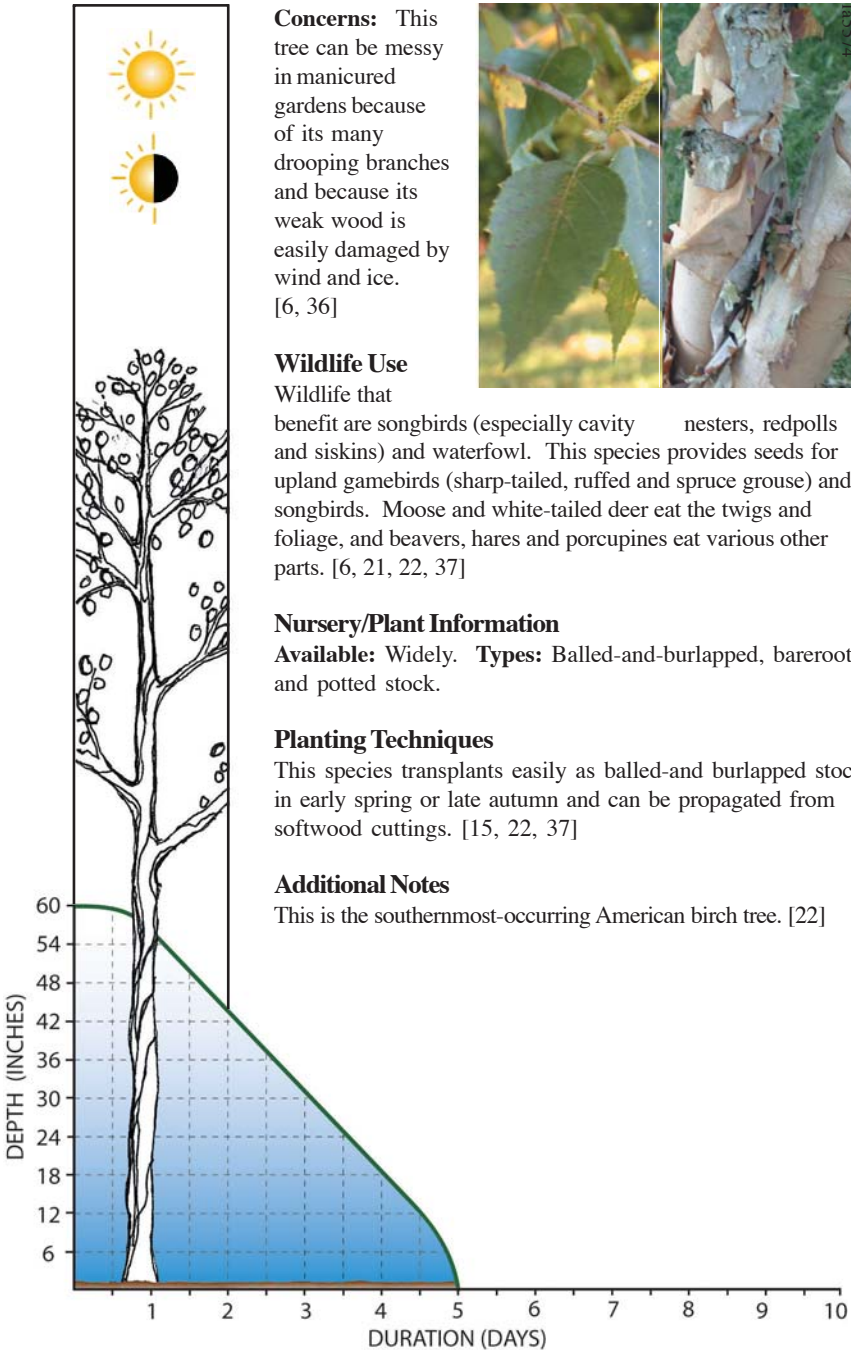
This species transplants easily as balled-and burlapped stock in early spring or late autumn and can be propagated from softwood cuttings. [15, 22, 37]

### Additional Notes

This is the southernmost-occurring American birch tree. [22]



Photos: www.calfl2.umn.edu/







## *Bidens cernua*

**Beggarsticks** – *a.k.a.* **Nodding Beggarsticks, Bur Marigold, Stick-tight, Nodding Bur-Marigold**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Exposed, sandy or muddy shores, streambanks, marshes, forest depressions, wet meadows, ditches, pond margins and other wet places. [7, 11, 32, 35]

**Range:** Minn. (Eco-Range: all), Wis., Mich. N.B. to B.C., s. to N.C., Okla., N.M. and Calif.; Eurasia. [7].

### **General Description**

**General:** Annual species. Mature height is 4" to 3.3'. **Flower:** Small, yellow, sunflowerlike heads from August to October. **Fruit:** The elongate achenes end in 2-4 barbed awns which stick tightly to clothing and fur. The flower heads nod as seeds ripen. **Leaf:** Bases of the opposite simple, sessile, leaves are often joined. **Soils:** Wet soils of a variety of textures. [7, 11, 35, 44]

### **Normal Water Level**

This species prefers moist/mesic conditions. [44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Medium-long – 4 days (decreasing 6"/day). Species tolerates seasonally flooded conditions for short duration and decreases in abundance as flood depth increases or decreases. Do not submerge young plants for more than 2 or 3 days in 1-2" of water. Mature plants have a tolerance for water level fluctuation, flood duration, and this species thrives in conditions similar to *Aster lanceolatus*. [1, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun. **Salt:** Low to moderate. **Nutrient:** Moderate, though *B. cernua* is intolerant to P levels decreasing. **Siltation:** Moderate to high. **Insect:** Infrequent.

**Other:** This species has a moderate-to-high tolerance to general disturbance and stress. [1, 44, 47]

### **Design Considerations**

Beggarsticks is used in upper shoreline zones and in vegetated swales. A good pioneer species. Well suited for restorations of all wet, disturbed areas and urban conditions. This species may be in the seed bank and respond well to drawdowns. **Concerns:** This genus is considered a nuisance for walkers when the seeds are ripe. It is short-lived. [26, 42, 44]

### **Wildlife Use**

Provides wildlife cover. Waterfowl (especially wood duck), shorebirds, songbirds, and small mammals consume achenes. [32, 44]

### **Nursery/Plant Information**

**Available:** Limited. **Types:** Plants and achenes.

**Indicator Status:** OBL (*B.cernua*)

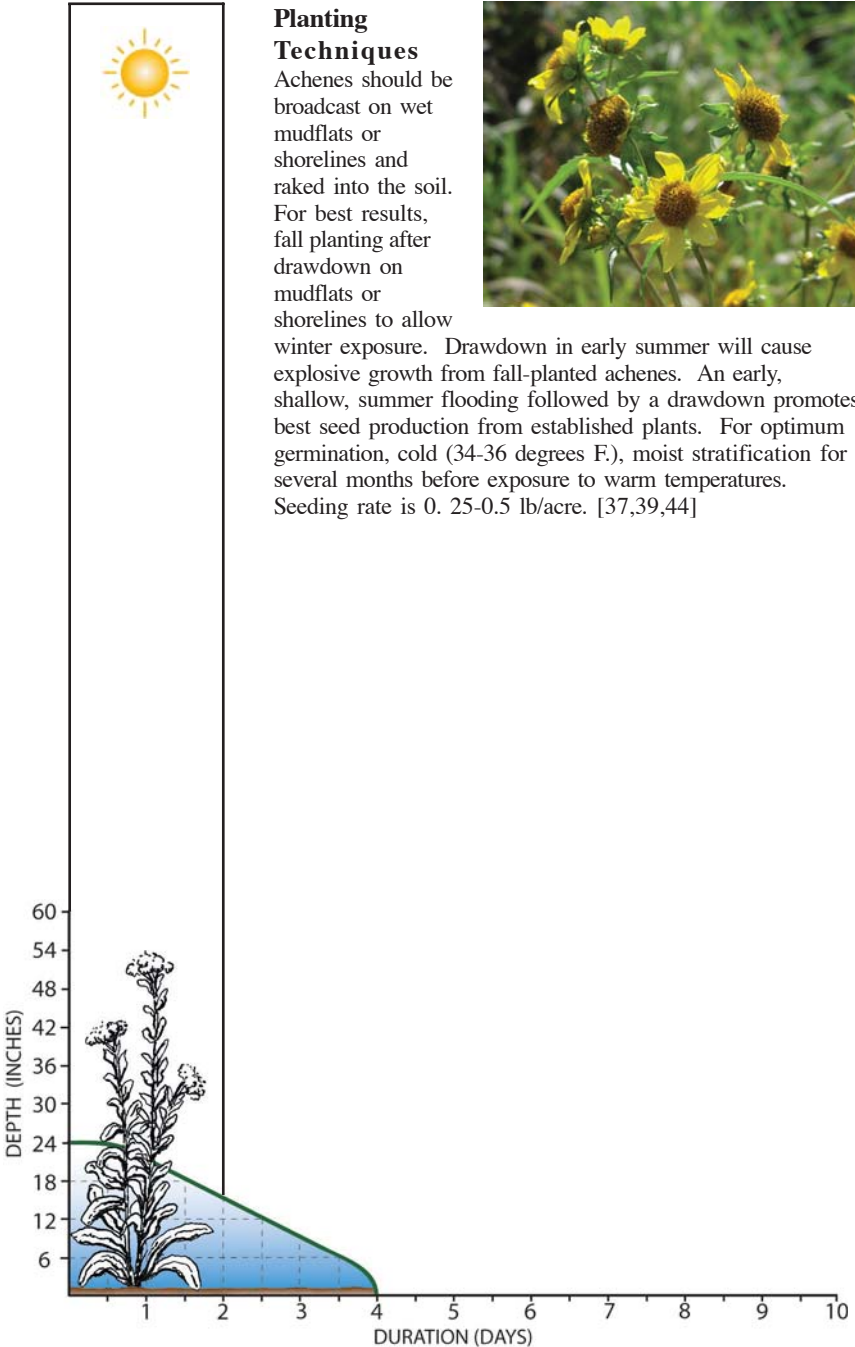
### Planting Techniques

Achenes should be broadcast on wet mudflats or shorelines and raked into the soil. For best results, fall planting after drawdown on mudflats or shorelines to allow

winter exposure. Drawdown in early summer will cause explosive growth from fall-planted achenes. An early, shallow, summer flooding followed by a drawdown promotes best seed production from established plants. For optimum germination, cold (34-36 degrees F.), moist stratification for several months before exposure to warm temperatures. Seeding rate is 0.25-0.5 lb/acre. [37,39,44]



Photo: Tony Randazzo





## *Boltonia asteroides*

**Boltonia** - a.k.a. White or Star Boltonia, White False Aster, False Aster

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Seasonally flooded, muddy shores, wet meadows, marshes, swamps, low or damp prairies, swales and edges of streams. [7, 35] **Range:** C. and s. Minn. (Eco-Range: 4, 7-9), s. Wis., extreme s. LP of Mich.; N.J. to s. Man., s. to Fla. and Tex.; introduced in nw. USA. [7, 21]

### Description

**General:** A robust, asterlike, perennial herb, which has branched stems, often in clumps and grows 3-5' tall. **Flower:** The heads are about 1" across, have yellow, hemispherical centers and narrow, usually white rays in the fall (August to October). **Leaf:** Broadly linear-to-lanceolate leaves that reduce towards the top. **Fruit:** Achenes differ from those of the asters and fleabanes by having no tuft of hairs at the end. **Root:** Fibrous-rooted, sometimes with shallow rhizomes. **Soil:** Moist-to-wet soils. [7, 35]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day).

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Unknown. **Siltation:** Unknown. **Insect:** Unknown. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

### Design Considerations

*Boltonia* makes a great cutflower and attracts butterflies, which makes it a good plant for perennial gardens. It may do well in semi-shaded areas. **Concerns:** This plant grows tall and should be planted with other robust species. [35]

### Wildlife Use

This species is a bee and butterfly magnet. [21]

### Nursery/Plant Information

**Available:** Limited. **Types:** Plants primarily, although achenes are available.

### Planting Techniques

The species establishes readily from achenes. [21]

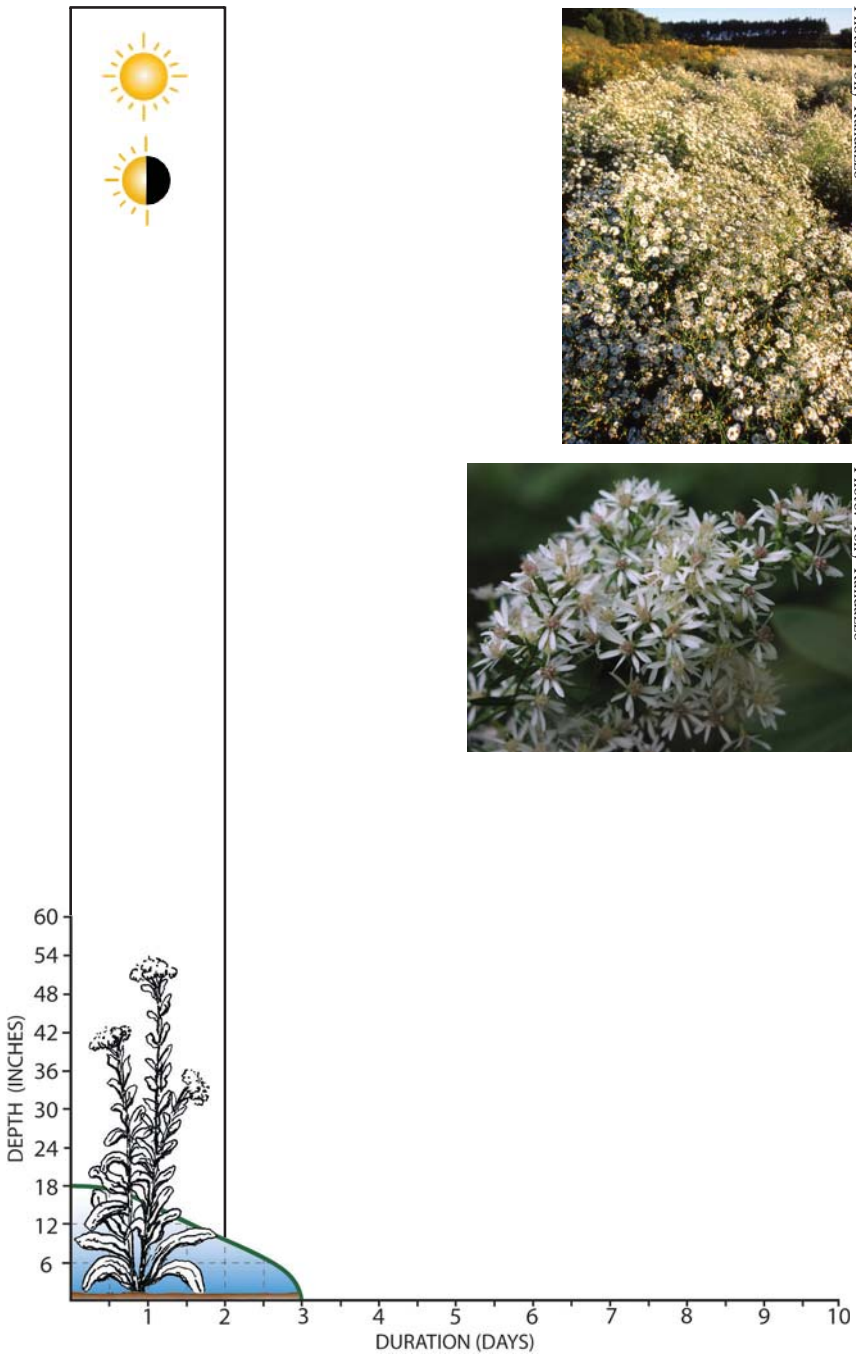
**Indicator Status: FACW**



Photo: Tony Randazzo



Photo: Tony Randazzo





## *Bromus ciliatus*

**Fringed Brome** a.k.a. *Bromus kalmii* - Fringed Brome-grass, Prairie Brome, Kalm's Brome, Wood Chess, Cheat

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Stream banks, shores, thickets, sedge meadows, fens, marshes, wet meadows and moist woods and thickets. This species is widely adapted to habitats from saturated wetland soils to mesic upland forests and roadsides. [7, 16, 21]

**Range:** All but sw. Minn. (Eco-Range: 1-6, 8), Wis., Mich.; Nfld. to Wash., s. to N.J., Tenn., Iowa, Tex. and Calif. [7, 21]

### **Description**

**General:** Cool-season, perennial grass that reaches 2-4' in height. It is a bunching, short-lived species. **Leaf:** Green, turning tan in autumn. **Flower:** Blooms June to July, often flowering first year. The inflorescences resemble those of wheat.

**Fruit:** Delicate, gracefully nodding caryopsis. **Root:** Fibrous. **Soil:** Saturated wetland soils to mesic upland forests and roadsides. [7, 16, 17, 47]

### **Normal Water Level**

This species prefers upland moist/mesic to wet/saturated conditions, although it is drought tolerant. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). This species is somewhat tolerant to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun to shade. **Salt:** Unknown. **Nutrient:** Low to moderate.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** Drought tolerant and moderate-to-low tolerance to general disturbance and stress. [1, 47]

### **Design Considerations**

A good restoration plant for shady sites as well as mesic-to-wet conditions. The seed head has dried flower uses. This species can be grown as a specimen or in small groups. **Concerns:** This species is not competitive with taller grasses.

### **Wildlife Use**

The good-sized seeds are eaten by a number of birds (grouse, partridges, lark sparrows, savannah sparrows and brown towhees) and rodents (chipmunks, gophers, ground squirrels, mice and prairie dogs). Hoofed browsers and geese consume the leaves or other parts of the plant, especially when young. [32]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Seed.

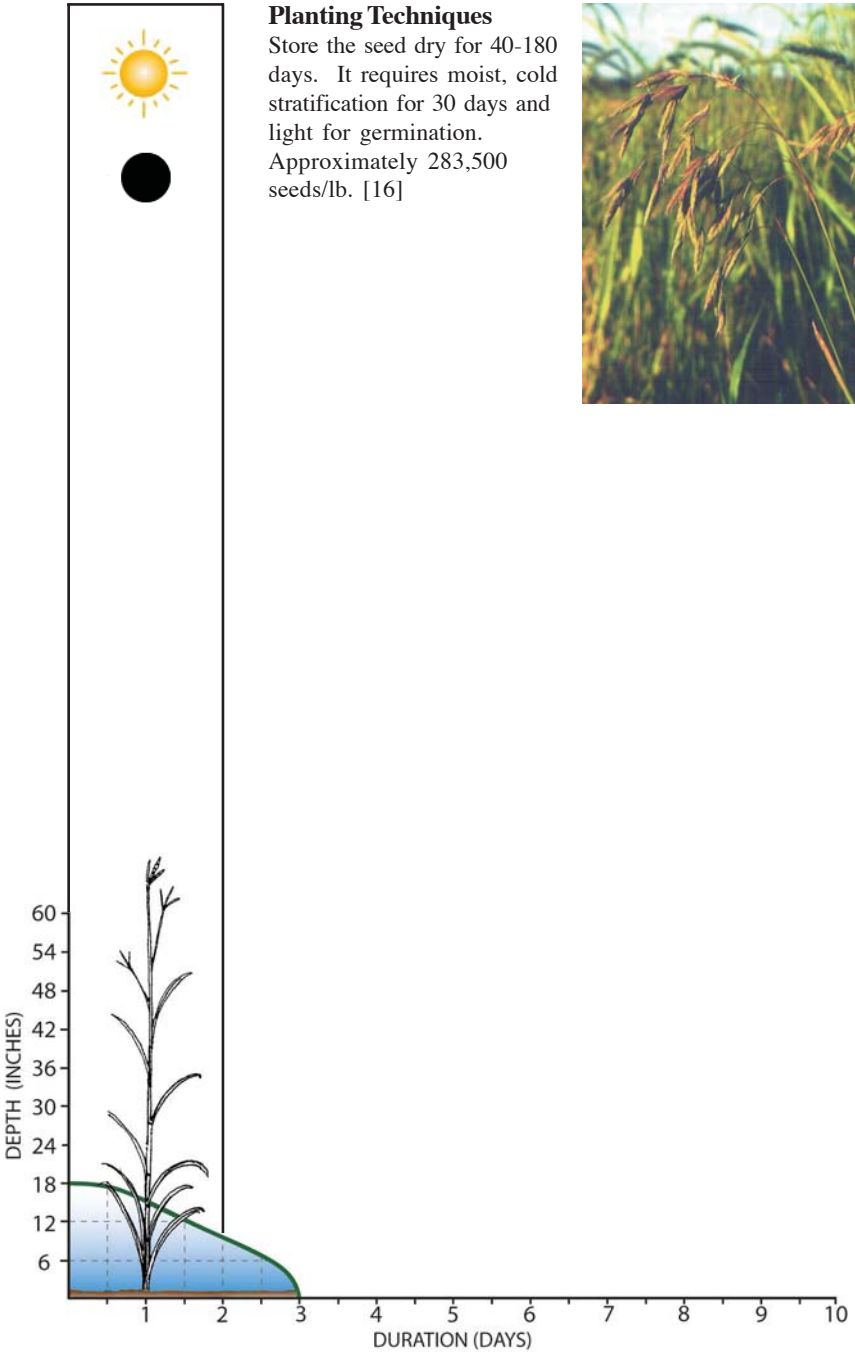
**Indicator Status: FACW**

**Planting Techniques**

Store the seed dry for 40-180 days. It requires moist, cold stratification for 30 days and light for germination. Approximately 283,500 seeds/lb. [16]



Photo: Paul Jackson





## *Calamagrostis canadensis*

Canada Blue-joint Grass *a.k.a.* Blue Joint Grass, Canada Blue-joint Grass, Bluejoint, Blue-joint Reedgrass, Reedgrass

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadow, wet-mesic prairies, shallow-water marshes, calcareous fens, stream banks, shrub-carrs and thickets. This species usually occurs as a subdominant in sedge meadows, and is the most frequent grass associate of the sedges. [7, 11, 16] **Range:** Common to abundant; Minn. (Eco-Range: All), Wis., Mich. Greenland to Alaska, s. to N.J., W.Va., N.C., Mo., Kan., N.M. and Calif. [7, 21]

### Description

**General:** Cool-season, perennial grass with a mature height of 2-4' has many very slender stems that arise from small rhizomes. **Flower:** A pretty, open inflorescence of tiny flowering spikelets on bluish stems that is a brown color from May to August. **Leaf:** The sheaths are usually hairless. The slender leaves tend to be flat. A distinct, thin, dry, papery structure extends beyond the summit of the sheath (the ligule). **Stem:** Nodes often are blue to reddish purple. **Fruit:** A caryopsis. **Root:** Creeping rhizomes. **Soil:** The pH range is 5.0-8.0. [7, 11, 44]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions, though will tolerate 3 to 6" of inundation. [21, 37, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 6". **Duration:** Medium long – 4 days (decreasing 3" every 2 days). Canada blue-joint grass can tolerate regularly or seasonally inundated condition to 6", but not permanently flooded conditions, but will moderately tolerate flood duration. This species is more abundant in wetlands with minimal water level fluctuations and will increase in abundance with decreases in flood depth. [1, 23, 37, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species has a moderate-to-low tolerance to general disturbance and stress. [1, 44, 47]

### Design Considerations

Canada blue-joint grass is used in upper shoreline zones and in vegetated swales. This species also does well in landscaping, restorations especially wetland, wet meadow and wet prairie, and mitigation sites. It provides good wildlife habitat for songbirds. **Concerns:** Can spread aggressively by rhizome under optimal conditions, though this is desirable in restorations threatened by invasive species. This species may decrease with heavy grazing. [14, 16, 21, 37, 44]

**Indicator Status: OBL**

### Wildlife Use

Songbirds and waterfowl eat the seeds. Geese, moose, deer, small mammals and muskrats graze on the entire plant, especially the young shoots. This grass stands up well in winter, making it a good source of food and cover for wildlife, especially songbirds. [11, 14, 37, 44]



Photo: Paul Jackson

### Nursery/Plant

#### Information

**Available:** Widely.

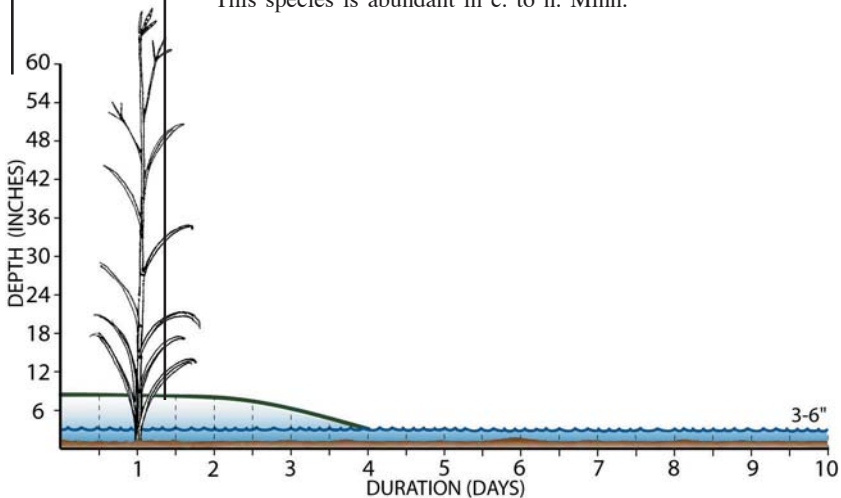
**Types:** Plants and seed, although not in large quantities due to low seed production and low viability.

#### Planting Techniques

Planting plugs has been most successful. Planting should be on  $\frac{1}{2}$ ' centers because the rhizomes spread slowly. Can be grown from seed, but is slow to establish. Soil should be moist to saturated, but not inundated during planting. Seed should be fresh, moist, cold stratified and divided. Light is important in germination. Seeding rate is 0.03-0.06 lb/acre, approximately 1,512,000 seeds/lb. Established stands may be mowed in alternate years for maintenance. [16, 44]

#### Additional Notes

This species is abundant in c. to n. Minn.







## *Caltha palustris*

**Marsh Marigold** - a.k.a. Cowslip, Common Marsh-marigold, King-cup

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Shallow water, swamp, hardwood swamps, wet woods, shrub swamps, thickets, especially stream banks, sedge meadows, fresh (wet) meadows, calcareous fens, marshes and springs. This species is usually associated with peaty ground and some flowing water. [7, 11, 16, 35, 41] **Range:** Common; Minn. (Eco-Range: All), throughout Wis., Mich. Circumboreal; s. to N.C., W.Va., Tenn., Ind., Ill., Iowa and Neb. [7, 21]

### **Description**

**General:** With its early bloom, marsh marigold is a harbinger of spring. It is a native perennial herb, that reaches a height of 1-2'. **Flower:** Many round, green-and-yellow buds open to become a flower with 5-9 bright yellow petals sepals, 1-1½" wide and 4 or more pistils surrounded by many stamens; blooms during April and May.

**Leaf:** The basal leaves are broadly heart-shaped or rounded, 2-7" wide, and usually coarsely toothed. **Stem:** Hollow, 8-24" long. **Fruit:** A follicle 3/8-5/8" long with a pronounced beak. **Root:** Fibrous, deep. **Soil:** Grows in saturated soil and prefers peat. [7, 11, 35, 41, 47]

### **Normal Water Level**

This species prefers shallow water of 3" of inundation or less to wet/saturated conditions. [21, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 6". **Duration:** Medium short – 3 days (decreasing 3" the first 2 days then 3" more the last day). Marsh marigold will tolerate seasonal to regular inundation with a moderate tolerance to duration. [1, 37]

### **Sensitivities or Other Tolerances**

**Exposure:** Part sun to shade. **Salt:** Low. **Nutrient:** Low. **Siltation:** Unknown.

**Insect:** Infrequent. **Other:** This species spreads slowly. It has a moderate tolerance to general disturbance and stress, and moderate tolerance to iron concentrations. [1, 37, 47]

### **Design Considerations**

The main use for this plant is in wetland/stream restorations or rehabilitation, especially in wet meadows, marsh/bog areas or areas associated with peaty ground and some flowing water. This species can be successfully planted on any wet ground, although it prefers swamp and peatlands. **Concerns:** Marsh marigold may not do well in nutrient-poor soils. [16]

### **Wildlife Use**

Upland game birds eat the seeds and moose eat it as food. It is used by frogs and insects as well. However, cattle and deer avoid eating this plant, which may be toxic to livestock. [21, 35, 37]

Indicator Status: OBL

### Nursery/Plant Information

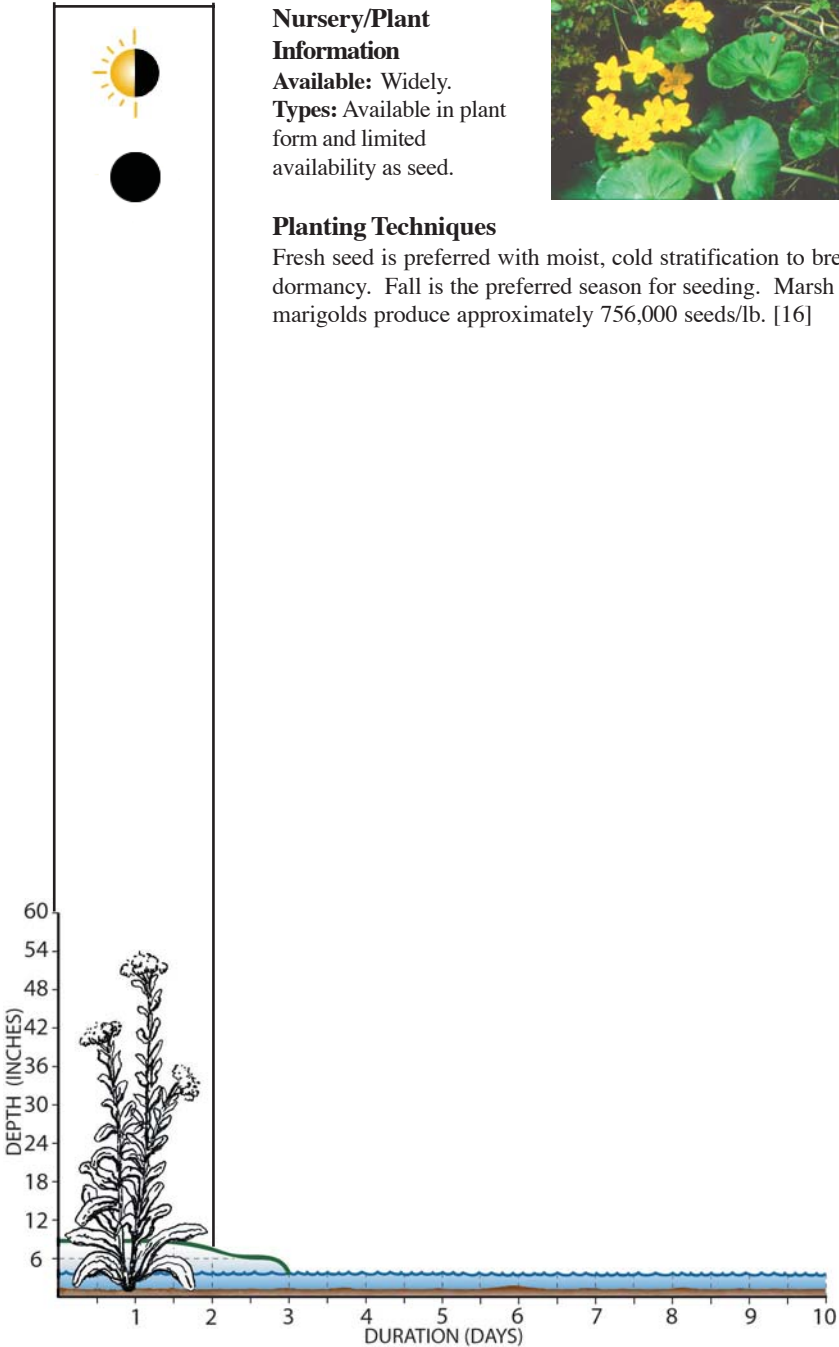
**Available:** Widely.  
**Types:** Available in plant form and limited availability as seed.



Photo: Dan Shaw

### Planting Techniques

Fresh seed is preferred with moist, cold stratification to break dormancy. Fall is the preferred season for seeding. Marsh marigolds produce approximately 756,000 seeds/lb. [16]





# *Carex aquatilis*

## Water Sedge

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadows, marshes, shores, stream banks, kettle lakes, ditches and fens. [7] **Range:** N., c. and infrequently s. Minn. (Eco-Region: 1-6, 8, 9), e. and n. Wis., local in w. UP of Mich. Circumboreal, s. to N.J., Ind., Iowa, Kan., N.M. and Calif. [7, 21]

### Description

**General:** This native perennial forms clumps or tufts. One of the lake sedges, *Carex aquatilis* is very similar to tussock sedge (*Carex stricta*). It may grow to a mature height of 2-3'. **Flower:** Pistillate scales reddish-brown or tawny to often purplish-black, usually with a paler midrib, which is generally narrower and often shorter than the perigynia. **Leaf:** Lowest leaves have blades; mature leaves tend to be blue-green. **Stem:** The flowering stems arise centrally; lack basal sheaths with 2 rows of fibers on each side of a central fiber. **Root:** Spreading by many slender rhizomes. **Soil:** Wet soils. [7, 11]

### Normal Water Level

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions, sometimes in salt marshes. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 12". **Duration:** Medium short – 3 days (decreasing in depth 6" in day 1 and 6" more in days 2 and 3). This species can tolerate seasonal-to-regular inundation, with a moderate tolerance to flood duration. It usually increases in abundance with flood depth increases. Found in sites with stable water levels. [1, 29, 37]

### Sensitivities or Other Tolerances

**Exposure:** Partial shade. **Salt:** Unknown. **Nutrient:** Unknown.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** Water sedge has a moderate rate of spread and a moderate-to-low tolerance to general disturbance and stress. [1, 37]

### Design Considerations

In addition to being a good stream bank stabilizer, this species works well in many restoration efforts. Restorations or reestablishment may include wet meadows, shores, stream banks, kettle lakes, fens and ditches. This is a good plant for partially sunny to shady conditions within rain garden designs. [37]

### Wildlife Use

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed chicks), marsh birds, shorebirds, seed-eating songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beavers, deer and muskrats. Stands of *Carex* in shallow water can provide valuable spawning habitat. In addition to providing food, sedges also provide

**Indicator Status:** OBL

valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

**Nursery/Plant Information**

**Available:** Limited.

**Types:** Limited plant and seed availability.



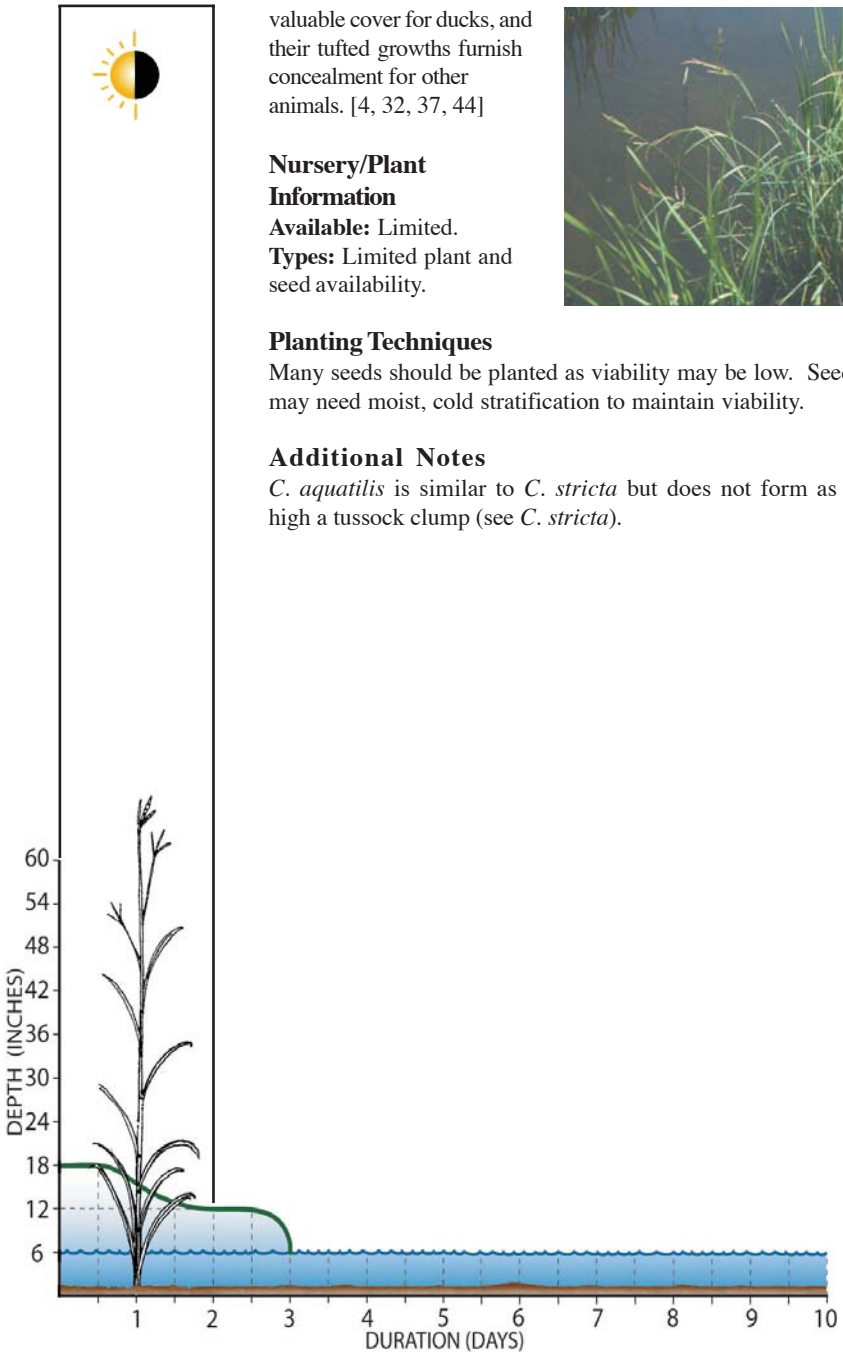
Photo: Paul Jackson

**Planting Techniques**

Many seeds should be planted as viability may be low. Seeds may need moist, cold stratification to maintain viability.

**Additional Notes**

*C. aquatilis* is similar to *C. stricta* but does not form as high a tussock clump (see *C. stricta*).





## *Carex bebbii*

Bebb's Sedge - a.k.a. Bebb's Oval Sedge

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet-to-moist meadows, marshes, lake edges, stream banks, ditches and calcareous fens. It forms dense clumps on moist-to-saturated soil. [7, 16]  
**Range:** Common northward; all but s.w. Minn. (Eco-Range: All), Wis., Mich. Nfld. to B.C., s. to N.J., Ohio, Ill., Neb. and Colo. [7, 21] **Threatened in Indiana.**

### Description

**General:** This native, cool-season, perennial, grass-like herb forms dense clumps with heights of 24-36". **Flower:** Green in May to June with 4-12 spikes, 3/16-3/8" long, sessile in a compact, crowded spike or head ½ to 1-3/16". Bracts inconspicuous, even the lowest one shorter than the inflorescence. Pistillate scales shorter and narrower than the perigynia. Perigynia crowded, stiffly ascending (the beaks often standing out from the body of the spike), ovate, 2-3 times as long as wide.  
**Leaf:** Elongate, mostly 1/16-3/16" wide; sheaths ventrally hyaline. **Fruit:** Achene lenticular. **Soil:** Moist-to-saturated soil, especially in calcareous situations. [7, 17]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 12". **Duration:** Medium short – 3 days (6" the first day then 6" the following 2 days).

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Unknown. **Nutrient:** Unknown.  
**Sitation:** Unknown. **Insect:** Unknown. **Other:** This species has a moderate tolerance to general disturbance and stress. [1]

### Design Considerations

A good species for wetland restorations and other saturated areas, such as stream banks and lake shores. It does exceptionally well in calcareous situations and wet meadows. This bunching herb will stay controlled for landscaping situations, rain gardens and moist pond areas. **Concerns:** *C. bebbii* may decline with competition from robust grasses and forbs. [16]

### Wildlife Use

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed chicks), marsh birds, shorebirds, seed-eating songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beavers, deer and muskrats. Stands of *Carex* in shallow water can provide valuable spawning habitat. In addition to providing food, sedges provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

Indicator Status: OBL

### Nursery/Plant Information

**Available:** Fairly widely.

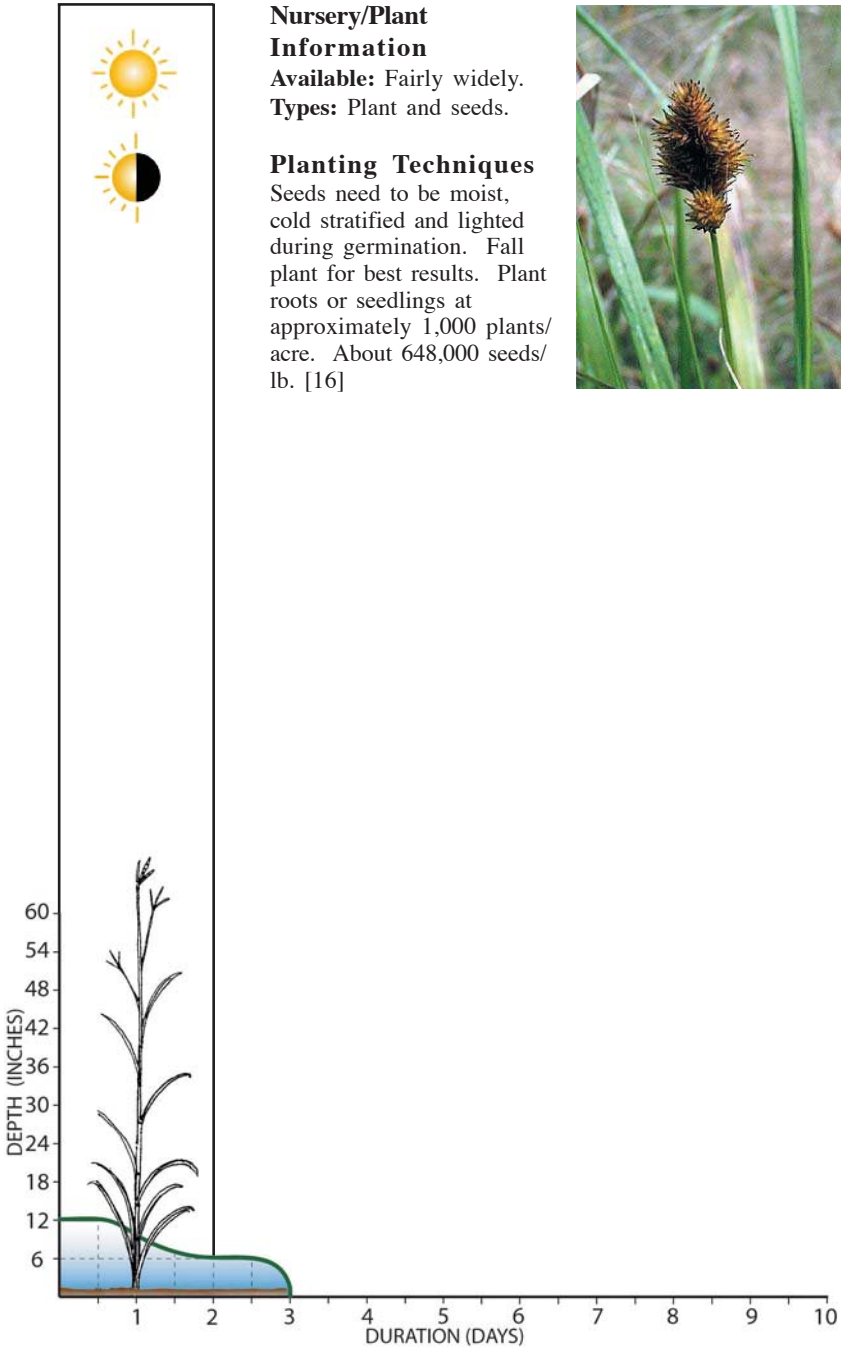
**Types:** Plant and seeds.

### Planting Techniques

Seeds need to be moist, cold stratified and lighted during germination. Fall plant for best results. Plant roots or seedlings at approximately 1,000 plants/acre. About 648,000 seeds/lb. [16]



Photo: Rusky Schmidt





## *Carex comosa*

**Bottlebrush Sedge** - a.k.a. Bristly Sedge

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Shallow marshes, wetland margins, floating mats, bogs, shores of ponds, lakes, streams and ditches. [4, 7, 11, 16] **Range:** Nc. and e. Minn (Eco-Regions: 1, 5-9), Wis., Mich. Que. to Minn. and S.D., s. to Fla. and Tex.; also Wash. and n. Idaho to Calif. [7, 21]

### **Description**

**General:** One of the region's more common aquatic sedges. It is a large, native, perennial herb, often forming large clumps that may grow to a height of 1½-4'.

**Flower:** Green from May to July. The more slender male spike is on a short stalk just above the female spikes. It is the female spikes that are nodding and have the bottle brush appearance. The sac-like structures around the ovaries called "perigynia" have a long beak with two slender teeth that curve away from each other. When these perigynia are all clustered together in a spike, the teeth create a "bristly" appearance. The perigynium are approximately ¼" long and strongly ribbed. **Leaf:** Leaves are ¼-½" wide, M-shaped, septate and rough-margined. **Stem:** Sharply triangular. **Fruit:** Tan achenes from July to August. **Root:** Rhizome in a dense cluster. **Soil:** Grows in very shallow water or moist soil. [4, 7, 11, 16, 44, 47]

### **Normal Water Level**

This species prefers shallow inundation of 12" or less to wet/saturated soils. [4, 21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 36". **Duration:** Medium short – 3 days (12"/day). This species tolerates regular and seasonal inundation. [37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Not tolerant.

**Insect:** Infrequent. **Other:** Bottlebrush sedge spreads slowly and is moderately tolerant to general disturbance and stress. [1, 44, 47]

### **Design Considerations**

Bottlebrush sedge, a good clump former, is used in upper shoreline zones. This species does well in restorations, especially in wetlands, shores of lakes, ponds and stream banks. A beautiful plant that is excellent in water gardens or other landscape situations. Spikes persist into the winter. The dense growth form makes this sedge a valuable shoreline stabilizer. It is a successional species that starts in very shallow water and moves to deeper areas that are normally arrowhead and pickerel weed habitat.

**Concerns:** While it is difficult to establish from seed, this species is important in many plant communities and can be established by plants or plugs. [4, 16, 44]

### **Wildlife Use**

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed chicks,

**Indicator Status: OBL**

Photo: Paul Jackson



Photo: Paul Jackson



marsh birds, shorebirds, songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrats. Stands of *Carex* in shallow water provide valuable spawning habitat. In addition to providing food, sedges provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

### **Nursery/Plant Information**

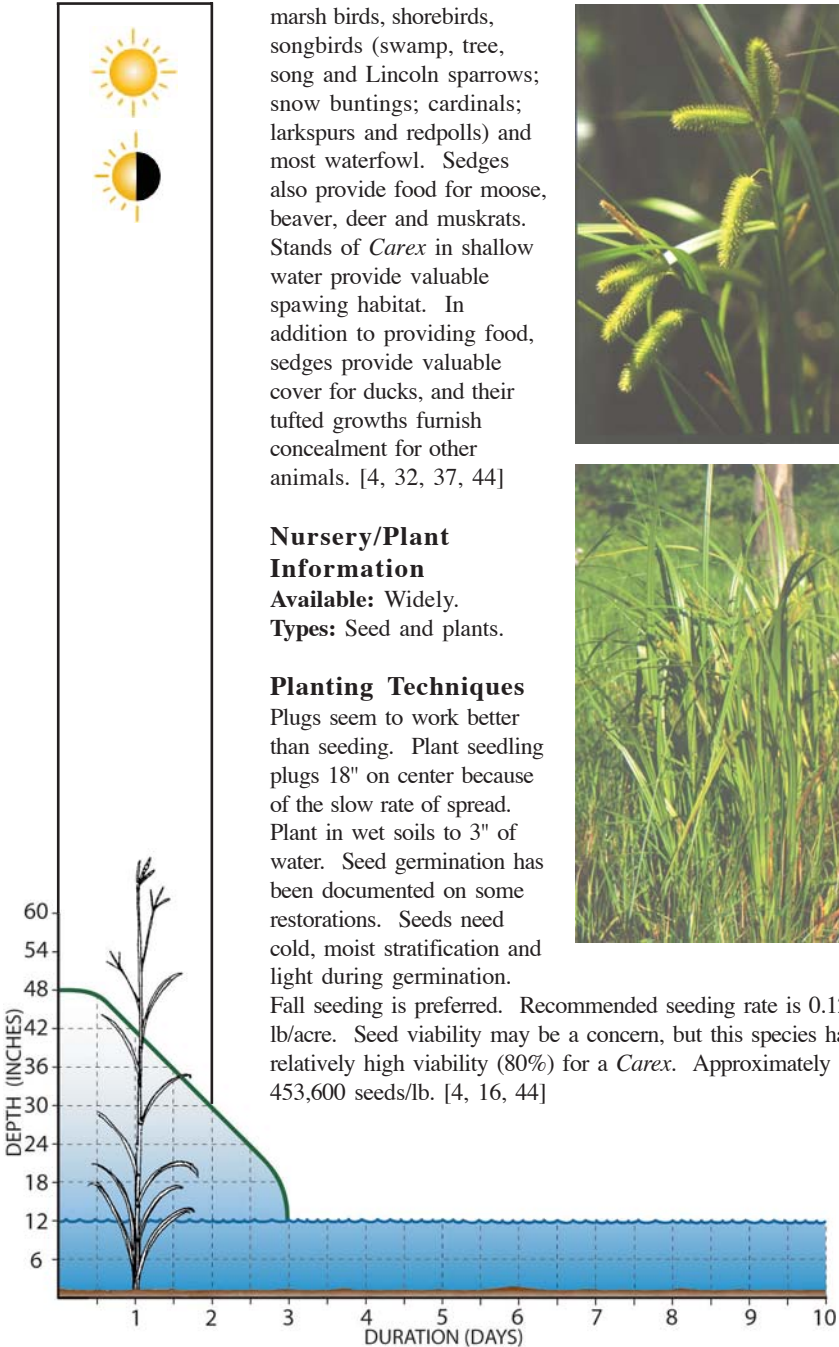
**Available:** Widely.

**Types:** Seed and plants.

### **Planting Techniques**

Plugs seem to work better than seeding. Plant seedling plugs 18" on center because of the slow rate of spread. Plant in wet soils to 3" of water. Seed germination has been documented on some restorations. Seeds need cold, moist stratification and light during germination.

Fall seeding is preferred. Recommended seeding rate is 0.125 lb/acre. Seed viability may be a concern, but this species has relatively high viability (80%) for a *Carex*. Approximately 453,600 seeds/lb. [4, 16, 44]







## *Carex crinita*

**Caterpillar Sedge** - a.k.a. Fringed Sedge, Sickie-grass

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Swamps, alder thickets, wet openings and mesic savannas, ditches, lake edges and potholes. [7, 16] **Range:** Ne. and ec. Minn. (Eco-Range: 1, 5, 6), n. and c. Wis., Mich. Nfld. and Que. to Minn., s. to Ga. and Tex.

**Threatened in Iowa.** [7, 21]

### **Description**

**General:** Large, densely clumped perennial that may grow 2-5' as a cool-season, native herb. **Flower:** Attractive, 4", nodding spikes that resemble a caterpillar from May to June. The flower heads are deep brown, with perigynia silk-green, 2-ribbed, otherwise nerveless, smooth, somewhat inflated, nearly circular in x-section, rounded to an abrupt, minute beak. **Leaf:** The leaves are flat, 1- to 3-ribbed, and brownish tinged. Main leaves are ¼-½" wide, the sheaths glabrous, bracts leaf-like, sheathless or nearly so, the lowest one 8-22". **Stem:** 3- sided, surpassing the leaves.

**Fruit:** Achene lenticular, constricted on 1 side or edge, with a bent style.

**Soil:** Wet-to-moist soils. [7, 16]

### **Normal Water Level**

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 12". **Duration:** Medium short – 3 days (decreasing 6" the first day and a total of 6" the following 2 days). This species has a moderate tolerance to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Unknown. **Nutrient:** Low. **Siltation:** Unknown.

**Insect:** Infrequent. **Other:** This species has a moderate-to-high tolerance to general disturbance and stress. [1]

### **Design Considerations**

This species is well suited for a wetland restoration especially in semi-shaded conditions, such as shrub-carrs or shrub wetlands. It will also do well in water gardens in many situations. Due to its bunching habit, this species will look good in all landscape scenarios and serves as a good plant for stabilization areas. [16]

### **Wildlife Use**

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed chicks) marsh birds, shorebirds, seed-eating songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrats. Stands of *Carex* in shallow water can provide valuable spawning habitat. In addition to providing food, sedges also provide valuable

**Indicator Status:** FACW+

cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

**Nursery/Plant Information**

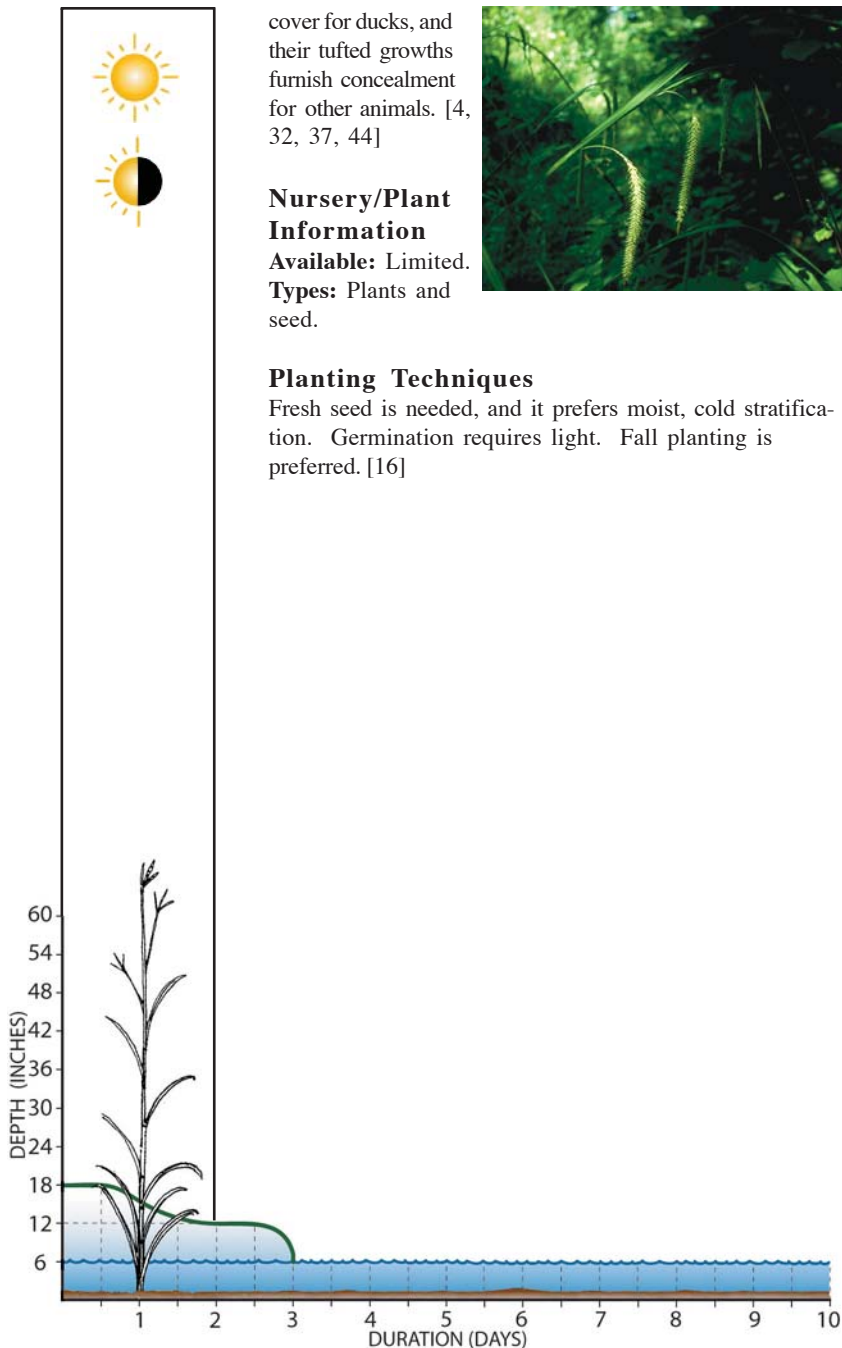
**Available:** Limited.  
**Types:** Plants and seed.



Photo: MINDNR

**Planting Techniques**

Fresh seed is needed, and it prefers moist, cold stratification. Germination requires light. Fall planting is preferred. [16]





## *Carex hystericina*

Porcupine Sedge - a.k.a. Bottlebrush Sedge

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Swamps, marshes, alder thickets, wet meadows, lake edges, ditches (agricultural) and calcareous fens. [7, 11, 16] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. N.B. to Wash., s. to Va., Ky., Ark., Tex., N.M. and Calif. [7]

### General Description

**General:** A slender, native perennial, which often forms large clumps about 2-3 1/2' tall.

**Flower:** Bracts of the lowest pistillate spike are generally longer than the inflorescence, which blooms from May to June. The lower spikelets are usually drooping on slender stalks. The numerous perigynia are 15-20 nerved, and densely clustered. The slender beak of the perigynium is conspicuous and has short, straight teeth.

**Leaf:** Leaves are 1/8- 3/8" wide, M-shaped and not septate. **Stem:** Triangular.

**Fruit:** Achene is trigonous, with a bony style, which becomes flexuous or contorted as the achene matures. **Root:** Clustered on short, stout rhizomes. **Soil:** Wet-to-moist soils at water's edge and calcareous situations. [7, 11, 16]

### Normal Water Level

This species prefers shallow water to wet/saturated conditions of 6" of inundation or less. [37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 36". **Duration:** Medium short – 3 days (12"/day). Porcupine sedge will tolerate seasonal to regular inundation to 6" of water with a moderate tolerance to duration. [1, 37]

### Sensitivities or Other Tolerances

**Shade:** Full sun to part shade. **Salt:** Moderate. **Nutrient:** Moderate.

**Siltation:** Unknown. **Insect:** Unknown. **Other:** Bottlebrush sedge has a moderate rate of spread and a moderate tolerance to general disturbance and stress. [1, 37, 47]

### Design Considerations

This species is a very attractive plant for shoreland restoration and water gardens. It may be a good soil stabilizer because of its bunching characteristic. It prefers calcareous soils, although it tolerates many soil types and fluctuating water levels. [16]

### Wildlife Use

*Carex* species are an essential food source for a wide variety of wildlife. Many birds, including rails (sora, yellow), grouse (especially ruffed chicks), marsh birds, shorebirds, seed-eating songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl, eat the achenes. Sedges also provide food for moose, beaver, deer and muskrat. Stands of *Carex* in shallow water can also provide valuable spawning habitat. In addition to providing food, sedges provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

Indicator Status: OBL

### Nursery/Plant Information

**Available:** Limited.

**Types:** Seeds and plants.

### Planting Techniques

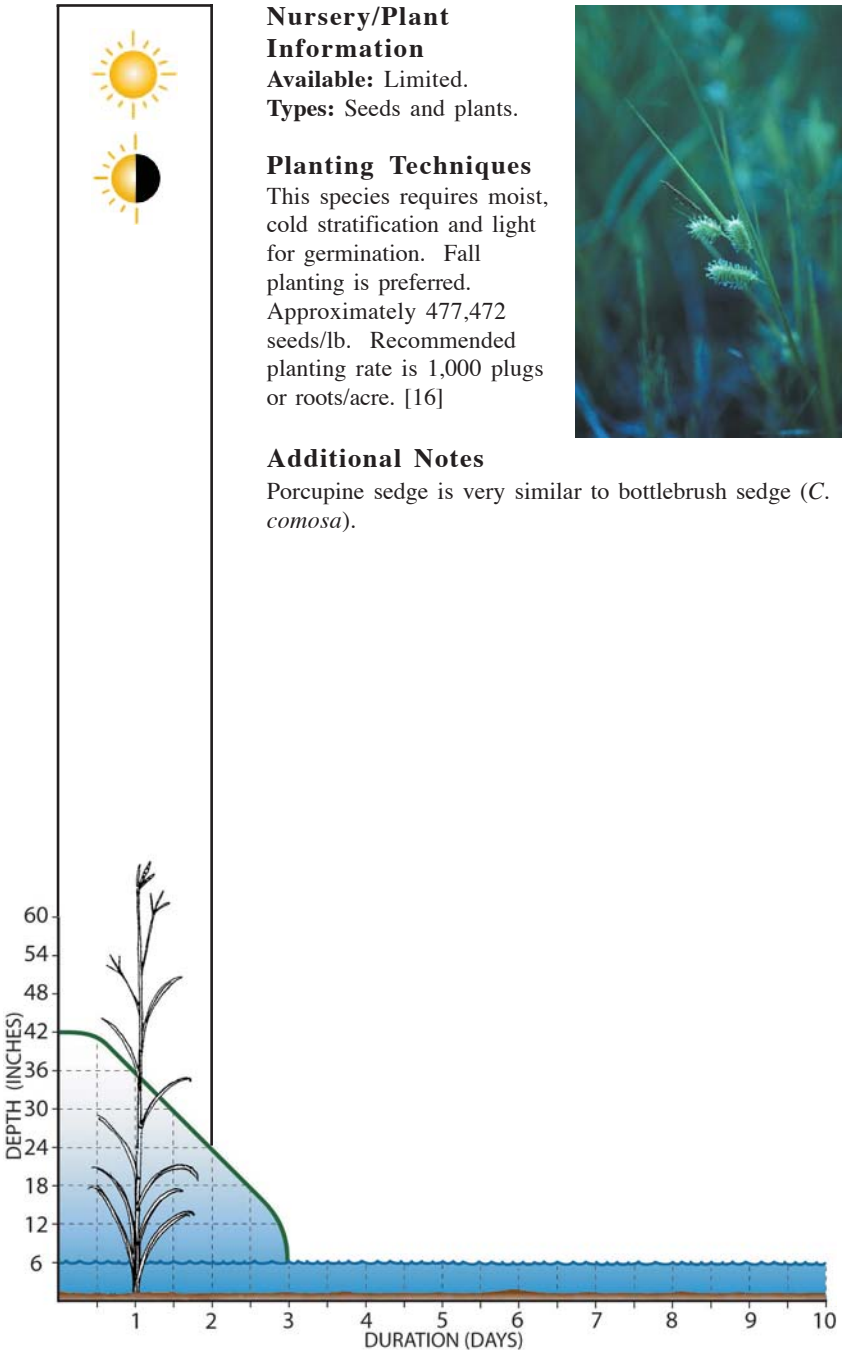
This species requires moist, cold stratification and light for germination. Fall planting is preferred. Approximately 477,472 seeds/lb. Recommended planting rate is 1,000 plugs or roots/acre. [16]

### Additional Notes

Porcupine sedge is very similar to bottlebrush sedge (*C. comosa*).



Photo: Jason Husveith





# *Carex lacustris*

Lake Sedge - a.k.a. Common Lakeshore or Lake-bank Sedge, Rip Gut

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Swamps, shallow marshes, shrub-carrs, alder thickets, wooded swamps, sedge meadows, borders of lakes and streams, kettle wetlands, wetland margins (usually in shallow water), low areas in tamarack swamps) and sometimes seasonally inundated wet meadows. [7, 11, 16] **Range:** Common; all but sw. and se. Minn. (Eco-Range: 1-8), Wis., Mich. Que. to Sask., s. to Fla. and Tex. [7, 21]

## Description

**General:** Lake sedge produces large, persistent scattered beds of clones. A cool-season, native perennial that can reach a height of 2-3'. **Flower:** Pistillate spikelets numbering 2-4 that are  $\frac{3}{4}$ -4" long, and are sessile or on short stalks. Staminate spikelets number 2-4. The perigynium is  $\frac{1}{4}$ -5/16" long, without hairs, distinctly ribbed and gradually tapers into a beak, which blooms from May to June.

**Leaf:** Coarse leaves that are M-shaped, bluish-green, 3' or more long, and 5/16-9/16" wide. It has reddened basal sheaths and open, feather-like (pinnate) fibers.

**Stem:** Triangular stems. **Fruit:** The achene is 3-angled. **Root:** Scaly rhizomes. **Soil:** Saturated soils. [7, 11, 16]

## Normal Water Level

This species prefers shallow water of 2' of inundation or less to wet/saturated conditions. [21, 37]

## Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 24". **Duration:** Long – 8 days (decreasing 3"/day). Will tolerate seasonal-to-regular inundation to 2', though more abundant in wetlands with minimal water level fluctuations. It will tolerate a moderate flood duration. [1, 23, 37]

## Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** Moderate. **Nutrient:** Moderate.

**Siltation:** Moderate. **Insect:** Infrequent. **Other:** Lake sedge has a rapid rate of spread and a moderate tolerance to general disturbance and stress. [1, 37, 46]

## Design Considerations

Lake sedge is another sedge well-adapted for restorations of shallow marshes, and any wooded swamps, thickets or shrub-carrs. It does well in borders of ponds, lakes and streams. **Concerns:** Lake sedge is aggressive, so it would probably not be ideal for landscape conditions or rain gardens, although the aggressiveness may be preferred for some restoration areas to outcompete invasive species.

## Wildlife Use

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed chicks),

Indicator Status: OBL



marsh birds, shorebirds, songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrat. Stands of *Carex* in shallow water provide valuable spawning habitat. Sedges also provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]



Photo: Dan Shaw



Photo: Dan Shaw

### Nursery/Plant Information

**Available:** Widely.

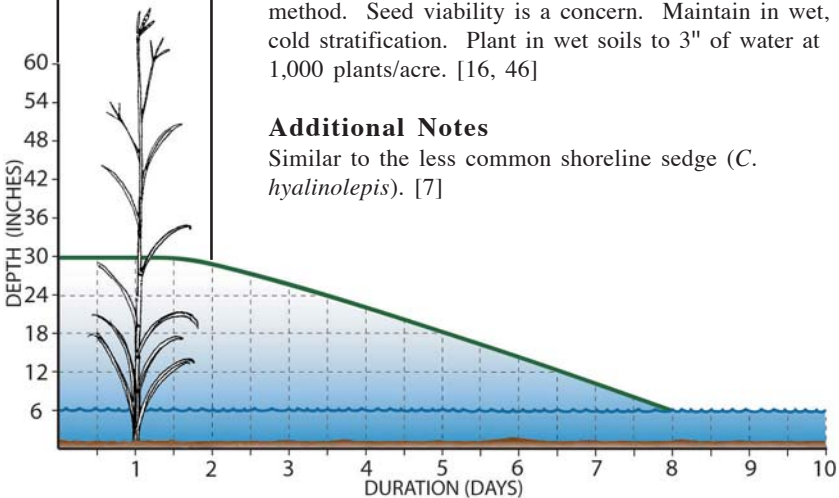
**Types:** Plants and seed.

### Planting Techniques

Lake sedge needs fresh seed and light for best germination. Dividing plants is also a successful propagation method. Seed viability is a concern. Maintain in wet, cold stratification. Plant in wet soils to 3" of water at 1,000 plants/acre. [16, 46]

### Additional Notes

Similar to the less common shoreline sedge (*C. hyalinolepis*). [7]





## Carex languinosa

Woolly Sedge - a.k.a. *Carex lasiocarpa* var. *latifolia*, *C. pellita* -  
Slender Sedge, Wiregrass Sedge, Hairy-fruited Sedge

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet-to-moist meadows and swales, marshes, sandy or marly shores and flats, stream banks (often wet places), and characteristic of floating bog-mats and minerotrophic sedge-mats. [7, 11] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. N.B. and Que. to B.C., s. to Va., Tenn., Ark., Tex. and Calif. [7, 21]

### Description

**General:** Colony-forming, native perennial that forms mats with stems 1-3' tall. **Flower:** Green from April to July. Perigynia have bidentate teeth up to 0.5 (0.7) mm long and less than half of the body length. Pistillate are usually narrower than the perigynia and acute or shortly awn-tipped, with scales partly or wholly brownish or purplish. **Leaf:** Glabrous folded along the midrib, blades have revolute margins and are 1/16-3/16" wide. **Stem:** Triangular. **Fruit:** Concavely trigonous achene. **Root:** From scaly rhizomes. **Soil:** Bogs and minerotrophic sedge-mats. [7, 11, 44]

### Normal Water Level

This species prefers moist soil although it will tolerate shallow water to 3-6" of inundation or less. [21, 37, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 12". **Duration:** Long – 6 days (decreasing 4"). Woolly sedge will tolerate seasonal or irregular inundation to a depth of 6". [37, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full sun. **Salt:** Low. **Nutrient:** Moderate to high. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** Tolerates moderate disturbance and stress. [1]

### Design Considerations

This species is used in upper shoreline zones and in vegetated swales. It will do well in some wetland restoration sites and along streams. **Concerns:** The species decreases with moderate grazing. [14, 37, 44]

### Wildlife Use

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed grouse chicks) marsh birds, shorebirds, songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrat. Stands of *Carex* in shallow water provide valuable spawning habitat. Sedges also provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

Indicator Status: OBL



### Nursery/Plant Information

**Available:** Limited.

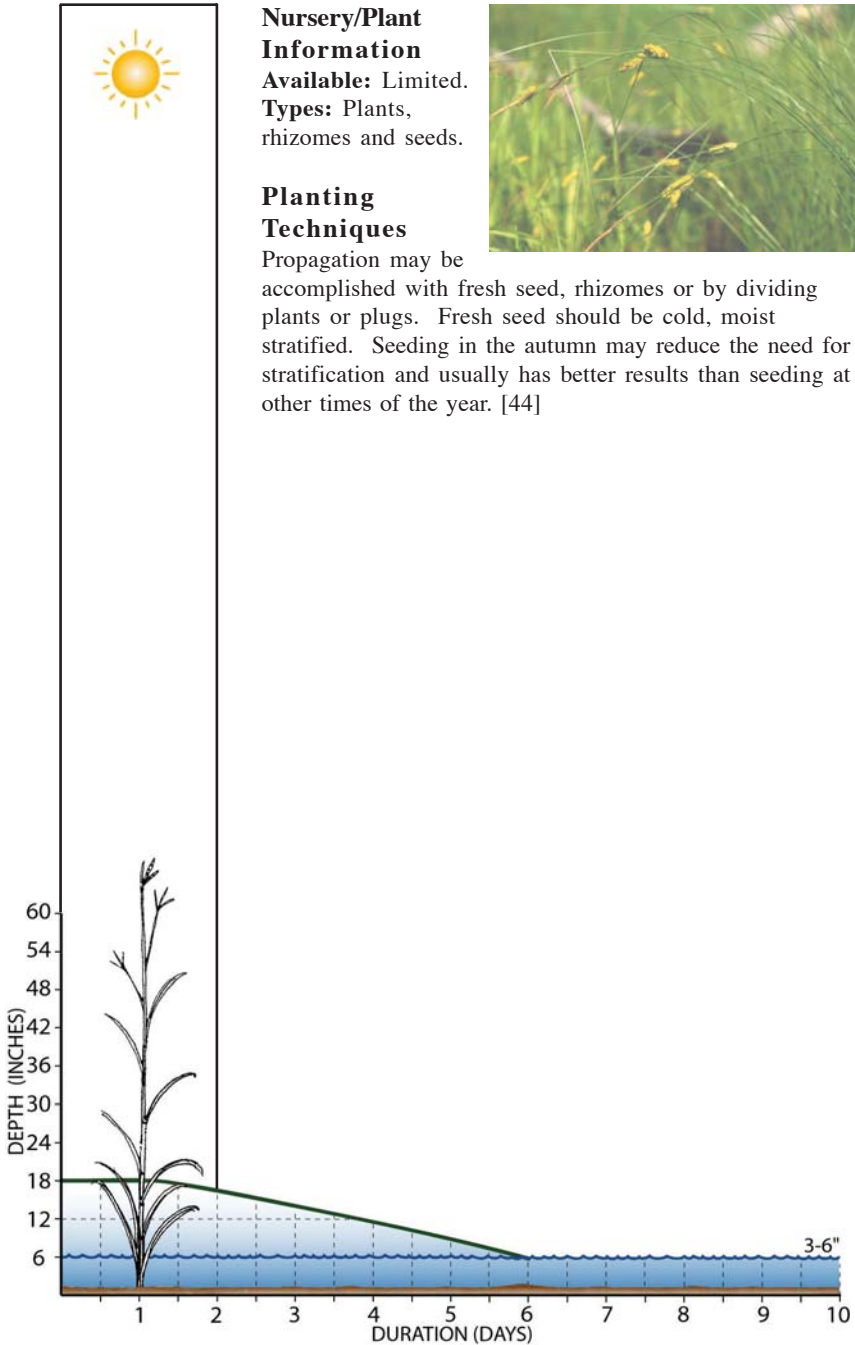
**Types:** Plants, rhizomes and seeds.



Photo: Paul Jackson

### Planting Techniques

Propagation may be accomplished with fresh seed, rhizomes or by dividing plants or plugs. Fresh seed should be cold, moist stratified. Seeding in the autumn may reduce the need for stratification and usually has better results than seeding at other times of the year. [44]







## *Carex lasiocarpa*

Wooly Needle Sedge -a.k.a. Slender, Wiregrass or Hairy-fruited Sedge

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Peatlands, wet peat soils, open bogs, calcareous fens, shrub-carrs, sedge meadows, shallow marshes; frequently in shallow water and on pond margins. The well developed, air-filled root and rhizome system makes this sedge one of the floating, mat-forming species that create the first stage in bog succession. Persists in wetlands with relatively unaltered watersheds, land use and hydrology. [7, 11]

**Range:** Common; especially along the hollows in Red Lake peatlands of Minn. (Eco-Range: 1-9), Wis., Mich. Circumboreal, Nfld. to Alaska, s. to N.J., Ohio, Iowa, N.D., Mont., Idaho and Wash. [7, 21]

### Description

**General:** A colony-forming, native perennial reaching over 3' tall. **Flower:** The 1-3 pistillate spikelets are 3/8 to 1-1/8" long and sessile, while the 1-3 staminate spikelets are 3/4 to 2-3/8" long. The perigynia are densely fuzzy with an oblong-oval shape and sharp teeth. **Leaf:** Wiry leaves (not over 2 mm wide) are characteristically C-shaped in cross section or inrolled, tapering to very slender tips. **Stem:** Triangular. **Fruit:** Achene concavely trigonous. **Root:** Air-filled root and long, scaly rhizomes. **Soil:** Prefers peat soils. [7, 11]

### Normal Water Level

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Medium short – 3 days (decreasing 6" the first day and a total of 6" the next 2). This species has a moderate tolerance to flood duration. [1, 23]

### Sensitivities or Other Tolerances

**Exposure:** Partial sun. **Salt:** Unknown. **Nutrient:** Low. **Siltation:** Unknown. **Insect:** Unknown. **Other:** This species has a moderately low tolerance to general disturbance and stress. [1, 46]

### Design Considerations:

Wooly needle sedge will do well in some wetland restoration sites especially peatlands and peat soils or in bog conditions. This species create the first stage in bog succession. Persist in wetlands with relatively unaltered watersheds land use and hydrology.

**Concerns:** This species decreases with moderate grazing. [14]

### Wildlife Use

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed grouse chicks), marsh birds, shorebirds, songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrat. Stands of *Carex* in shallow water

**Indicator Status:** OBL

provide valuable spawning habitat. Sedges also provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

**Nursery/Plant Information**

**Available:** Limited.

**Types:** Seed and roots.

**Planting Techniques**

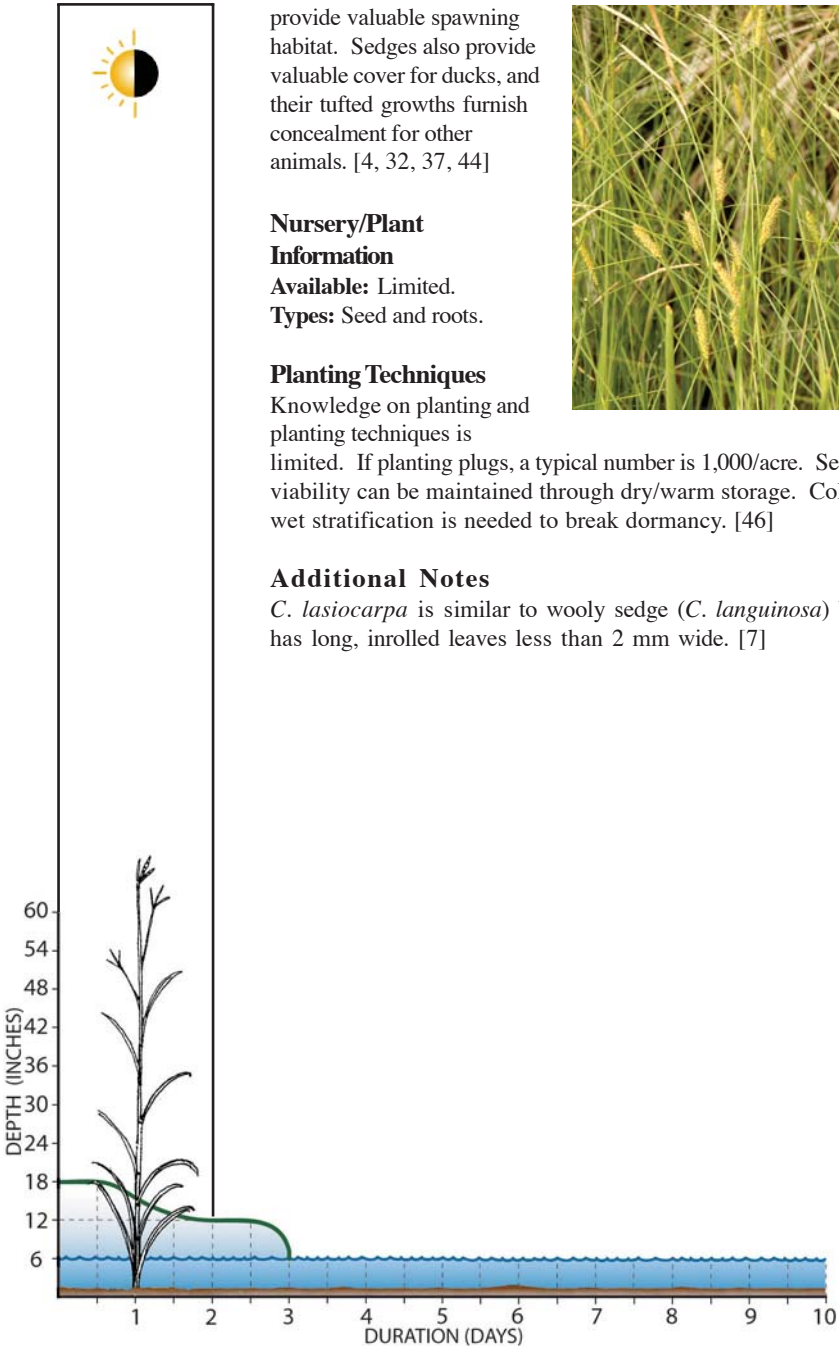
Knowledge on planting and planting techniques is limited. If planting plugs, a typical number is 1,000/acre. Seed viability can be maintained through dry/warm storage. Cold, wet stratification is needed to break dormancy. [46]

**Additional Notes**

*C. lasiocarpa* is similar to woolly sedge (*C. languinosa*) but has long, inrolled leaves less than 2 mm wide. [7]



Photo: Mark Genes





## *Carex retrorsa*

**Retorse Sedge** - a.k.a. **Deflexed Bottlebrush Sedge, Beaked Sedge**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Flood plain forest, swamps, thickets and marshes. [7, 16]

**Range:** Common in n., occasional in s. Minn. (Eco-Range: All), Wis., Mich. Que. to B.C., s. to Md., Ind., Iowa and Ore. **Endangered in Ind.** [7, 21]

### **Description**

**General:** Densely clustered perennial reaching 2-4' tall. **Flower:** Spikes sheathless, at least the lowest one generally several times as long as the inflorescence. Several crowded spikes are sessile. Lower spikes are pistillate and upper spikes are staminate. Pistillate scales conspicuous, shorter and narrower than the perigynia. Perigynia numerous, densely crowded in 8 or more rows, widely spreading or the lowest ones retrorse, glabrous, shining, firm-walled but somewhat inflated, ellipsoid and often somewhat oblique, narrowed to a prominent, slender, smooth beak 1/16" long with short teeth. **Leaf:** Septate (especially the sheaths), mostly 1/8-3/8" wide with the leaves subtending the pistillate. **Stem:** Triangular. **Fruit:** Achenes dark brownish, narrowly trigonous, 1/16" long; the persistent, bony style becoming contorted with maturity. **Root:** Densely clustered on a very short rhizome. **Soil:** Wet to mesic soils of sandy to mucky conditions. [7, 17]

### **Normal Water Level**

This species prefers shallow water to wet/saturated conditions of 6" of inundation or less, although it will tolerate mesic conditions. [21, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Medium short – 3 days (decreasing 6" the first day and a total of 6" the following 2 days). Retorse sedge will tolerate regular, seasonal or irregular inundated periods of 6" or less and is somewhat tolerant to flood duration. [1, 37]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun. **Salt:** Unknown. **Nutrient:** Moderate. **Siltation:** Unknown. **Insect:** Unknown. **Other:** This species has a moderately low tolerance to general disturbance and stress. [1, 37]

### **Design Considerations**

Retorse sedge is used well in wetland restorations of flood plains, thickets and marsh conditions. **Concerns:** This species spreads slowly.

### **Wildlife Use**

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed grouse chicks) marsh birds, shorebirds, songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrat. Stands of *Carex* in shallow water provide valuable spawning habitat. Sedges also provide valuable cover for ducks, and

**Indicator Status:** OBL

their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

**Nursery/Plant Information**

**Available:**

Limited.

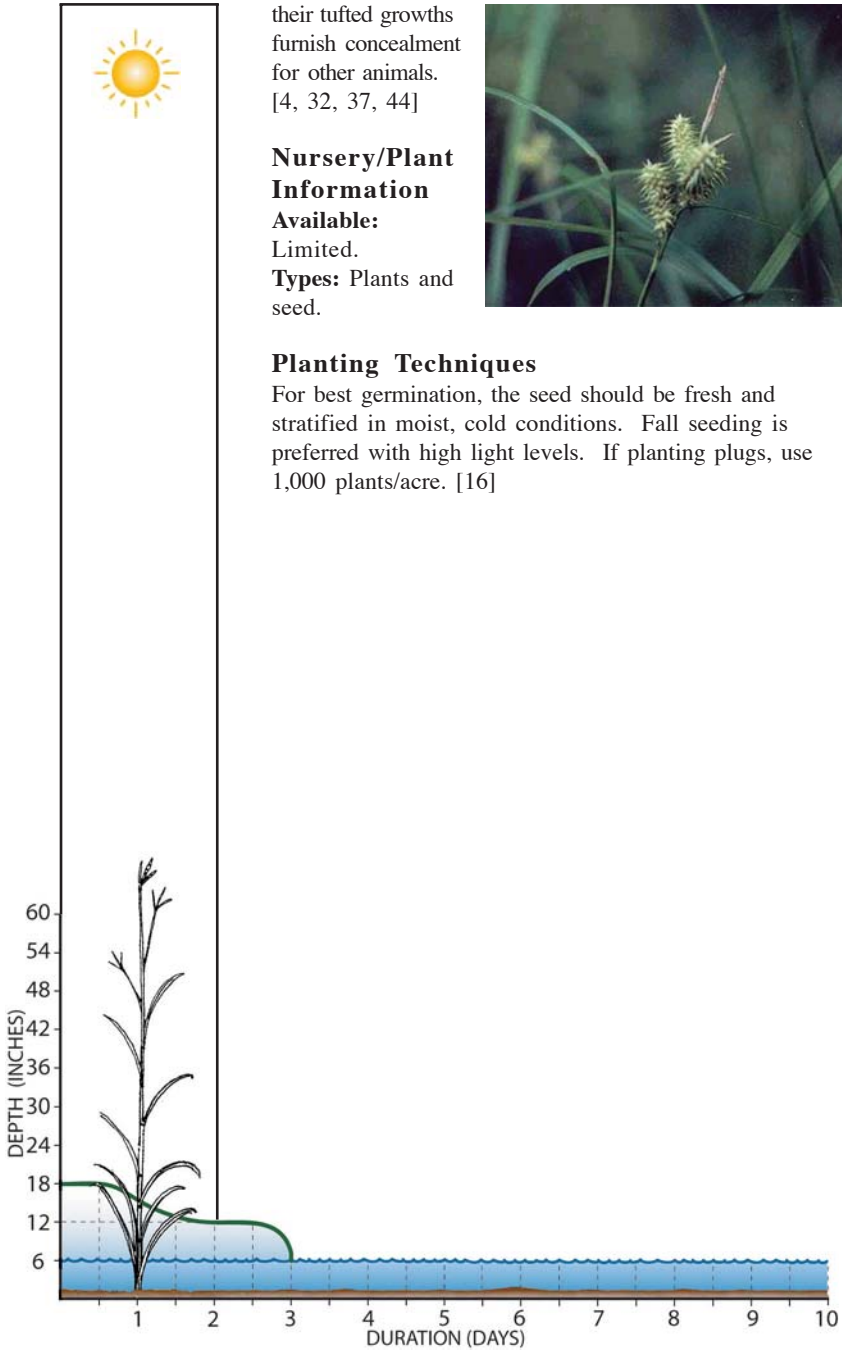
**Types:** Plants and seed.



Photo: Ray Frances Wis. State Herbarium

**Planting Techniques**

For best germination, the seed should be fresh and stratified in moist, cold conditions. Fall seeding is preferred with high light levels. If planting plugs, use 1,000 plants/acre. [16]





## *Carex stipata*

Awl-fruited Sedge - a.k.a. Common Fox, Stalk-grain or Soft Sedge

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Flood plain forest, swamps, thickets, wet meadow, wetland margins, wet basins, marshes and ditches (usually not in sphagnum bogs). [7, 11, 16] **Range:** Common; Minn. (Eco-Range: All), Wis., Mich. Nfld. to s. Alaska, s. to Fla., Tex. and Calif. [7, 21]

### Description

**General:** Awl-fruited sedge is a somewhat stout, clump-forming sedge that may reach 3'. It is a cool-season, native, perennial herb that is similar to *C. vulpinoidea*, but slightly more robust with flaccid stems. **Flower:** Green flower color from May to July. Perigynia are 1/8-1/4" long, lance-triangular shaped, sessile and densely aggregated. The perigynia has a conspicuous beak that is less than twice as long as the body, but gives the large pyramid-shaped inflorescence a prickly appearance. **Leaf:** M-shaped, coarse, green leaves that are usually shorter than the stem. Thin sheaths extend beyond the leaf base and are conspicuously cross-wrinkled and whitish. **Stem:** Clustered, sharply triangular. **Fruit:** Achene lenticular. **Soil:** Prefers wet-to-moist soils of peat, muck, bogs (but not sphagnum) and loams. [7, 11, 44]

### Normal Water Level

This species prefers moist soil although will tolerate shallow water to wet/saturated conditions of 12" of inundation or less. [21, 37, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 6". **Duration:** Medium long – 4 days (decreasing 3" every 2 days). This species will tolerate some seasonal and irregular water fluctuations and is somewhat tolerant to flood duration. It is tolerant, however, to flood depth and frequency increases. [1, 37, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun, although it usually occurs in shaded to partially shaded areas. **Salt:** Low to moderate. **Nutrient:** High. **Siltation:** Moderate – although it decreases in abundance with high water levels. **Insect:** Infrequent. **Other:** Has a slow rate of spread. Increased sediment has been shown to decrease biomass of *C. stipata*, and it has a moderately high tolerance to general disturbance and stress. [1, 12, 37, 44]

### Design Considerations

Although awl-fruited sedge is well adapted for partially sunny to shaded wet basins and marshes, it is used in upper shoreline zones, other open, wet habitats and vegetated swales. This species is well suited to calcareous areas and its bunching character provides soil stabilization. It is a fast grower for shoreland habitats, restorations and revegetation zones in a variety of light conditions. [16, 44]

Indicator Status: OBL



### Wildlife Use

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed grouse chicks) marsh birds, shorebirds, songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs, and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrats. Stands of *Carex* in shallow water provide valuable spawning habitat. Sedges also provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]



Photo: MINDNR

### Nursery/Plant Information

**Available:** Widely. **Types:** Plants and seed.

### Planting Techniques

Seeding works well, and the plants spread quickly. Store seeds in dry, cold conditions (14% moisture) and sow the following spring, or fall seed with fresh seed. Awlfruited sedge is a clump-forming species. Plugs should be planted 15-18" on center. Recommended seeding rate is 0.125lb/acre. Approximately 567,000 seeds/lb. [16, 44]



# *Carex stricta*

**Tussock Sedge** - a.k.a. **Common Tussock, Hummock, or Meadow Sedge**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Sedge meadow, marshes, shrub-carrs, calcareous fens, peatlands, shores, stream banks and ditches. This is the characteristic sedge of Minnesota and Wisconsin sedge meadows. The hummocks may persist for decades, even when pastured. [7, 11, 16] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich.; N.J. to Man., s. to Fla., Tex. and Colo. [7, 21]

## **Description**

**General:** Densely clumped, colonial perennial forming large, raised hummocks to 30" tall. **Flower:** Flowering stems arise laterally. Perigynia are beakless, flat, widest below the middle section of the body, and taper to the tip. Blooms from April to June. **Leaf:** Slender and green mature leaves, like the stems, are extremely rough on the edges. The flower stem has been reduced to bladeless sheaths on the lowest leaves. The reddish-brown basal sheaths disintegrate into 2 rows of fibers on each side of a central fiber (pinnate). Pincushion-like young shoots erupt in late summer, persist through winter, and grow quickly in early spring into a tuft of bright blue-green leaves. **Stem:** Mostly triangular stems about 15-40" tall which usually exceed the leaves. **Fruit:** Lenticular achenes. **Root:** Long, scaly rhizomes. **Soil:** Prefers wet-to-saturated peat and calcareous soils. [7, 11, 17]

## **Normal Water Level**

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [16, 21, 37]

## **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 12". **Duration:** Medium short – 3 days (decreasing 6" the first day and a total of 6" the following 2 days). It will tolerate regular or seasonal water fluctuations, is moderately tolerant to flood duration and will increase in abundance as flood depth increases. [1, 23, 37]

## **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Unknown. **Nutrient:** Moderate. **Siltation:** Moderate, 0-8 cm/year. **Insect:** Infrequent. **Other:** This species is acid tolerant and has a moderate rate of spread. It has moderate tolerance to general disturbance and stress. [1, 37]

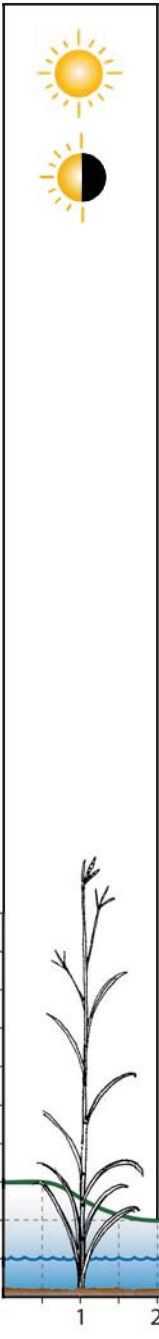
## **Design Considerations**

Tussock sedge is used in wetland restorations, and should be used in calcareous, sedge meadow, shrub-carr and peat situations. It may be used in shoreland restorations of lakes, ponds and streams, and has survived ditches. Persists in wetlands with relatively unaltered watershed land use and hydrology and the hummocks may persist for decades, even when grazed. It is attractive in landscape and water garden plantings due to its bunching form. **Concerns:** At times, this species has been overspecified in restorations due to its availability. [16]

Indicator Status: OBL

Photo: Paul Jackson

Photo: Paul Jackson



### Wildlife Use

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed grouse chicks) marsh birds, shorebirds, songbirds (swamp, tree, song and Lincoln sparrows; snow buntings; cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrats. Stands of *Carex* in shallow water provide valuable spawning habitat. Sedges also provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]



### Nursery/Plant Information

**Available:** Widely. **Types:** Plants, roots and seeds.

### Planting Techniques

Tussock sedge germinates well when fresh seed is fall planted. If storing over winter, the seed should be moist, cold stratified and germinated with plenty of light. About 3,000,000 seeds/lb. Plant seedlings or plants in wet soils to 3" of water at a density of about 1,000 plants/acre. [16]

### Additional Notes

Water sedge (*C. aquatilis*) is very similar to tussock sedge. *C. aquatilis* lacks basal sheaths with 2 rows of fibers on each side of a central fiber; the flowering stems arise centrally; lowest leaves have blades; mature leaves tend to be blue-green; and stems do not form pincushion-like young shoots that persist through winter [11].





# *Carex vulpinoidea*

**Fox Sedge - a.k.a. Brown Fox Sedge**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Wet and moist meadows, marshes, lake shores, stream banks, roadsides and ditches (a pioneer species). [7, 11, 16] **Range:** Common; Minn. (Eco-Range: All), Wis., Mich. Nfld. to B.C., s. to Fla., Tex., Colo., Ariz. and Ore. [7, 21]

## **Description**

**General:** Densely clumped, cool-season, perennial sedge that may reach 3' in height. **Flower:** Green, brown flower color resembling a fox's tail, blooms from May to July. Perigynia are lance-ovate and taper into a beak. **Leaf:** Generally longer than the stem, although the lowest stem leaves are reduced to scales (aphyllopodic). **Stem:** Slender, firm stems about 12-40" tall that have whitish, thin sheaths that are conspicuously cross-wrinkled. **Fruit:** Achene lenticular. **Root:** Short rootstocks. **Soil:** Wet soils of all types. [7, 8, 11, 44]

## **Normal Water Level**

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [21, 37, 44]

## **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Medium long – 4 days (decreasing 6" the first day, 12" the second day, and a total of 6" the last 2 days). Fox sedge tolerates regular and seasonal inundation although it is not tolerant of extended periods of flooding. [1, 8, 37, 44]

## **Sensitivities or Other Tolerances**

**Exposure:** Partial to full sun. **Salt:** Low to moderate. **Nutrient:** Moderate to high. **Siltation:** Moderate, 0-8 cm/year. **Insect:** Infrequent. **Other:** Fox sedge has a slow rate of spread and a moderate-to-high tolerance to general disturbance and stress. [1, 8, 37, 44]

## **Design Considerations**

Fox sedge is used in upper shoreline zones, streambank stabilization and vegetated swales. It is an excellent colonizer for wetland mitigation sites since it is a pioneer species that tends to revegetate wet, open sites soon after disturbance. It will do well in landscapes and rain gardens due to its clump form, tolerance to water fluctuation and slow rate of spread. The seedhead looks similar to a fox's tail. **Concerns:** Fox sedge may not be long lived if it is in areas of dense competition. [11, 16, 44]

## **Wildlife Use**

*Carex* species are an essential food source for a wide variety of wildlife. The achenes are eaten by many birds, including rails (sora, yellow), grouse (especially ruffed grouse chicks) marsh birds, shorebirds, songbirds (swamp, tree, song and Lincoln sparrows; snow buntings, cardinals; larkspurs and redpolls) and most waterfowl. Sedges also provide food for moose, beaver, deer and muskrat. Stands of *Carex* in shallow water

Indicator Status: OBL

provide valuable spawning habitat. Sedges also provide valuable cover for ducks, and their tufted growths furnish concealment for other animals. [4, 32, 37, 44]

### Nursery/Plant Information

**Available:** Widely.

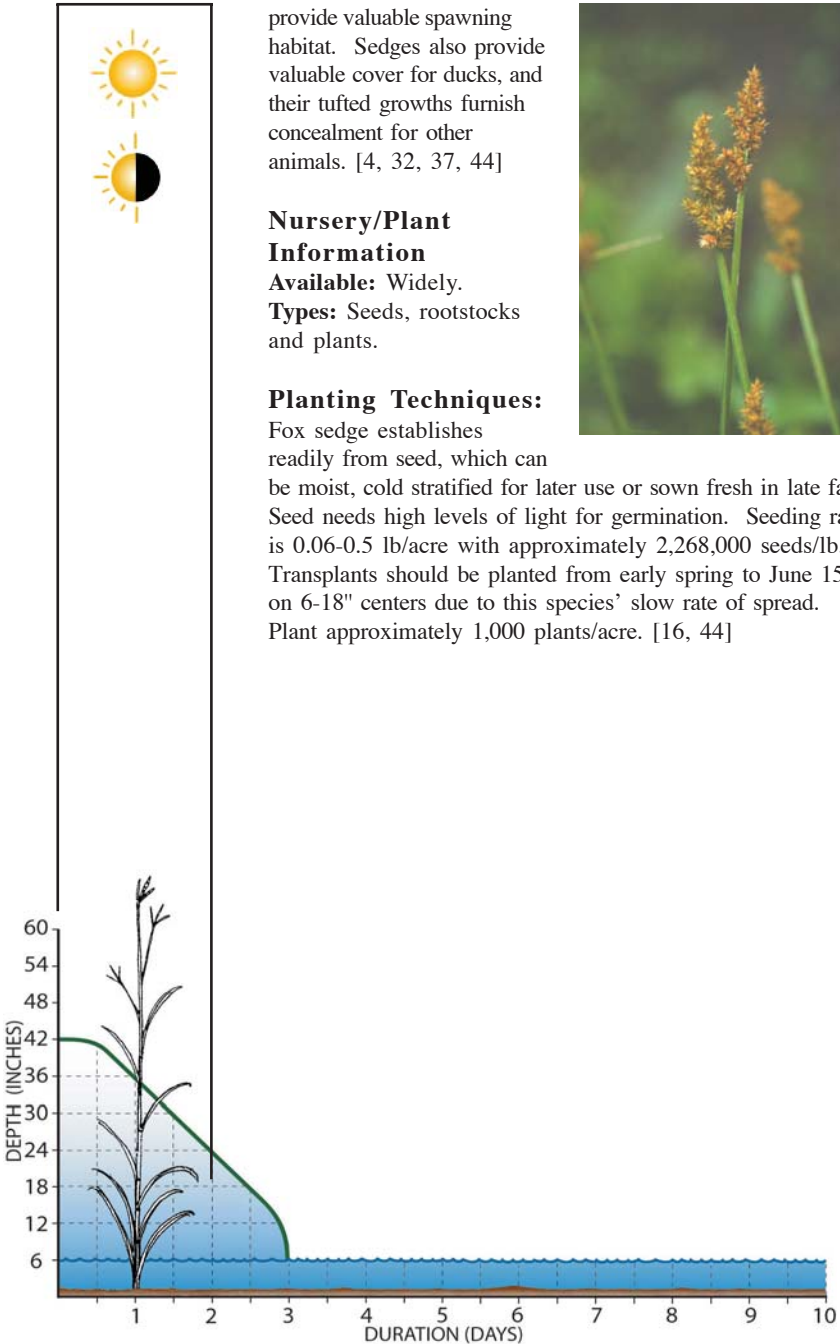
**Types:** Seeds, rootstocks and plants.

### Planting Techniques:

Fox sedge establishes readily from seed, which can be moist, cold stratified for later use or sown fresh in late fall. Seed needs high levels of light for germination. Seeding rate is 0.06-0.5 lb/acre with approximately 2,268,000 seeds/lb. Transplants should be planted from early spring to June 15 on 6-18" centers due to this species' slow rate of spread. Plant approximately 1,000 plants/acre. [16, 44]



Photo: Paul Jackson





## *Celtis occidentalis*

**Hackberry** - a.k.a. Sugarberry, Nettle tree, Common Hackberry

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Flood plain and river valley (first terrace) forest species; lowland wet-to-mesic and upland mesic-dry drainage basins, wooded slopes and on high, rocky, limestone bluffs bordering streams and windbreaks. [17, 22, 36, 44]

**Range:** Minn. (Eco-Region: 4-9), Wis., Mich. Extreme s. Ont., e. to N. England., s. to n. Ga., w. to nw. Okla., n. to N.D.; local in s. Que. and s. Man. [17, 21]

### **Description**

**General:** A deciduous tree reaching heights of 50-75', widths of 50-75' and trunk diameters of 1½-3'. It usually has a rounded crown of spreading or slightly drooping branches, often deformed by bushy growths on the ends of the branches called "witches' brooms." **Flower:** Greenish yellow flowers from April to May, with both male and female flowers at base of young leaves in early spring. **Leaf:** Ovate, long, pointed leaves in 2 rows, usually sharply toothed, unequal-sided with a rounded base and 3 main veins. Shiny green and smooth above, often hairy on veins and paler beneath, turning yellow in autumn. **Bark:** Gray or light brown; smooth with conspicuous corky warts or ridges, becoming scaly. **Twigs:** Light brown, slender, mostly hairy, slightly zigzag. **Fruit:** Persistent small (¼-3/8"), orange-red to purplish berries that are 1-seeded drupes; dry and sweet; slender-stalked at leaf bases; maturing in autumn. **Root:** Deep, coarse, wide-spreading lateral roots. **Soil:** Sandy loam to silty clays with a pH range of 6.6-8.0. [17, 22, 36, 44]

### **Normal Water Level**

Upland moist-to-dry soils and can tolerate limestone bluffs. [21, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 60". **Duration:** Long – 5 days (decreasing 12"/day). Seedlings cannot tolerate submergence, yet mature trees can survive irregular or spring floods. A permanent high water table will stress the plant. Seedlings are somewhat tolerant, saplings are moderately tolerant and trees are tolerant to flood duration and flood depth increases. [1, 22, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate to high. **Nutrient:** Low to moderate. **Siltation:** Low to moderate. **Insect:** Frequent – hackberry nipple gall, morning cloak butterfly, scales. **Other:** Hackberry is susceptible to witches' broom, powdery mildew and leaf spots. It is resistant to drought, heat, salt, alkaline soils and mine spoils. It can be impacted occasionally by soil compaction and wind and ice damage. A good tree for dry, polluted conditions, it is moderately tolerant to general disturbance and stress. [1, 22, 25, 32, 37, 44]

### **Design Considerations**

Hackberry is used in upper shoreline zones, stream bank stabilization, upland slope buffers and shelterbelts. It has been used well in polluted urban conditions and as a street tree. Hackberry is a hardy tree that can withstand many stresses.

**Indicator Status:** FAC-

**Concerns:**

Deformed branches may affect form. [44]

**Wildlife Use**

During the winter, this species' fruit is popular with many birds, especially cedar waxwings, yellow-bellied sapsuckers, mockingbirds and robins. It is also an exclusive food source of the hackberry and snout butterflies. Small mammals and deer use the tree as a source of food and shelter. [21, 22, 32, 36, 37, 44]



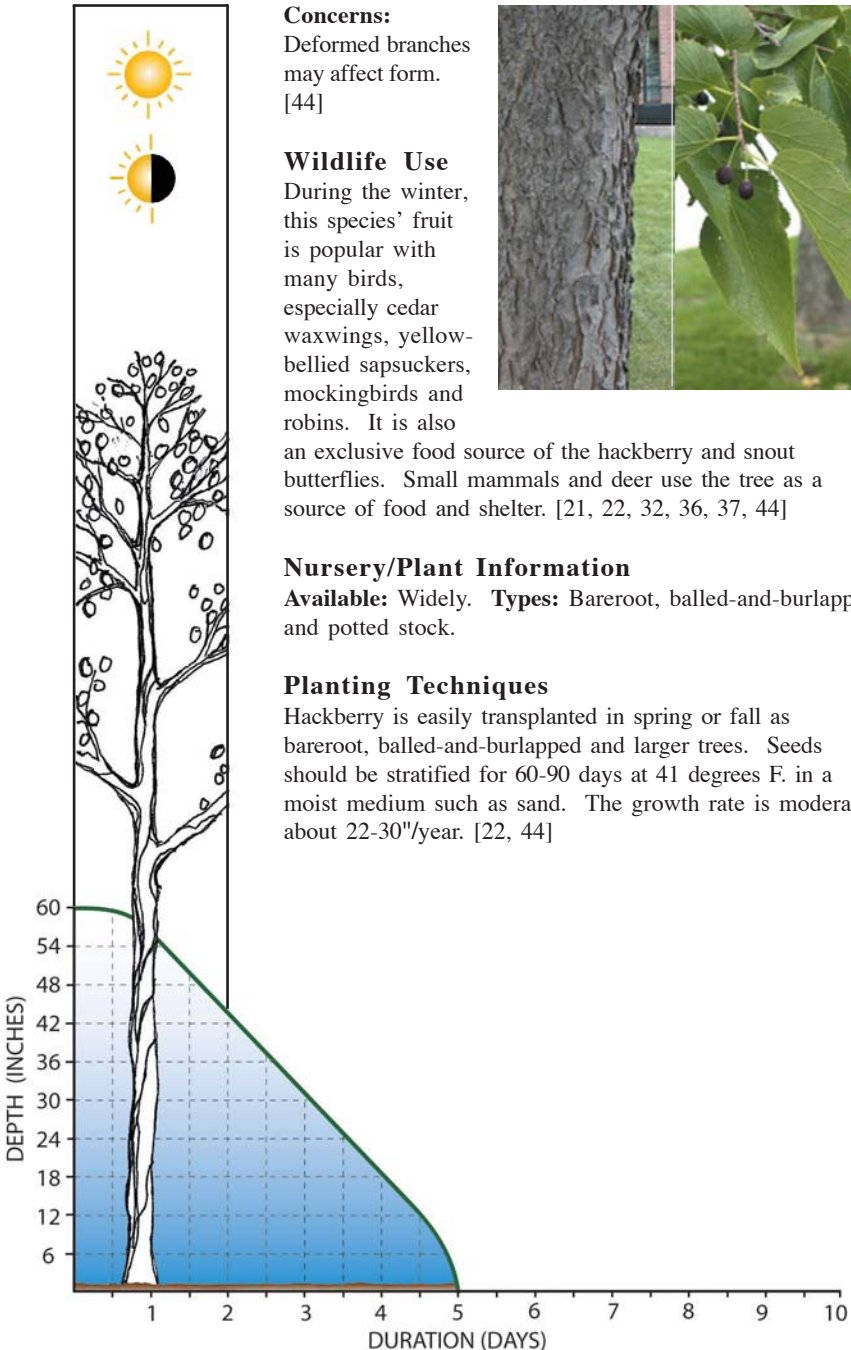
Photo: www.calla2.unm.edu/

**Nursery/Plant Information**

**Available:** Widely. **Types:** Bareroot, balled-and-burlapped and potted stock.

**Planting Techniques**

Hackberry is easily transplanted in spring or fall as bareroot, balled-and-burlapped and larger trees. Seeds should be stratified for 60-90 days at 41 degrees F. in a moist medium such as sand. The growth rate is moderate, about 22-30"/year. [22, 44]





# *Cephalanthus occidentalis*

**Buttonbush - a.k.a. Common Buttonbush, Honey-balls, Globe-flowers**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Hardwood swamp, low alluvial woods, flood plain forest, thickets, stream banks, marshes, meadows, prairie sloughs and open bogs (often in standing water or muck). [7, 16, 22, 36] **Range:** Se. Minn. (Eco-Region: 6-8), wc. and s. Wis., LP of Mich. N.S., N.B. and Que. to s. Minn, s. to W. Indies and Mex. [7, 21]

## **Description**

**General:** A spreading, aquatic shrub or sometimes small tree with many branches (often crooked and leaning) and an irregular crown. This shrub can form dense thickets 3-12' tall. **Flower:** White, tubular flowers collectively forming globose balls from June to August. **Leaf:** Opposite or 3 at a node (whorled), ovate, pointed at the tip, rounded at the base; without teeth. Paler and sometimes hairy beneath and shiny green above. **Bark:** Gray or brown; becoming deeply furrowed into rough, scaly ridges. **Twigs:** Mostly in 3s; reddish-brown, stout, sometimes hairy, with rings at nodes. **Fruit:** Button-like balls of fruit  $\frac{3}{4}$ -1" in diameter, each 2-seeded and maturing in autumn. **Root:** Fibrous, shallow, lateral roots. **Soil:** The pH range is 6.0-8.5. Tolerates most soils although it prefers lowland wet, wet-mesic, moist peat, and low alluvial woodland types. [7, 22, 36, 44]

## **Normal Water Level**

Although it will grow in drier areas, this species prefers shallow water of 2-3' of inundation or less to wet/saturated conditions. [6, 21, 37, 44]

## **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 24". **Duration:** Long – 45+ days (12" in 3 days and 12" for possibly 45 more days). Seedlings that are 10" tall or less can survive complete submergence for up to 45 days in 18" or less of water. This species will tolerate regular, irregular and seasonal flooding of up to 3' and will tolerate increases in flood depth. [1, 13, 22, 37, 44]

## **Sensitivities or Other Tolerances**

**Exposure:** Partial to full sun. Will tolerate full shade but may decline.

**Salt:** Moderate to high (will tolerate salty soil and water). **Nutrient:** Moderate, although low for seedlings. **Siltation:** Moderate. **Insect:** Infrequent – San Jose scale can be troublesome. **Other:** Buttonbush is damaged infrequently by wind and ice. It is sensitive to drought and heat, though resistant to alkaline soils and soil compaction. It has a moderate-to-low tolerance to general disturbance and stress. [1, 6, 13, 22, 25, 37, 44]

## **Design Considerations**

Buttonbush has been used in stream bank stabilization and in upper and lower shoreline zones. It is a nice landscape plant if allowed to be aggressive and soil moisture is maintained. A good plant for wetland restorations, especially in flood plain forests, meadows, thickets and stream banks. **Concerns:** This species can be very

**Indicator Status: OBL**



aggressive and may form monocultures, this may be a desirable trait if invasive species are a threat. [16, 44]



Photo: Dan Shaw

### **Wildlife Use**

Buttonbush

provides a good nectar source and

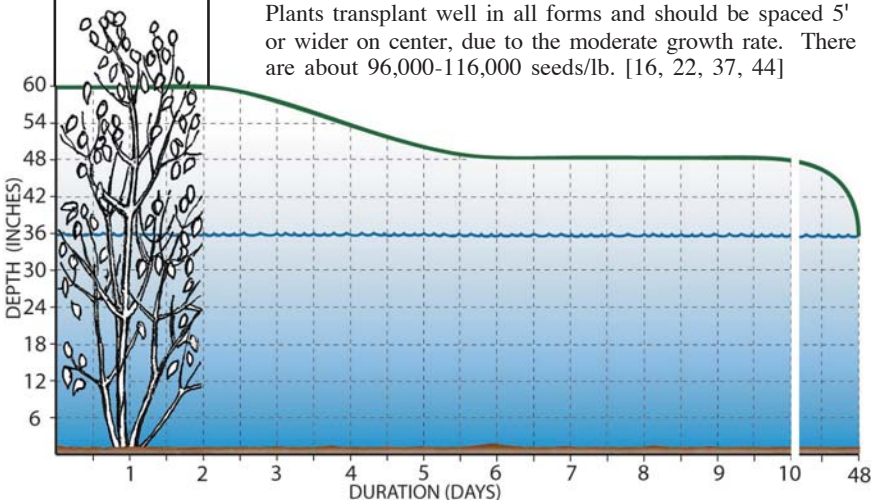
habitat for insects and hummingbirds. Waterfowl (mallard, widgeon, shoveller, wood duck, teal) are the principal users of its seeds, although they may be eaten also by insects, beaver and muskrats. Deer, muskrats and beaver browse it. It provides habitat for birds and reptiles. The leaves are poisonous to humans and unpalatable to livestock. [6, 22, 32, 36, 37, 44]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Seed and bareroot and potted stock.

### **Planting Techniques**

Seeds are best germinated in plenty of light on wet mudflats and shorelines. Seeds can be collected August to September and stored in fresh water at 34 degrees F. if they are not planted immediately. This species sprouts easily from cuttings and should be rooted prior to flooding. Plants transplant well in all forms and should be spaced 5' or wider on center, due to the moderate growth rate. There are about 96,000-116,000 seeds/lb. [16, 22, 37, 44]





## *Chelone glabra*

Turtlehead - a.k.a. White Turtlehead, Snake-head

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Swamp openings, thickets, stream banks, shores, wet meadows, marshes, peatlands and calcareous fens. [7, 16, 35, 41] **Range:** Nc. and e. Minn. (Eco-Region: 1-3, 5-9), Wis., Mich. Nfld. to Minn., s. to Ga. and Ala. [7, 21]

### Description

**General:** Robust perennial herb that is 1-3" tall, and often grows as a single stem topped with a cluster of large, white flowers. **Flower:** It has spikes of white (sometimes lavender) flowers that are 2-lipped and 1-1½" long. The shape of the flower suggests the head of a turtle. Blooms from July to October. **Leaf:** Narrow, opposite, elongate (½-1" wide and 3-6" long), glossy, dark green and coarsely toothed. **Stem:** Bluntly angled stems are often clumped. **Fruit:** Seeds flat, suborbicular, with a broad wing. **Root:** Fibrous, deep. **Soil:** Wet-to-moist soils of many types, although it prefers calcareous soils and peat. [7, 35, 41]

### Normal Water Level

This species prefers shallow water of 3" of inundation or less to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 9". **Duration:** Short – 2 days (decreasing 6" the first day and 3" the second). This species has a moderate tolerance to flood duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Unknown. **Nutrient:** Low. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate-to-low tolerance to general disturbance and stress. [1,47]

### Design Considerations:

Turtlehead is widely known as a landscape plant for mesic to wet gardens. It is also well suited for wetland restorations, rain gardens, and lake-edge restorations, especially in calcareous and peaty conditions. It is suited for cutflowers and is a butterfly host. **Concerns:** Loss of habitat has made turtlehead less common. Many cultivars have been produced that may be mistakenly used in wetland restorations. [16, 41]

### Wildlife Use

This species is a host plant for the very rare Baltimore butterfly as well as other butterfly larvae and insects. It attracts hummingbirds. With the decline of turtlehead habitat, the baltimore butterfly is losing its host. [21, 41]

Indicator Status: OBL

### Nursery/Plant Information

**Available:** Widely.

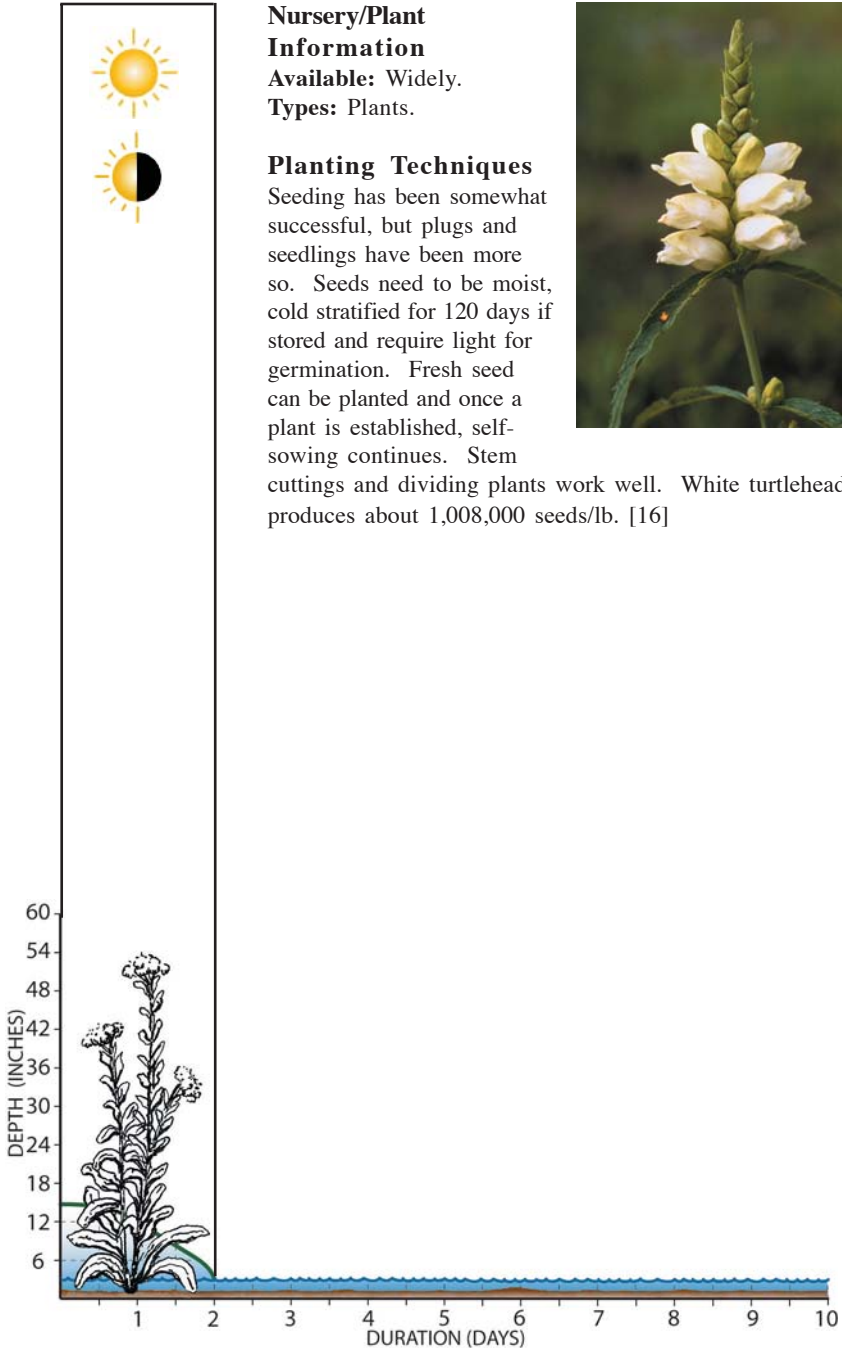
**Types:** Plants.

### Planting Techniques

Seeding has been somewhat successful, but plugs and seedlings have been more so. Seeds need to be moist, cold stratified for 120 days if stored and require light for germination. Fresh seed can be planted and once a plant is established, self-sowing continues. Stem cuttings and dividing plants work well. White turtlehead produces about 1,008,000 seeds/lb. [16]



Photo: Paul Jackson







## *Cornus amomum*

Silky Dogwood – a.k.a. *C. obliqua*

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Conifer swamps, floodplain depressions, ox-bows, low alluvial woods, wet thickets, marshes, springs, meadows, open bogs, calcareous fens, lake shores, stream banks and wet dunes. Silky dogwood is not as common as red-osier dogwood (*C. sericea*) in shrub-carrs. [7, 11, 22] **Range:** Common; se. Minn. (Eco-Region: 5-9), c. and s. Wis., LP of Mich. (occasional in s. UP). Me. and Que. to Minn., s. to Ga., Ala., Ark. and Okla. [7, 21]

### Description

**General:** An erect, deciduous shrub that forms a dense cluster of stems usually 6-12' high and wide. **Flower:** Our latest-flowering dogwood. The inflorescence is an open cyme with white flowers that bloom from May to July. **Leaf:** Opposite, ovate-to-elliptic, and 2-3/8 to 4¾" long with 4 to 6 pairs of lateral veins. The leaves are dark green on top and silky underneath. **Stem:** Brownish stems and reddish-purple bark. **Twigs:** Magenta with fine hairs and brown pith. **Fruit:** Mature berry is dark blue; the immature fruit may be white to bluish white. **Root:** Fibrous, shallow lateral roots. **Soil:** Tolerates most soils. [7, 11, 22]

### Normal Water Level

This species prefers moist-to-wet/saturated conditions although it is tolerant of more upland conditions. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 36". **Duration:** Long – 30+ days (decreasing 24" in 4 days and then 12" in the next 30 days). This species can tolerate seasonal and irregular flooding and is moderately to somewhat tolerant to flood duration. [1, 8, 22, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Unknown. **Insect:** Infrequent – borers, scales, dogwood club-gall and leaf miner can be minor problems. **Other:** Infrequent damage from ice and wind, though sensitive to 2,4-D, lighting, drought and heat. Silky dogwood is resistant to soil compaction. It has a moderate-to-high tolerance to general disturbance and stress. [1, 8, 22, 37]

### Design Considerations

Silky dogwood has been used often for wildlife cover and in restorations. It is well suited for stream bank stabilization and for shrubby thickets adjacent to wooded swamps. Other restorations that it would be well suited for are calcareous fens, lake shores, marshes and wet dunes. This species should be considered in landscaping situations and for rain gardens with low-salt conditions. **Concerns:** Stressed by drought conditions. [11]

**Indicator Status:** FACW+

### Wildlife Use

This is one of the better species for habitat and beauty. The fruit and buds are used by wood ducks, marsh birds, shorebirds, songbirds (cardinals, catbirds, evening and pine grosbeaks, kingbirds, robins, hermit and wood thrushes, common flickers, downy woodpeckers and cedar waxwings) and gamebirds (ruffed grouse, wild turkeys). Other major users are large and small mammals (deer, moose, rabbits and chipmunks). This dogwood is not edible to humans. [11, 21, 22, 32]



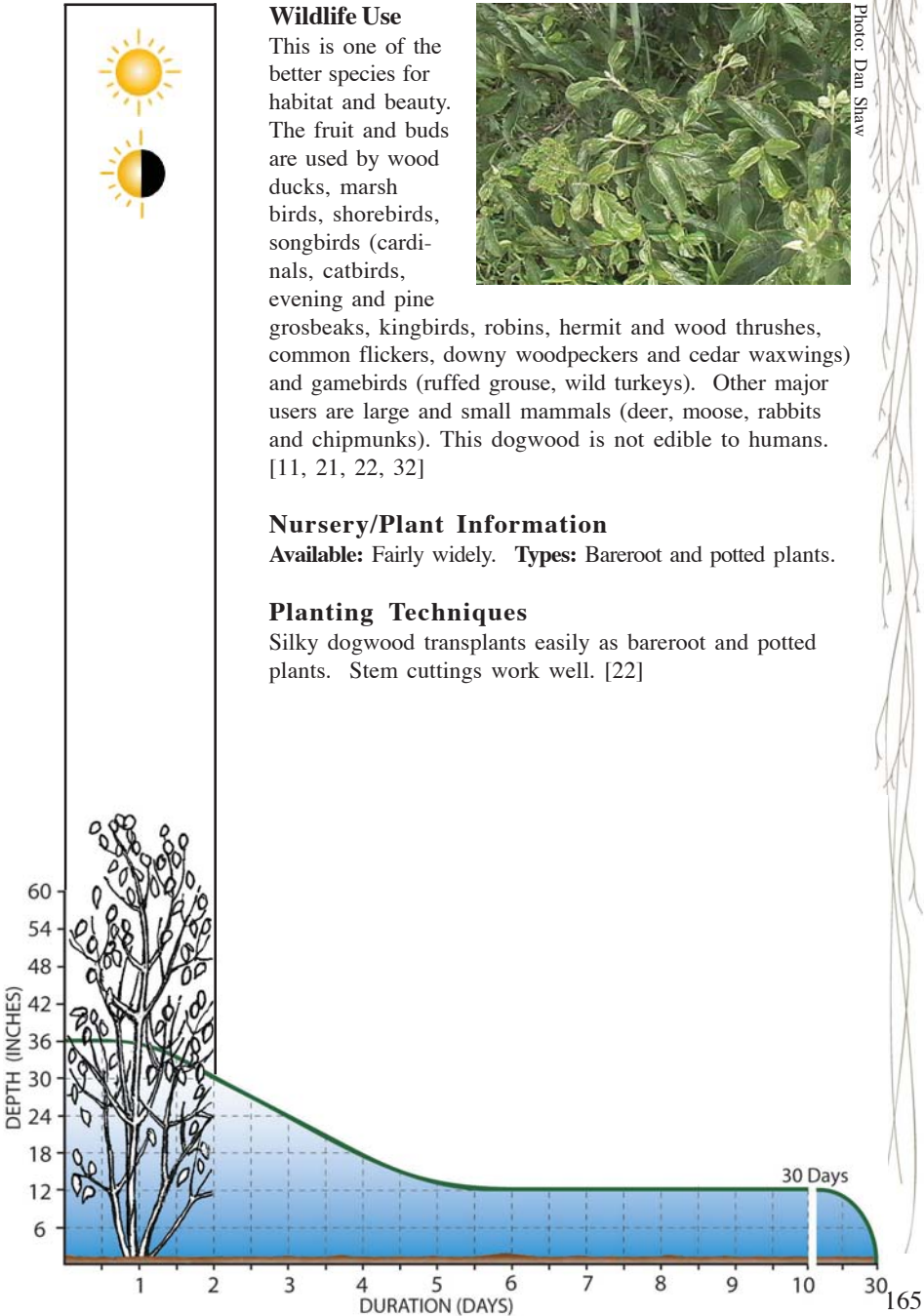
Photo: Dan Shaw

### Nursery/Plant Information

**Available:** Fairly widely. **Types:** Bareroot and potted plants.

### Planting Techniques

Silky dogwood transplants easily as bareroot and potted plants. Stem cuttings work well. [22]





## *Cornus racemosa*

Gray Dogwood - a.k.a. *C. foemina*, *C. paniculata*, *C. foemina racemosa*

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Lake shores, stream banks, swamps, thickets, marshes, low prairies, savannas and moist woods (open alluvial woods, rocky wooded hilltops, wood's edge, fence row, rocky ledges, limestone outcrops, glades, oak woods). [7, 16, 22] **Range:** Common; all but far ne. Minn (Eco-Range: 1, 3-9), local in nc. Wis., LP and occasional in c. and e. UP of Mich. Me. and s. Que. to s. Man., s. to Va., s. Ill. and Mo. [7, 21]

### Description

**General:** Gray dogwood is a widely adapted, multistemmed shrub that forms large, upright, branching stands that may reach heights of 12'. **Flower:** Showy white flower clusters in May to July. **Leaf:** Lanceolate-to-elliptic leaves that are 1½ to 3-1/8", abruptly acuminate, often whitened beneath, with 3-4 lateral veins to a side. Good purple-red fall color. **Bark:** Old bark mostly smooth and gray, pith white or tan. **Twigs:** Glabrous, at first green, soon becoming tan and eventually gray-brown. **Fruit:** Excellent production of berries that are white, August to September. **Root:** Fibrous, shallow lateral roots; suckers profusely, forming large colonies. **Soil:** Wet-mesic, mesic-dry, dry soil gradient with a pH range of 5.5-8.5, will tolerate most soils. [7, 22, 44]

### Normal Water Level

This species prefers moist/saturated-to-dry conditions, although it persists on unfavorable sites. [21, 37, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 6". **Duration:** Short – 2 days (decreasing 3"/day). This species will tolerate seasonal and irregular inundation of 2-4" of short duration and will decrease in abundance with flood depth decreases. [1, 22, 37, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate to high. **Siltation:** Moderate to high. **Insect:** Infrequent; none serious. **Other:** Gray dogwood is sensitive to 2,4-D, salt and lighting. It has some resistance to O<sub>3</sub>, wind/ice damage and soil compaction. Gray dogwood is resistant to drought, heat, alkaline soils and mine spoils. It has a high tolerance to general disturbance and stress. [1, 2, 10, 16, 22, 25, 37, 44]

### Design Considerations

Gray dogwood is commonly used in restorations or revegetation sites and is often allowed to form thickets. It has been used in slopes, buffers, fence rows, stream bank stabilization, lake edges, and upper shoreline zones. It will increase and become denser with disturbance. **Concerns:** This species suckers and forms thickets that will invade surrounding area and become aggressive. This may be a strategy to inhibit other species that invade, such as buckthorn and honeysuckle. [16, 44]

**Indicator Status:** FACW-



### **Wildlife Use**

This is one of the better species for habitat and beauty. The flowers attract the common blue butterfly. The fruit and buds are particularly used by wood ducks, marsh birds, shorebirds, songbirds (cardinals, catbirds, evening and pine grosbeaks, kingbirds, robins, hermit and wood thrushes, common flickers, downy woodpeckers and cedar waxwings), and game birds (ruffed grouse, pheasants and wild turkeys). Other major users are large and small mammals (deer, moose, rabbits, beavers, woodchucks, raccoons, squirrels and chipmunks). This dogwood is not edible to humans. [21, 22, 32, 37, 44]



Photo: Paul Jackson



Photo: Paul Jackson

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Bareroot and potted stock.

### **Planting Techniques**

The seeds germinate readily if they are scarified. The roots sucker well and will spread quickly. Cuttings also root easily and grow rapidly. About 12,100 seeds/lb. [16, 22, 44]



## *Cornus sericea*

**Red-osier Dogwood** - a.k.a. *C. stolonifera* - **Red Osier, Redosier or Red-twigged Dogwood; Kinnikinnik**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Swamps, marshes, shores, stream banks, flood plain forests, sedge meadows, wet to wet-mesic prairies, calcareous fens, shrub thickets and sand dunes. It is a characteristic shrub of shrub-carrs. It may form dense thickets and may invade nonwooded areas in response to water level changes. [7, 11, 16, 22, 36]

**Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Nfld. to Alaska, s. to Pa., Ill., Neb. and n. Mex. [7, 21]

### **Description**

**General:** Many-stemmed, erect, deciduous shrub, 6-12' tall, forming thickets.

**Flower:** Flat-topped clusters of small, creamy white flowers from May to August.

**Leaf:** Lanceolate to ovate, without teeth, 1½-3½" long with 5-7 pairs of lateral veins. The leaves are dull green above, whitish green and covered with fine hairs beneath, and turn reddish in autumn. **Bark:** Gray or brown, smooth or slightly furrowed into flat plates. **Twigs:** Reddish to bright red, hairy when young, then lack hairs with rings at nodes. **Fruit:** A cluster of white, juicy, berry-like drupes with 2 seeds; April to November. **Root:** Fibrous shallow lateral roots, stoloniferous. **Soil:** Lowland wet water gradient with a pH range of 5.5-8.5. Will tolerate many soil types, including calcareous and peat. [7, 8, 11, 22, 36, 44]

### **Normal Water Level**

This species prefers mesic to wet/saturated conditions. [21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 36". **Duration:** Long – 30+ days (12" every 2 days until the last 12", which may last up to 30 days). It tolerates constant inundation during early spring better than during the growing season, although it will tolerate seasonal and irregular fluctuations. [1, 8, 11, 22, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate to high.

**Siltation:** Moderate to high. **Insect:** Occasional – scale, bagworms, other insects.

**Other:** Red-osier dogwood spreads slowly by stolons. It is tolerant to drought, heat, alkaline soils and soil compaction, although it is intolerant to 2,4-D, O<sub>3</sub> and lighting. It is also tolerant of oil/grease and metals. It may handle SO<sub>2</sub>, wind and ice damage. It has a moderate tolerance to general disturbance and stress. [1, 2, 8, 10, 22, 25, 37, 44]

### **Design Considerations**

Red-osier dogwood is specified in many plans for restorations, buffers, screens, erosion control, stream bank stabilization and landscaping. It will work well in rain gardens and other water-fluctuation situations. It provides habitat for wildlife and beauty to landscapes. Overall a good plant in many designs. **Concerns:** There are many cultivars and varieties. It may invade sedge meadows, prairies and calcareous

## Indicator Status: FACW

fens as water levels change. When deer numbers are high, this species is reduced in size and abundance. [16, 36, 44]



Photo: MINDNR

### Wildlife Use

This is one of the better species for habitat and beauty. The flowers attract common blue butterflies. The fruit and buds are used particularly by wood ducks, marsh birds, shorebirds, songbirds (cardinals, catbirds, evening and pine grosbeaks, kingbirds, robins, hermit and wood thrushes, common flickers, downy woodpeckers and cedar waxwings), and gamebirds (ruffed grouse, pheasants and wild turkeys). Other major users are large and small mammals (deer, moose, rabbits, beavers, woodchucks, raccoons, squirrels and chipmunks). It provides excellent warbler and American goldfinch habitat. Its fruit is not edible to humans. [7, 11, 21, 22, 32, 37, 44]

### Nursery/Plant Information

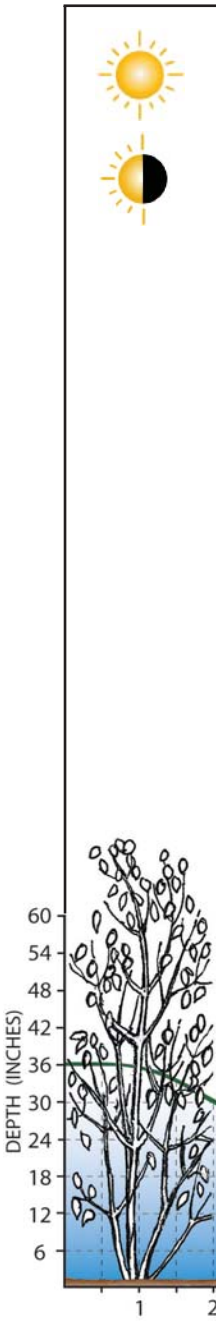
**Available:** Widely. **Types:** Bareroot and balled-and-burlapped plants.

### Planting Techniques

This species is easily propagated with excellent seedling establishment. It will root from cuttings, and spreads by stolons. This technique is commonly used for bank stabilization. Red-osier dogwood grows rapidly, although it is slow to re-establish after disturbance. [22, 44]

### Additional Notes

With its white fruit and pith, red-osier dogwood is unique among dogwoods. [11, 36]





## *Eleocharis obtusa*

**Blunt Spikerush** - a.k.a. *Eleocharis ovata* – **Blunt Spike Rush**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Wet, sandy or muddy shores, marshes, ditches, mud flats, disturbed artificial wetlands and temporary ponds. Commonly found in disturbed, saturated soils, such as those of farmed wetlands and wetland creation or restoration sites. [7, 11, 16, 44] **Range:** Mostly ne. and ec. Minn (Eco-Region: 5-9), n. Wis., local in w. UP and far n. LP of Mich. Widespread over much of N. Amer. and Eurasia. [7, 21]

### **Description**

**General:** A densely tufted, herbaceous annual that is hardy and reaches 12-20". **Flower:** Brown, from June to October in ovoid spikelets. **Stem:** The soft stems have sheaths that are oblique at the apex. **Fruit:** Lens-shaped achene with a triangular cap (the tubercle) that is a different color and texture than the body of the achene. Bristles subtending the achene usually number 6-7 and are as long or longer than the achene. **Root:** Fibrous. **Soil:** Wet sandy or muddy soils. [7, 11, 24, 44]

### **Normal Water Level**

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Long – 30 days (decreasing 6"/day for 2 days, then the last 6" over 28 days). Blunt spikerush will tolerate regular flooding to 6" of water. Continuous flooding of 15" or more or increases in flood depth can kill it. It has a moderate tolerance to flood duration. [1, 24, 26, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Prefers full sun. **Salt:** Low to moderate. **Nutrient:** Moderate to high and unaffected by P increases. **Siltation:** Low. **Insect:** Infrequent. **Other:** Spikerush has a high metal uptake and a moderate tolerance to general disturbance and stress. [1, 6, 24, 37, 44]

### **Design Considerations**

Blunt spikerush is commonly found in disturbed, saturated soils, such as farmed or created wetlands and restoration sites. It is used in stream bank stabilization, mud flat revegetation, vegetated swales and in calcareous situations. A good plant to add to many restorations, and may come from the seedbank. **Concerns:** May decline with increased competition. [16, 26, 44]

### **Wildlife Use**

Waterfowl (coots, black ducks, mallards, pintails, ring-necked ducks and teal; blue, snow and Canada geese; and swans) eat the rhizomes and achenes of this plant. The achenes are also eaten by sora and Virginia rails. Prairie voles, muskrats and rabbits eat the plant and achenes. [24, 32, 37, 44]

Indicator Status: OBL

### Nursery/Plant Information

**Available:** Widely.

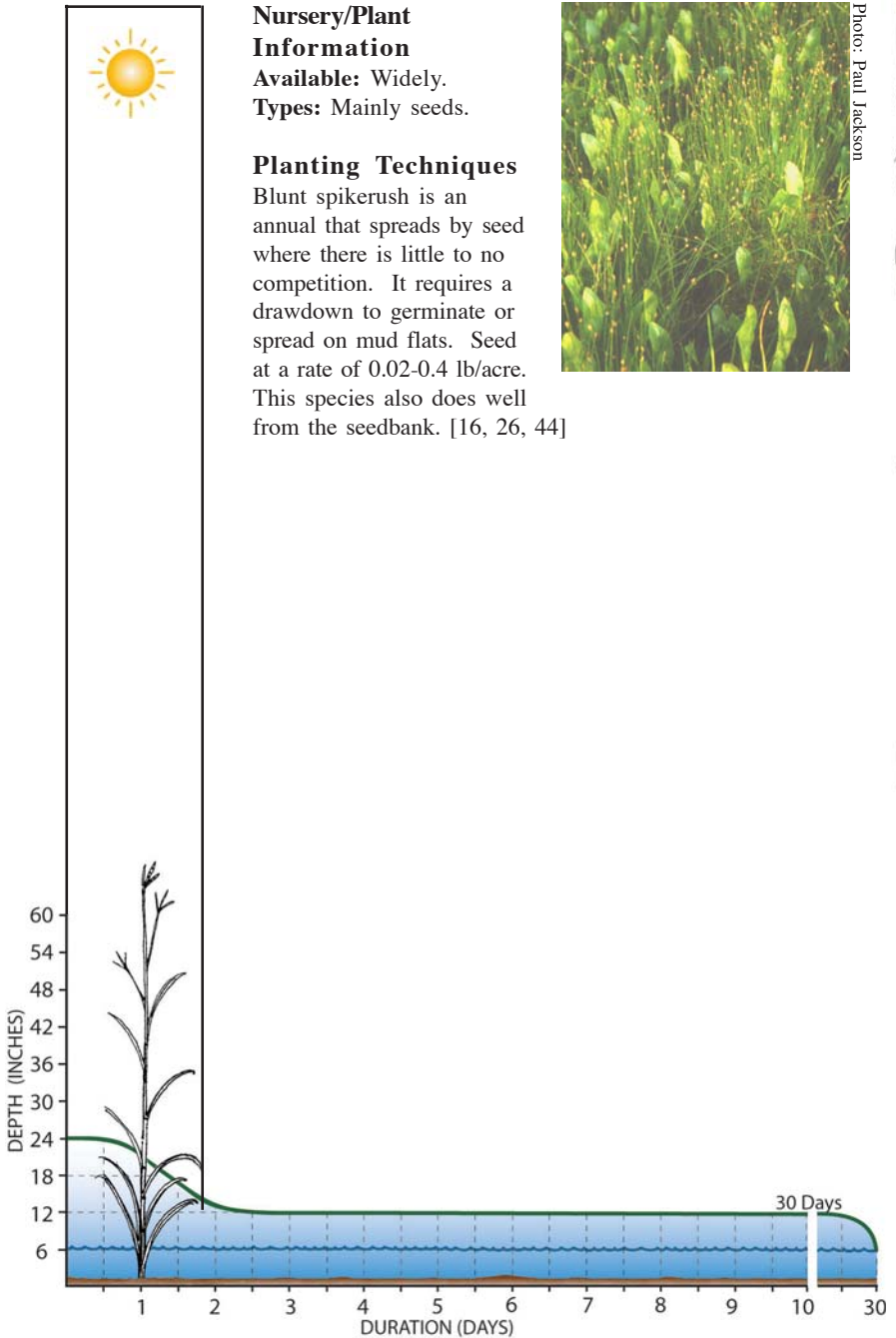
**Types:** Mainly seeds.

### Planting Techniques

Blunt spikerush is an annual that spreads by seed where there is little to no competition. It requires a drawdown to germinate or spread on mud flats. Seed at a rate of 0.02-0.4 lb/acre. This species also does well from the seedbank. [16, 26, 44]



Photo: Paul Jackson







## *Elymus virginicus*

Virginia Wild Rye - a.k.a. Virginia Wildrye, Terrell-grass

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Flood plain forests, wet savannas, mesic woodlands, thickets and stream banks. [7, 16] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Nfld. to Alta., s. to Fla. and Ariz. [7, 21]

### **Description**

**General:** A short-lived, cool-season perennial grass that clumps and reaches heights up to 3'. **Flower:** Tan color from June to October. The awn is less than 3 cm long. **Leaf:** Flat, 3/8-9/16" wide, rough to the touch on both sides, with smooth sheaths. **Stem:** 24-48" long. **Fruit:** A caryopsis. **Root:** Rhizomes. **Soil:** Moist soil in many types. [7, 17, 44]

### **Normal Water Level**

This species prefers upland moist to wet/saturated conditions. [21, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 36". **Duration:** Long – 15 days (decreasing 12"/day for first 2 days, then 6" on day 3 and last 6" over 15 days). It will tolerate dry soils as well. [44]

### **Sensitivities or Other Tolerances**

**Exposure:** Partial to full sun. **Salt:** Moderate. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 44, 47]

### **Design Considerations**

Virginia wild rye is used mostly as a forage and haying species. It is also used along stream banks for stabilization, slope buffers, vegetated swales and in floodplain forest or savanna areas. It is a good landscape plant and dries well for arrangements. Consider it for many types of wetland restorations. **Concerns:** This species can become aggressive if it is seeded too heavily. [16, 44]

### **Wildlife Use**

Virginia wild rye is grazed and is palatable for many browsers as well as blackbirds and quail. [32, 44]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants and seed.

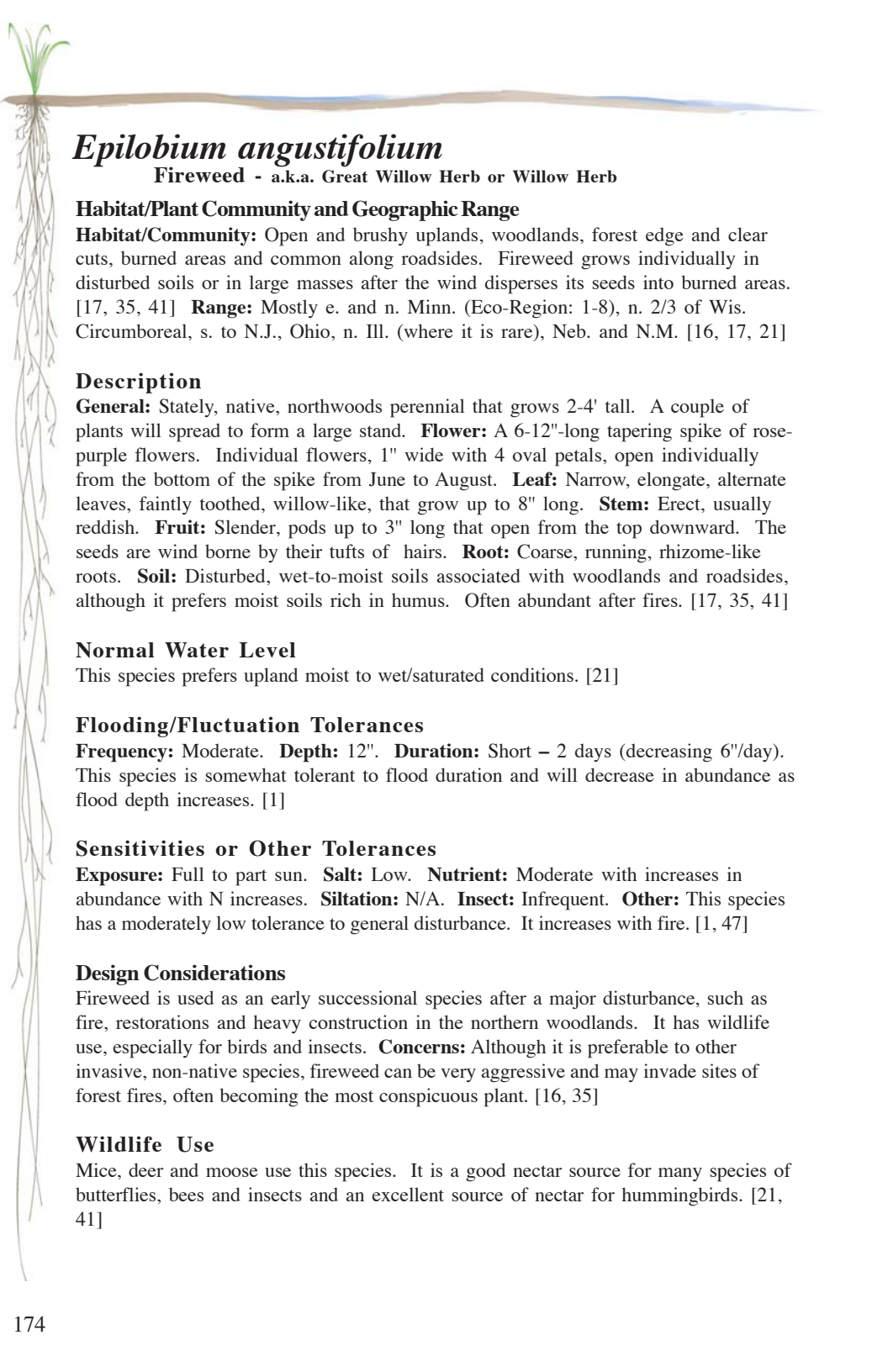
### **Planting Techniques:**

Seeding is best done in spring or fall. Recommended rates are 0.06-1.0 lb/acre. Over seeding can be a problem. Approximately 73,000 seeds/lb. [16, 44]

Indicator Status: FACW-



Photo: Rusty Schmidt



# *Epilobium angustifolium*

Fireweed - a.k.a. Great Willow Herb or Willow Herb

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Open and brushy uplands, woodlands, forest edge and clear cuts, burned areas and common along roadsides. Fireweed grows individually in disturbed soils or in large masses after the wind disperses its seeds into burned areas. [17, 35, 41] **Range:** Mostly e. and n. Minn. (Eco-Region: 1-8), n. 2/3 of Wis. Circumboreal, s. to N.J., Ohio, n. Ill. (where it is rare), Neb. and N.M. [16, 17, 21]

## Description

**General:** Stately, native, northwoods perennial that grows 2-4' tall. A couple of plants will spread to form a large stand. **Flower:** A 6-12"-long tapering spike of rose-purple flowers. Individual flowers, 1" wide with 4 oval petals, open individually from the bottom of the spike from June to August. **Leaf:** Narrow, elongate, alternate leaves, faintly toothed, willow-like, that grow up to 8" long. **Stem:** Erect, usually reddish. **Fruit:** Slender, pods up to 3" long that open from the top downward. The seeds are wind borne by their tufts of hairs. **Root:** Coarse, running, rhizome-like roots. **Soil:** Disturbed, wet-to-moist soils associated with woodlands and roadsides, although it prefers moist soils rich in humus. Often abundant after fires. [17, 35, 41]

## Normal Water Level

This species prefers upland moist to wet/saturated conditions. [21]

## Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species is somewhat tolerant to flood duration and will decrease in abundance as flood depth increases. [1]

## Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate with increases in abundance with N increases. **Siltation:** N/A. **Insect:** Infrequent. **Other:** This species has a moderately low tolerance to general disturbance. It increases with fire. [1, 47]

## Design Considerations

Fireweed is used as an early successional species after a major disturbance, such as fire, restorations and heavy construction in the northern woodlands. It has wildlife use, especially for birds and insects. **Concerns:** Although it is preferable to other invasive, non-native species, fireweed can be very aggressive and may invade sites of forest fires, often becoming the most conspicuous plant. [16, 35]

## Wildlife Use

Mice, deer and moose use this species. It is a good nectar source for many species of butterflies, bees and insects and an excellent source of nectar for hummingbirds. [21, 41]

Indicator Status: FAC

### Nursery/Plant Information

**Available:** Fairly.

**Types:** Plants commercially.

### Planting Techniques

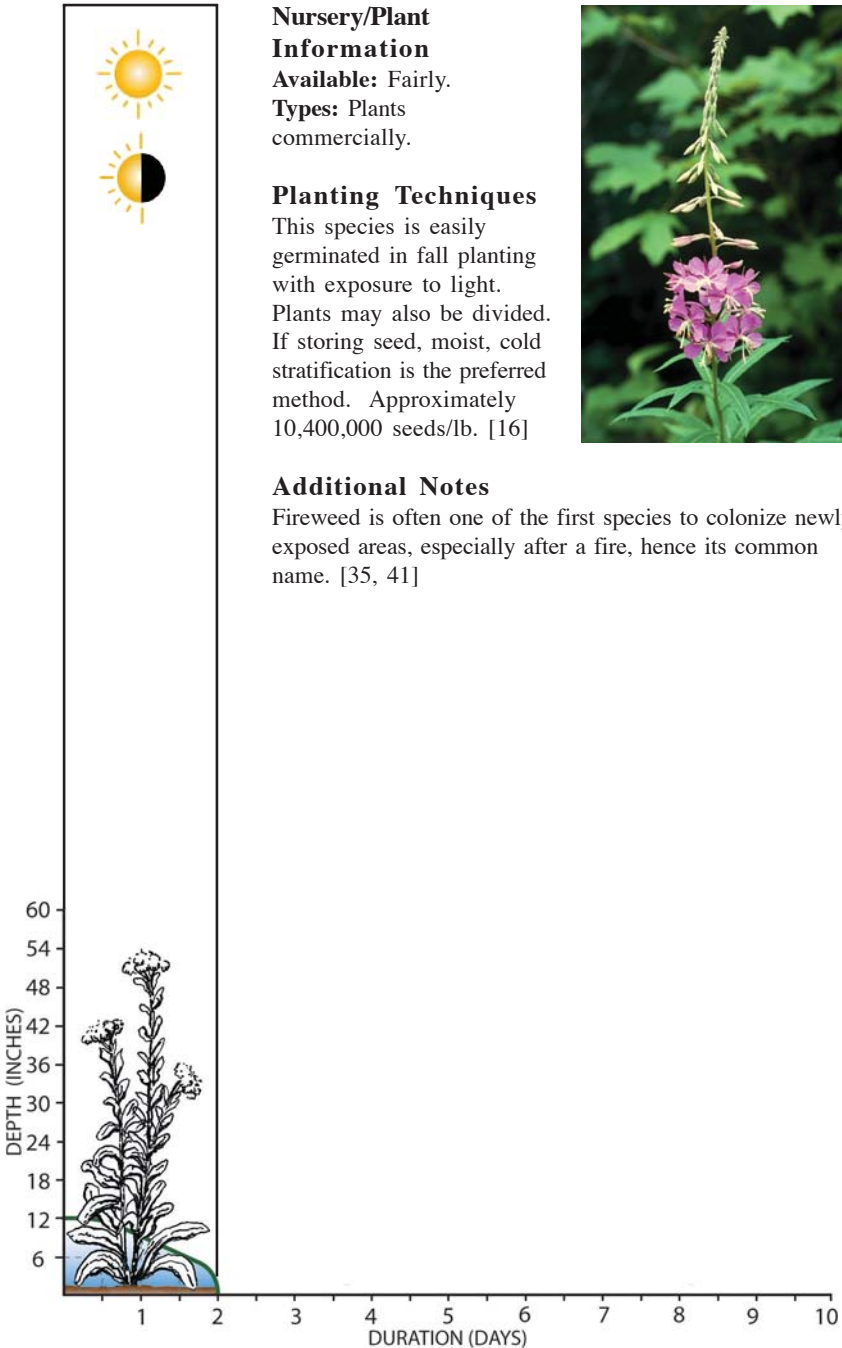
This species is easily germinated in fall planting with exposure to light. Plants may also be divided. If storing seed, moist, cold stratification is the preferred method. Approximately 10,400,000 seeds/lb. [16]

### Additional Notes

Fireweed is often one of the first species to colonize newly exposed areas, especially after a fire, hence its common name. [35, 41]



Photo: MINDNR





## *Equisetum fluviatile*

**Horsetail** - a.k.a. Water-horsetail, Swamp Horsetail, Pewterwort, Joint Rush

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** In standing water of marshes, muddy shores, bogs, lake edges, ponds, peatlands, ditches and swales. [4, 7, 17] **Range:** All but sw. Minn. (Eco-Region: 1-8), common in Wis., Mich. Circumboreal, s. to Pa., W.V., Ohio, n. Ill., Iowa, Nebr., nw. Mont. and Ore. [7, 21]

### **Description**

**General:** A rhizomatous perennial with annual stems which, like other horsetails, grows in large beds. A dark-green, leafless plant, growing to 3'. Sterile and fertile stems look alike, except fertile stems produce a terminal cone. **Leaf:** Leaves reduced to a toothed membrane that encircles the stem at each node. The 15-20 pointed teeth are dark brown to black with a pale margin. **Stem:** Hollow, jointed stems that may branch and are ridged and stiff, with a high silica content. A central cavity takes up about 80% of the stem's diameter. Each stem is jointed and can be pulled apart, making a snapping sound, like popping bubble wrap. Depending on growing conditions, branching may occur at the nodes. **Fruit:** Oval cone that produces spores which will germinate on moist soil. **Root:** Emerges from a buried rhizome. **Soil:** Muddy to peaty soils preferred in standing water. [4, 7, 17]

### **Normal Water Level**

This species prefers deep water of 3' of inundation or less to wet/saturated conditions. [4, 7, 21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 12". **Duration:** Long – 10 days (decreasing 2.5"/day). This species has a moderate tolerance to flood event duration, although it is very tolerant to depth increases. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun to part shade. **Salt:** Low to moderate. **Nutrient:** Low. **Sitation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate-to-low tolerance to general disturbance and stress. [1, 47]

### **Design Considerations**

Even though common horsetail regrows from the rhizomes each year, it will work well in restorations in peat soils, muddy shores, ponds and mud flats. It provides good habitat for fish and other animals. **Concerns:** May produce large, monotypic beds. [4]

### **Wildlife Use**

Common horsetail provides good fish cover and habitat, food for geese and is grazed by ruffed grouse and moose. Research in Alaska has shown that it is a primary food source for trumpeter swans, dominating the diet of both adult and young swans. [4, 21, 32]



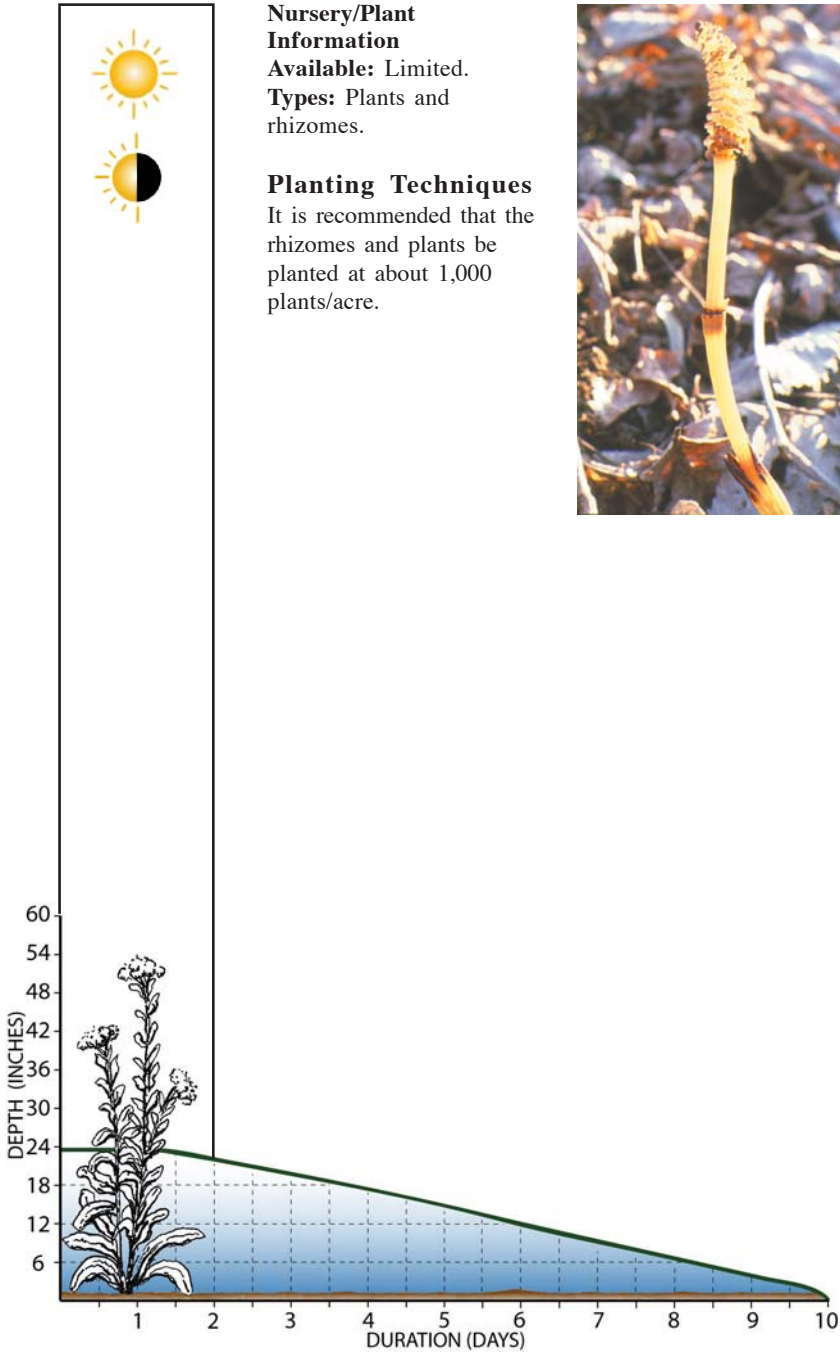
**Indicator Status: OBL**

**Nursery/Plant Information**  
**Available:** Limited.  
**Types:** Plants and rhizomes.

**Planting Techniques**  
It is recommended that the rhizomes and plants be planted at about 1,000 plants/acre.



Photo: Paul Jackson





## *Eryngium yuccifolium*

Rattlesnake Master - a.k.a. Rattlesnake-master, Button Snakeroot

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Mesic and dry, sandy soils of open woods, prairies and savannas. [16, 17] **Range:** Nw., c. and s. Minn. (Eco-Region: 3-5, 7-9), Wis. and Mich. S. USA, n. to Va., Ind., Minn. and Kan., and occasionally farther north. **Special concern species in Minn., endangered in Mich.** [17]

### Description

**General:** Rattlesnake master's appearance is reminiscent of the Southwest's yucca. This coarse, spiny, erect perennial stands 28-42" tall. **Flower:** Composed of dense heads, each head subtended by a bract, each flower by a bractlet. Heads round-ovoid; white-to-lilac blooms from July to September. **Leaf:** Linear, very elongate, parallel-veined leaves that are whitish with bristly outer edges. The upper leaves gradually reduce. **Stem:** Usually simple to the inflorescence. **Fruit:** Round, scaly and about 1" in diameter. **Root:** Fascicled roots. **Soil:** Prefers wet-to-dry sandy soil in uplands. [17]

### Normal Water Level

This species prefers mesic to dry upland conditions.

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). It will tolerate drought and heat.

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Low. **Siltation:** Low. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

### Design Considerations

A beautiful, distinctive plant that is ideal for landscapes as a contrast or background plant. The flowers may be dried for arrangements. It is a butterfly magnet and is a tough fast grower for restorations, rain garden edges, and upland buffers. It is an early successional species. **Concerns:** Rattlesnake master is an endangered or special concern species in Minnesota and Michigan. Cultivars are starting to be produced. [16]

### Wildlife Use

It is a butterfly host plant and a bee and butterfly magnet.

### Nursery/Plant Information

**Available:** Widely. **Types:** Plants and seed.

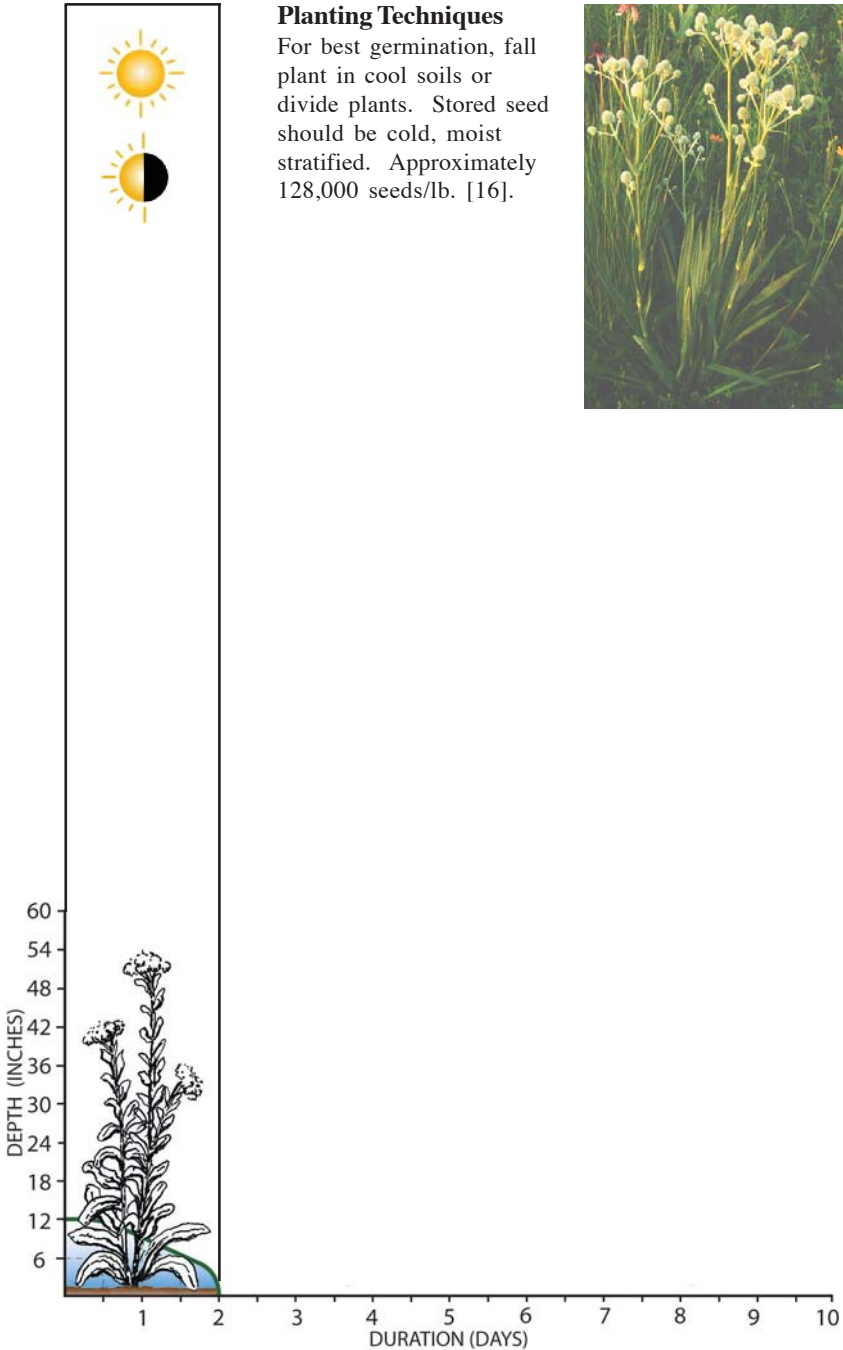
**Indicator Status: FAC+**

### Planting Techniques

For best germination, fall plant in cool soils or divide plants. Stored seed should be cold, moist stratified. Approximately 128,000 seeds/lb. [16].



Photo: Dan Shaw







## *Eupatorium maculatum*

**Joe-pye-weed** - a.k.a. *Eupatoriadelphus m.* - Joe-pye Weed, Spotted Joe Pye Weed, Purple Boneset

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Wet meadows, sedge meadows, shrub-carrs, marshes, low prairie, shores, stream banks, ditches, cedar swamps, calcareous fens and open bogs. [7, 11, 16, 35, 41, 44] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Nfld. to B.C., s. to Md., Ohio, Ill., N.M. and Utah. [7, 21]

### **Description**

**General:** Robust, native perennial herb, usually 3-5' tall with 1 to several stems. **Flower:** Deep-rose to light-pink, flat inflorescence that lacks ray flowers and appears fuzzy or shaggy, 9-22 disc flowers occur in each head from July through September. Hundreds of individual flowers, ¼" wide, make up each inflorescence. **Leaf:** Toothed, lance-shaped leaves generally are in whorls of 4 or 5 and are 3-9" long. **Stem:** Often spotted with purple. **Fruit:** Achenes prismatic, mostly 5-angled and nerved. **Root:** Fibrous, shallow. **Soil:** Moist soils, especially calcareous wet or rich loam soils. [7, 11, 35, 41, 44, 47]

### **Normal Water Level**

This species prefers moist soil to wet/saturated conditions. [21, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Medium long – 3.5 days (6" the first half day and then 6"/day). This species has a moderate tolerance to flood duration and will decrease in abundance as flood depth increases. [1, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Low. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 44]

### **Design Considerations**

Joe-pye-weed is used in restorations, vegetated swales, shorelines, lake edges, wet prairies and gardens. It is an attractive plant, well suited for the perennial garden, rainwater garden and landscape where height is allowed. It provides good cutflowers, bird habitat and butterfly food. Joe-pye-weed prefers calcareous and heavy soils and is usually a good addition to a prairie garden. **Concerns:** This species may become aggressive, which may be preferable in some situations. Also, many cultivars or varieties are available, which may work in a landscape design but are not well suited to restorations. [16, 44, 47]

### **Wildlife Use:**

This species provides habitat for many species. It attracts butterflies, bees and many other insects. It provides cover for small mammals, amphibians and reptiles. Swamp sparrows and turkeys eat the seeds. [21, 32, 41, 44]

**Indicator Status: OBL**

**Nursery/Plant Information**

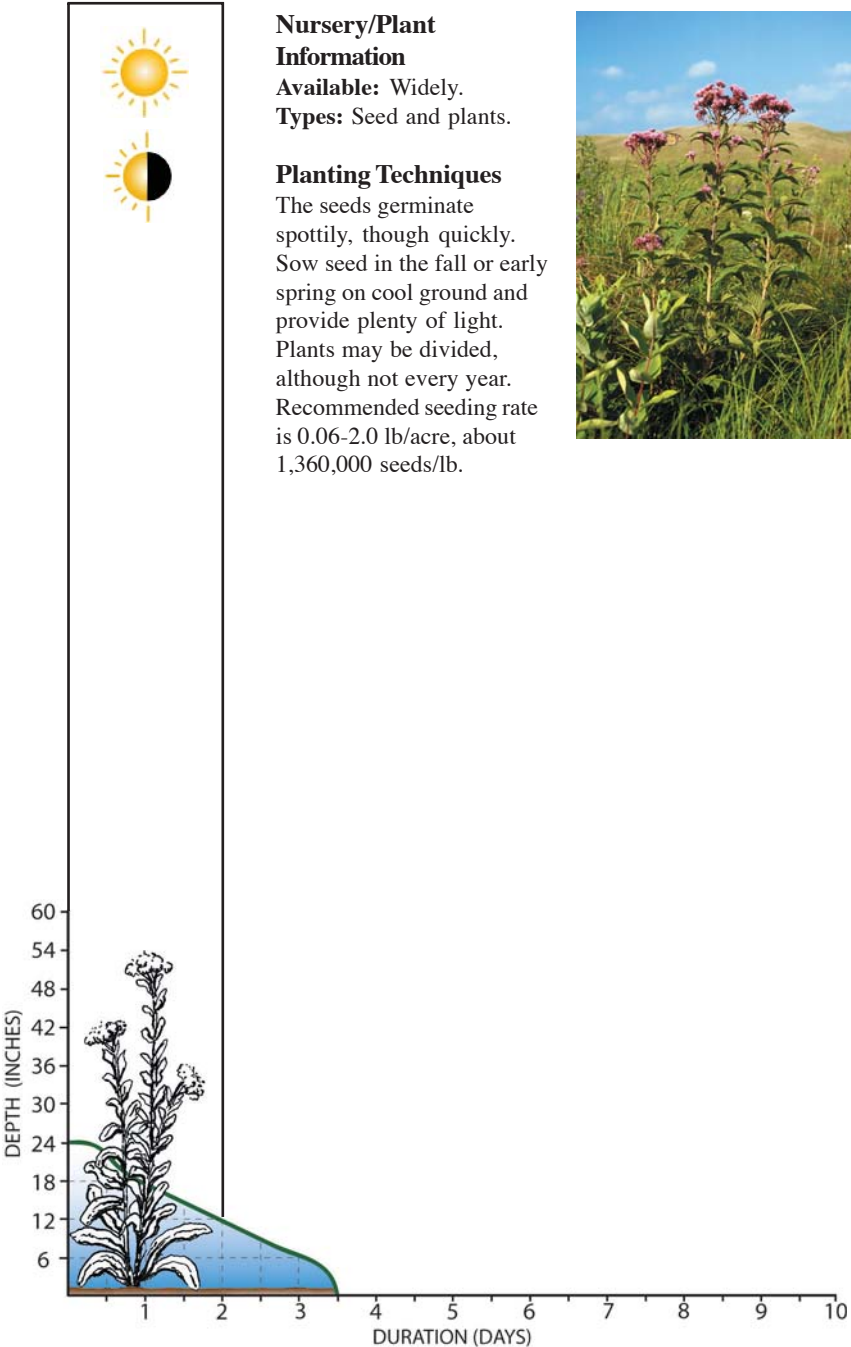
**Available:** Widely.  
**Types:** Seed and plants.

**Planting Techniques**

The seeds germinate spottily, though quickly. Sow seed in the fall or early spring on cool ground and provide plenty of light. Plants may be divided, although not every year. Recommended seeding rate is 0.06-2.0 lb/acre, about 1,360,000 seeds/lb.



Photo: Paul Jackson





# *Eupatorium perfoliatum*

**Boneset - a.k.a. Common Boneset, Indian Sage**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Marshes, wet meadows, sedge meadows, low prairies, prairie swales, shores, stream banks, ditches, cedar swamps, thickets and calcareous fens. Often occurring with Joe-pye-weed (*E. maculatum*). It is often associated with groundwater seepages and tends to be a pioneer species. [7, 11, 16, 35, 41, 44]

**Range:** Common; Minn. (Eco-Region: All), Wis., Mich. N.S. and Que. to se. Man., s. to Fla. and Tex. [7, 21]

## **Description**

**General:** Coarse, hairy, native, perennial herb that may reach heights of 2-3'.

**Flower:** Conspicuous, flattish cluster of small, flowerheads that lack ray flowers. 9-23 white disc flowers occur in each head; individual flowers are ¼" in diameter and give a fuzzy appearance. **Leaf:** Opposite, elongate, wrinkly, leaves 4-8" long, join at the base (perfoliate) so that the stem appears to grow through the leaves. Leaves are covered in fine, whitish hair. **Stem:** Stems are coarsely hairy. **Fruit:** Achenes prismatic, mostly 5-angled and nerved. **Root:** Fibrous. **Soil:** Prefers moist or wet low grounds of rich loam or calcareous soils. [7, 11, 35, 41, 44]

## **Normal Water Level**

This species prefers wet/saturated-to-moist conditions. [21, 44]

## **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Medium long – 3.5 days (decreasing 6" the first half day and then 6"/day after that). This species has a moderate tolerance to flood duration and is unaffected by increases in flood depth. [1, 44]

## **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Low to moderate. **Insect:** Infrequent. **Other:** This species has a moderate-to-high tolerance to general disturbance and stress. [1, 44, 47]

## **Design Considerations**

Similar to Joe-pye-weed, boneset is used in restorations, vegetated swales, shorelines, and is used to bind soil with its fibrous root system to resist erosion. It is a good habitat provider and groundcover. Flower color is not brilliant in gardens but the 2-3' plant has an interesting texture. Consideration should be given for this plant in rain gardens, lake edges and other landscape designs. **Concerns:** Leaves are often eaten by insects. [16, 44]

## **Wildlife Use**

Boneset is an excellent nectar provider for bronze copper, monarch, crescent and fritillary butterflies. Turkeys, swamp sparrows and some waterfowl eat the achenes. Mallards and ruffed grouse eat the leaves. It also provides cover for small mammals, reptiles and amphibians. [21, 32, 41, 44]

**Indicator Status:** FACW+

**Nursery/Plant Information**

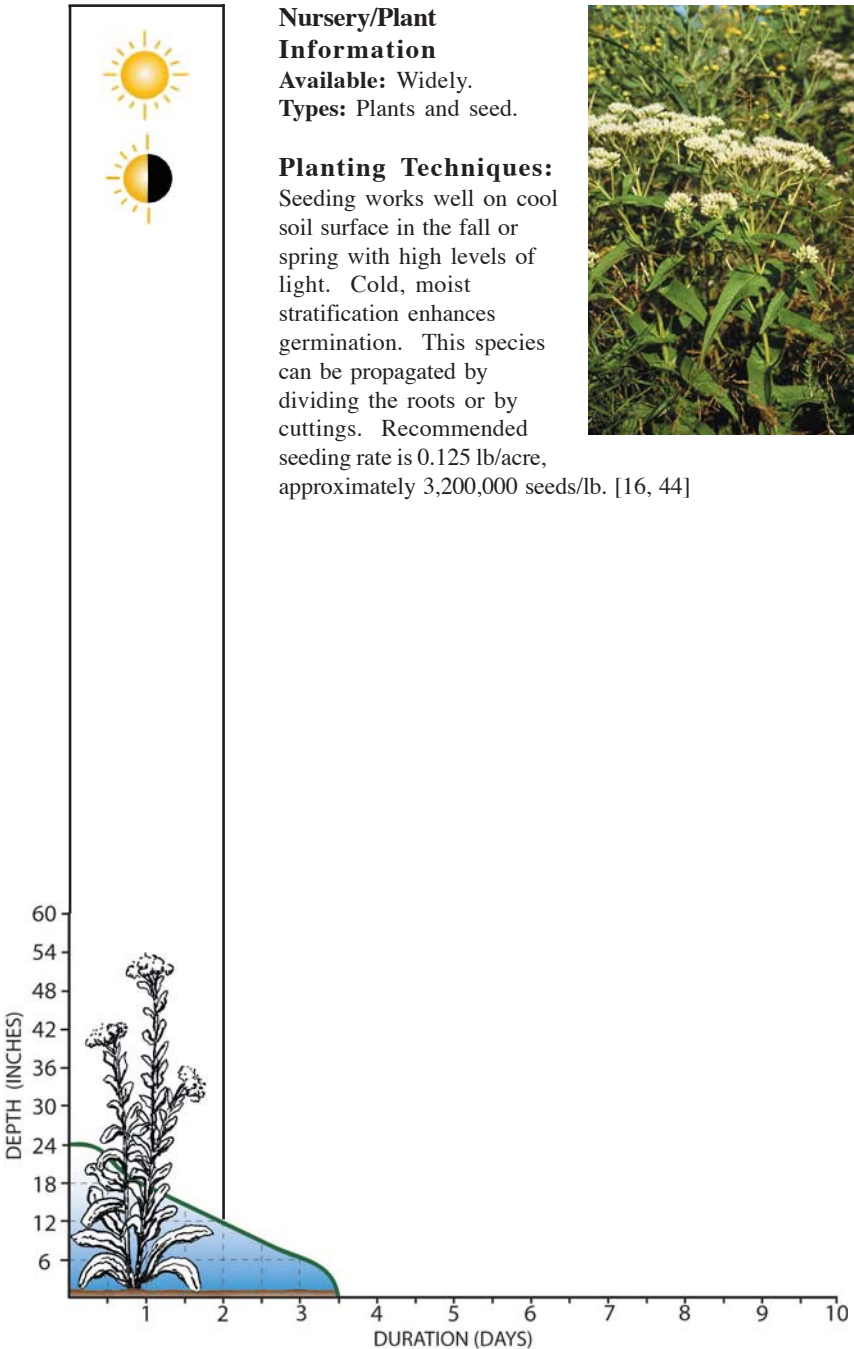
**Available:** Widely.  
**Types:** Plants and seed.

**Planting Techniques:**

Seeding works well on cool soil surface in the fall or spring with high levels of light. Cold, moist stratification enhances germination. This species can be propagated by dividing the roots or by cuttings. Recommended seeding rate is 0.125 lb/acre, approximately 3,200,000 seeds/lb. [16, 44]



Photo: Paul Jackson





## *Euthamia graminifolia*

**Grass-leaved Goldenrod** - a.k.a. *Solidago graminifolia* - Bushy, Fragrant, Common Flat-topped, or Flat-topped Goldenrod

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Shrub, wet meadows, low prairies, springs, fens, swamps, interdunal wetlands, and stream banks (often where sandy or gravelly; also weedy in abandoned fields). [7, 17] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Nfld. and Que. to B.C., s. to Va., Ala., Tex. and N.M. [7, 21]

### **Description**

**General:** An erect, native, perennial herb that grows 1-3' high. **Flower:** Yellow disk and ray flowers from July to October. It looks more like an aster than a typical goldenrod. **Leaf:** Alternate, linear-to-narrow, lance-shaped leaves usually 1-6" long with 3 veins. **Stem:** Erect stem that has many small, lance-like leaves, usually branched at head. **Fruit:** A finely haired achene. **Root:** Spreading by rhizomes. **Soil:** Prefers wet/saturated to moist gravelly or sandy soils. [7, 17]

### **Normal Water Level**

This species prefers wet/saturated to moist/upland conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Medium. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species has a moderate-to-low tolerance to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun. **Salt:** Moderate. **Nutrient:** Low. **Siltation:** Low, from 0-8 cm/year. **Insect:** Infrequent. **Other:** This species has a moderate-to-high tolerance to general disturbance and stress. [1, 46]

### **Design Considerations**

A good restoration plant for old fields and meadows, wet prairies, fens and stream banks. Its root system helps resist erosion. A good plant for rain gardens due to its ability to withstand flooding and dry soils. **Concerns:** This species can spread quickly from rhizomes and become weedy.

### **Wildlife Use**

This species provides food and habitat for mice, rabbits, deer, grouse, bees and other insects. [21]

### **Nursery/Plant Information**

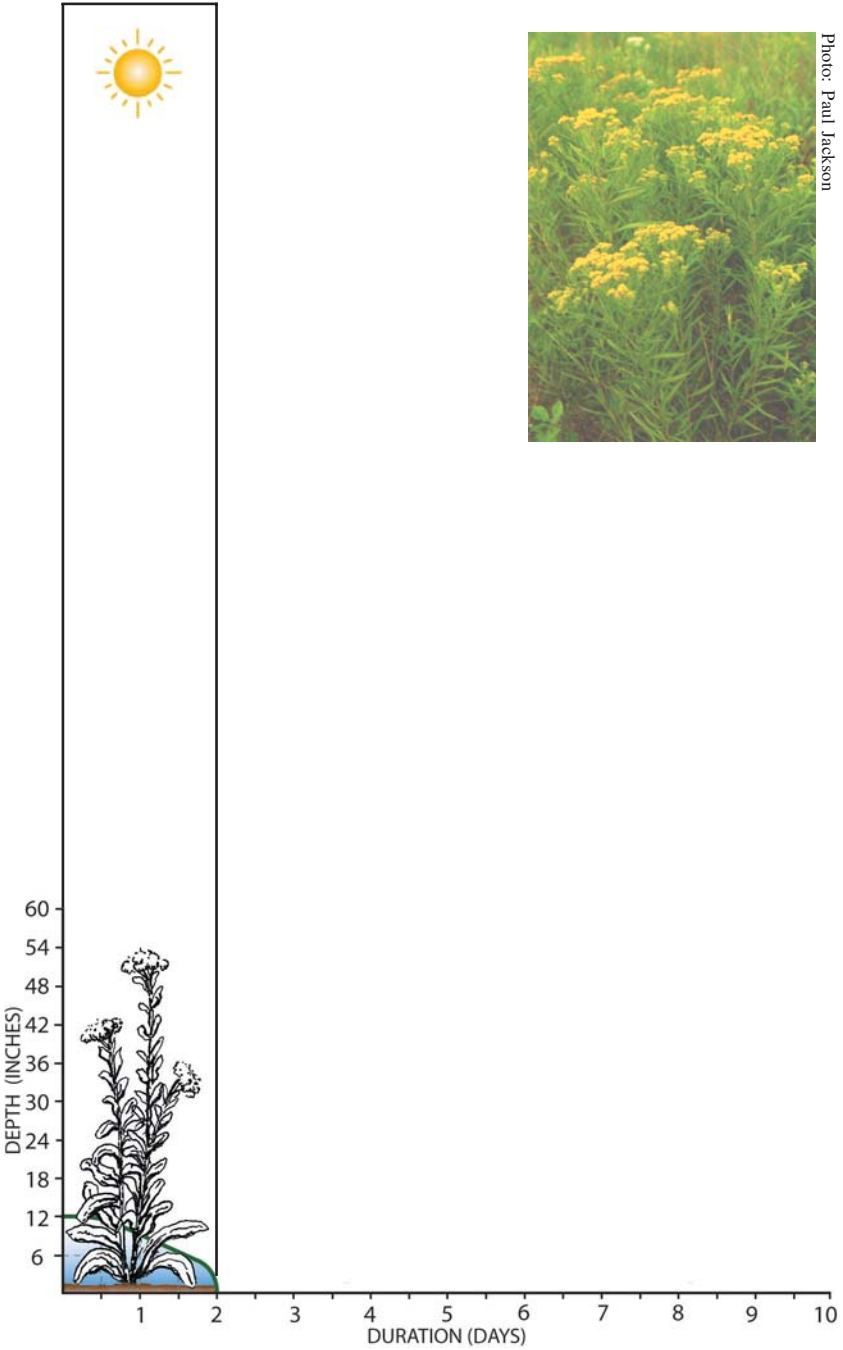
**Available:** Limited. **Types:** Plants and seed.

### **Planting Techniques**

This species should be planted with other aggressive species such as native grasses. There are 350,000 seeds/oz.

Indicator Status: FACW-

Photo: Paul Jackson





## *Fraxinus nigra*

**Black Ash - a.k.a. Basket Ash, Hoop Ash**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Flood plain forest, wooded or cedar swamps, peat bogs, edge of bogs, along streams, low lake margins, alluvial flats and wet depressions in forests. [7, 11, 22, 36] **Range:** All but sw. Minn. (Eco-Range: 1, 2, 4-8), Wis., Mich. Nfld. and Que. to Man., s. to Del., W.Va., Ind. and Iowa. [7, 21]

### **Description**

**General:** A stout-twigged, deciduous tree with narrow, rounded crown of upright branches 50-75' tall and 35-50' wide. **Flower:** 1/8" long, purplish flower during April and May before the leaves emerge. Male and female flowers are on separate trees. **Leaf:** Opposite and pinnately compound 12-16" long. Leaflets number 7-11 and are 1-2½" long, toothed, sessile and paired (except at end). Leaf scars are nearly circular. Dark green above, paler beneath, with tufts of rust-colored hairs along midvein, and a burgundy-purple fall color. One of the last species to leaf out in the spring. **Bark:** Gray, corky, furrowed into soft, scaly plates that rub off easily. **Twigs:** Branches are circular, gray, stout, becoming hairless. **Fruit:** Flat samaras, 1-1½" long wing to the base, and blunt on both ends that hang in clusters and matures in late summer. **Root:** Very shallow and wide-spreading roots. **Soil:** Prefers lowland wet soils, though will tolerate most soils and a pH of 4.6-6.5. [7, 11, 22, 36, 37]

### **Normal Water Level**

This species prefers upland moist to wet/saturated conditions. [21, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 60". **Duration:** Long – 5 days (decreasing 12"/day). This species is tolerant of both seasonal and irregular inundation and somewhat tolerant to flood duration. [1, 22, 37]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun to part shade. **Salt:** High. **Nutrient:** Low. **Siltation:** Moderate. **Insect:** Frequent – oystershell scale, ash borer. **Other:** This species is resistant to 2,4-D, lighting, drought, heat, mine spoils and soil compaction. It is frequently damaged by wind and ice and is susceptible to leaf spot, anthracnose, rust and canker. It has a moderate to low tolerance to general disturbance and stress. [1, 22, 37]

### **Design Considerations**

A good species for lake edges, restorations of wooded swamps and other wooded wetlands. It is a tough species that can tolerate many adverse conditions. **Concerns:** A couple of cultivars exist.

### **Wildlife Use**

Black ash provides seeds for a number of birds (especially wood ducks, turkeys, bobwhites, red-winged blackbirds, cardinals, purple finches, and pine grosbeaks), sap for yellow-bellied sapsuckers, and nesting habitat for mourning doves and evening



**Indicator Status:** FACW+

grosbeaks. It also provides habitat for deer, moose, beavers, porcupines, squirrels and rodents. [21, 22, 32, 37]

**Nursery/Plant Information**

**Available:** Becoming more widely available.

**Types:** Bareroot, balled-and-burlapped and potted stock.

**Planting Techniques**

Black ash is readily transplanted in spring or autumn with care. [22]

**Additional Notes**

The circular leaf scars and flat samaras winged to the base of black ash distinguish it from the half circle leaf scars and flat, winged wedge-shaped samaras of green ash. Black ash takes its name from its dark brown heartwood. [11, 36]

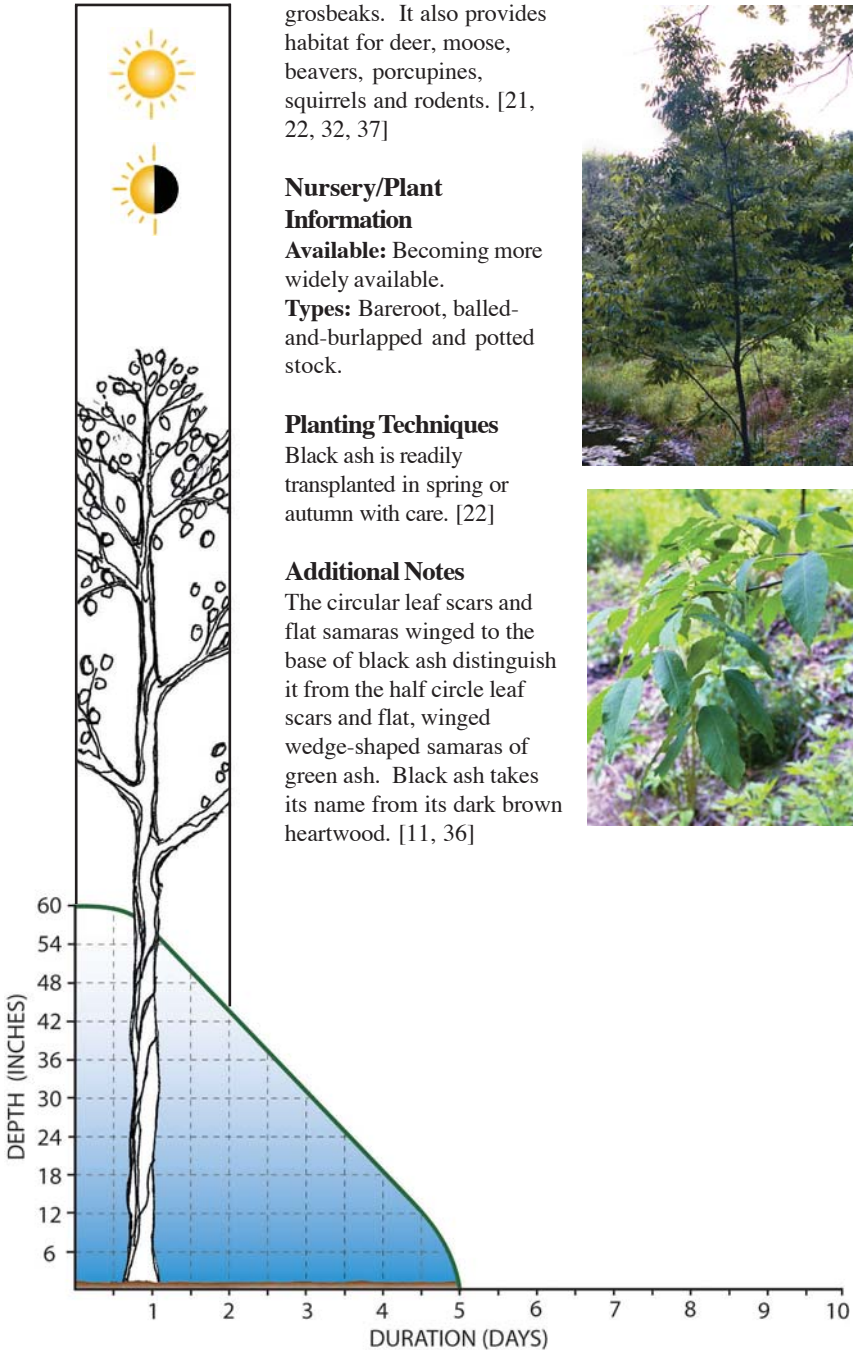


Photo: Rusty Schmidt

Photo: Rusty Schmidt





## *Fraxinus pennsylvanica*

Green Ash - a.k.a. *F. pennsylvanica subintegerrima*, *F. pennsylv lanceolata* -

Swamp Ash, Water Ash

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Flood plain forests, swamps, shores, lake edges, stream banks, Midwest windbreaks and farmstead plantings. [7, 11, 22, 36, 44] **Range:** Minn. (Eco-Region: All), Wis., Mich. N.S. and Que. to Alta., s. to Fla. and Tex. [7, 21]

### Description

**General:** Early successional, deciduous tree with a height of 50-75' and width of 35-50'. Trees have dense, rounded or irregular crowns of shiny green foliage; fast growing on dry soils. **Flower:** Small clusters of many yellow flowers that bloom before leaves in early spring. Male and female flowers are on separate trees. **Leaf:** Opposite, pinnately compound, shiny green above, green or paler and slightly hairy beneath; turn yellow in autumn. The leaflets number 5-9 (usually 7) and are toothed, slightly petioled and 2-5" long. The leaf scars are in a half circle. **Bark:** Furrowed in a very tight, regular diamond pattern of crisscrossing ridges with reddish inner layer. **Twigs:** Smooth and round, becoming gray and hairless. **Fruit:** A wedge-shaped samara, with a round or somewhat round body and a flat 1¼-2¼" long wing that is yellowish and hangs in clusters that mature in late summer and autumn. **Root:** Shallow, fibrous roots. **Soil:** It tolerates most soil types, although it prefers moist alluvial soils of sand to sandy loam and a pH range of 6.1-7.5. This species may be found in rich, upland habitats. [7, 8, 11, 22, 36, 44]

### Normal Water Level

This species prefers upland moist to wet/saturated conditions, although it will tolerate dry, rich, upland soils. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 60" in spring and 24" in summer. **Duration:** Long for spring, medium long for summer – 10 and 4 days, respectively (decreasing 6"/day in spring and 12" over 2 days in summer). This species has a high flood tolerance in spring, especially at the thaw and rainy season. It has a tolerance to irregular inundation throughout the rest of the year. Adults are very tolerant to flood depth increases; seedlings are moderately tolerant. [1, 8, 22, 44]

### Sensitivities or Other Tolerances

**Exposure:** Not much shade; full to part sun. **Salt:** Moderate. **Nutrient:** High. **Siltation:** High. **Insect:** Frequent – ash borer, oystershell scale, brown headed ash sawfly, lilac leaf minor, lilac borer. **Other:** Green ash is resistant to 2,4-D, lighting, drought, heat, alkaline soils, mine spoils and soil compaction. It is the most tolerant of the ashes. It is damaged by wind and ice and is sensitive to SO<sub>2</sub> and O<sub>3</sub>. It has a moderate tolerance to general disturbance and stress. [1, 2, 8, 10, 22, 25, 37, 44]

### Design Considerations

Green ash is one of the more common shade trees being planted because of its toughness and ease of growth. It is used for restorations of wet depressions, flood plain forests, stream bank stabilization, slope buffers and shelterbelts. It thrives along roads, streets, and restrictive urban landscapes. **Concerns:** Green ash may be

## Indicator Status: FACW

overplanted. It is often used in place of slower-growing species such as hard maples and oaks. [11, 36, 44]

### Wildlife Use

The twigs and seeds provide forage for many mammals like deer, beavers and mice.

This ash also provides habitat for many bird species (especially wood ducks, turkeys, bobwhites, red-winged blackbirds, cardinals, purple finches and pine grosbeaks), sap for yellow-bellied sapsuckers, and nesting habitat for mourning doves and evening grosbeaks. Fallen logs provide habitat for amphibians, reptiles and insects. [21, 22, 32, 37, 44]

### Nursery/Plant Information

**Available:** Widely. **Types:** Balled-and-burlapped, potted and bareroot stock.

### Planting Techniques

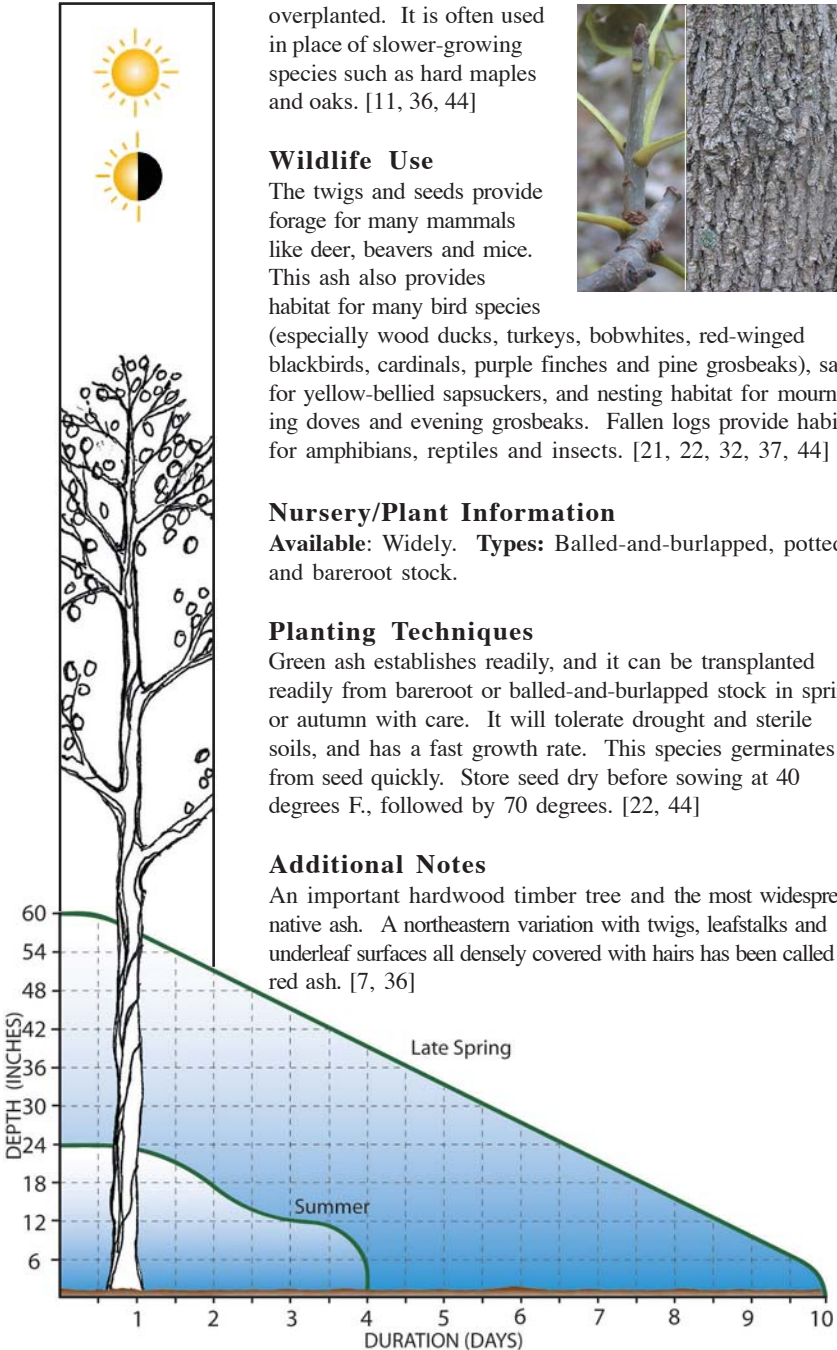
Green ash establishes readily, and it can be transplanted readily from bareroot or balled-and-burlapped stock in spring or autumn with care. It will tolerate drought and sterile soils, and has a fast growth rate. This species germinates from seed quickly. Store seed dry before sowing at 40 degrees F., followed by 70 degrees. [22, 44]

### Additional Notes

An important hardwood timber tree and the most widespread native ash. A northeastern variation with twigs, leafstalks and underleaf surfaces all densely covered with hairs has been called red ash. [7, 36]



Photo: www.cala2.unm.edu/





# *Galium boreale*

Northern Bedstraw - a.k.a. Snow Bedstraw

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Stream banks, shores, thickets, swamps, common along roads and wet-to-moist meadows (also in drier woods and fields). It usually grows in well-drained, open places. [7, 16, 35, 41] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Circumboreal, s. to Del., Ky., Mo. and Calif. [7, 21]

## Description

**General:** Northern bedstraw is a native, perennial herb standing 10-36". It often grows in large clumps and is an impressive sight when in bloom. **Flower:** Small, rather showy, 4-petaled, white flowers in a dense cluster (1-3" wide) at the top of the square stem. The flowers are sweet scented, and each flower is ¼" wide and blooms from June to July. **Leaf:** Elongate, without teeth, and in whorls of 4. Each leaf is very narrow, ¼" wide, linear, ¾-2" long, with a minutely rounded end and 3-nerved. **Stem:** A square-stemmed plant with many smooth stems that are commonly short-bearded just beneath the nodes. Sterile axillary branches with smaller leaves often develop. **Fruit:** Fruit with 2 carpels, 1-seeded, 2 mm, smooth or with short, straight or curled (not hooked) hairs. **Root:** Rhizomes. **Soil:** A variety of not-too-dry soils, though prefers old fields. [7, 35, 41]

## Normal Water Level

This species prefers upland moist to wet/saturated conditions, although it will tolerate some drought. [21]

## Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 1 day (decreasing 12" in 1 day). This species is somewhat tolerant to flood duration. [1]

## Sensitivities or Other Tolerances

**Exposure:** Full sun to partial sun. **Salt:** Unknown. **Nutrient:** Low.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species is moderately low in tolerance to general disturbance and stress. [1, 47]

## Design Considerations

This species may be used in landscapes or rock gardens as a ground cover and provides good cutflower. **Concerns:** It may become overly aggressive due to its rhizomonous spread, though this may be preferred in some situations to compete with non-native species. [16]

## Nursery/Plant Information

**Available:** Limited. **Types:** Plants and seed.

## Planting Techniques

No seed treatment is needed, and this species divides well. Approximately 1,008,000 seeds/lb. [16]

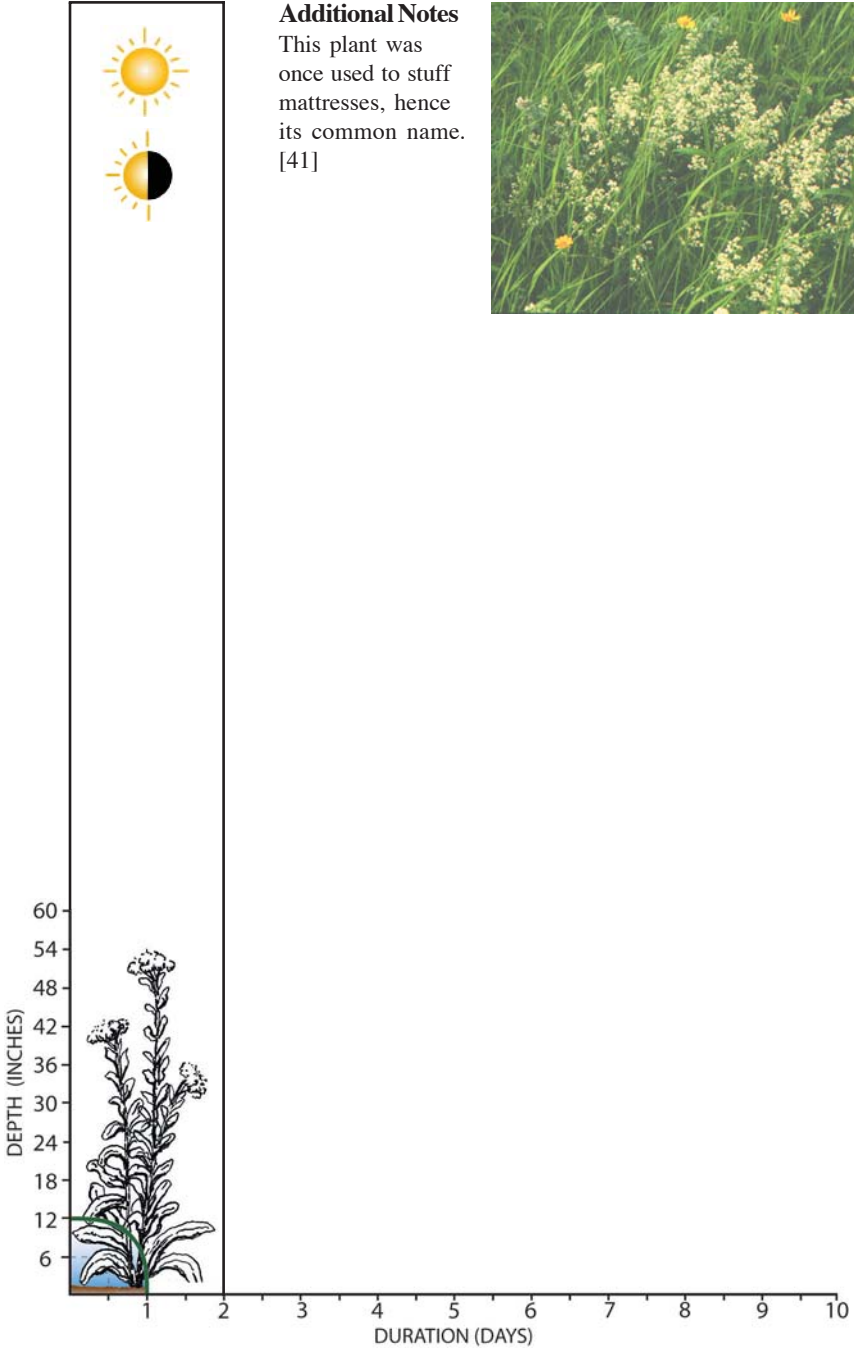
**Indicator Status: FAC**

**Additional Notes**

This plant was once used to stuff mattresses, hence its common name. [41]



Photo: Paul Jackson





# *Gentiana andrewsii*

**Bottle Gentian** - a.k.a. **Prairie, Closed Blue or Blind Gentian**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Wet meadows, swamps, wet woods, mesic savannas, thickets, low prairies, shores and ditches. It is found in moist, undisturbed open or somewhat shaded areas, especially along railroad beds and old fields. [7, 16, 35, 41] **Range:** Minn. (Eco-Region: All), Wis., Mich. Que. to Man., s. to N.J., N.C., Ohio, Mo. and Neb. [7, 21]

## **Description**

**General:** A beautiful, slow-growing, native, perennial herb that is usually 1-2' tall. It has maroon-to-bronze fall color. **Flower:** Stems end in clusters of bottle-shaped, 1- to 1½"-long, blue flowers. The top of the flower is closed or nearly so by 5 fused petals, making the interior available only to large insects such as bumblebees, which can push the petals apart. Blooms August-October in second year if competition is minimized. **Leaf:** Toothless opposite, lance-shaped leaves with a pair of nerves in addition to the midrib. The leaf sides bend upward to form a trough. **Stem:** Upright simple stems. **Fruit:** Papery pod, roughly the size and shape of the flowers, contains hundreds of tiny, brown seeds. **Root:** Cluster of fleshy-fibrous to sometimes tuberous-thickened roots. **Soil:** Found in most soil types. [7, 35, 41]

## **Normal Water Level**

This species prefers upland mesic moist-to-wet/saturated conditions. [21]

## **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 1 day (decreasing 12" in 1 day).

## **Sensitivities or Other Tolerances**

**Shade:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Low.

**Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

## **Design Considerations**

A wonderful perennial for perennial gardens, rain gardens and rock gardens. It is used in restorations of prairies, wet meadows, lake edges, calcareous situations and ditches where it will be provided with enough sun the first growing season. It provides great cut and dried flowers. **Concerns:** It can be hard to establish in areas with significant competition. [16, 41]

## **Wildlife Use**

Bottle gentian is a good nectar source for bumblebees. [21, 35, 41]

## **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants. It does not start well from seed in competition.

**Indicator Status: FACW**

**Planting Techniques**

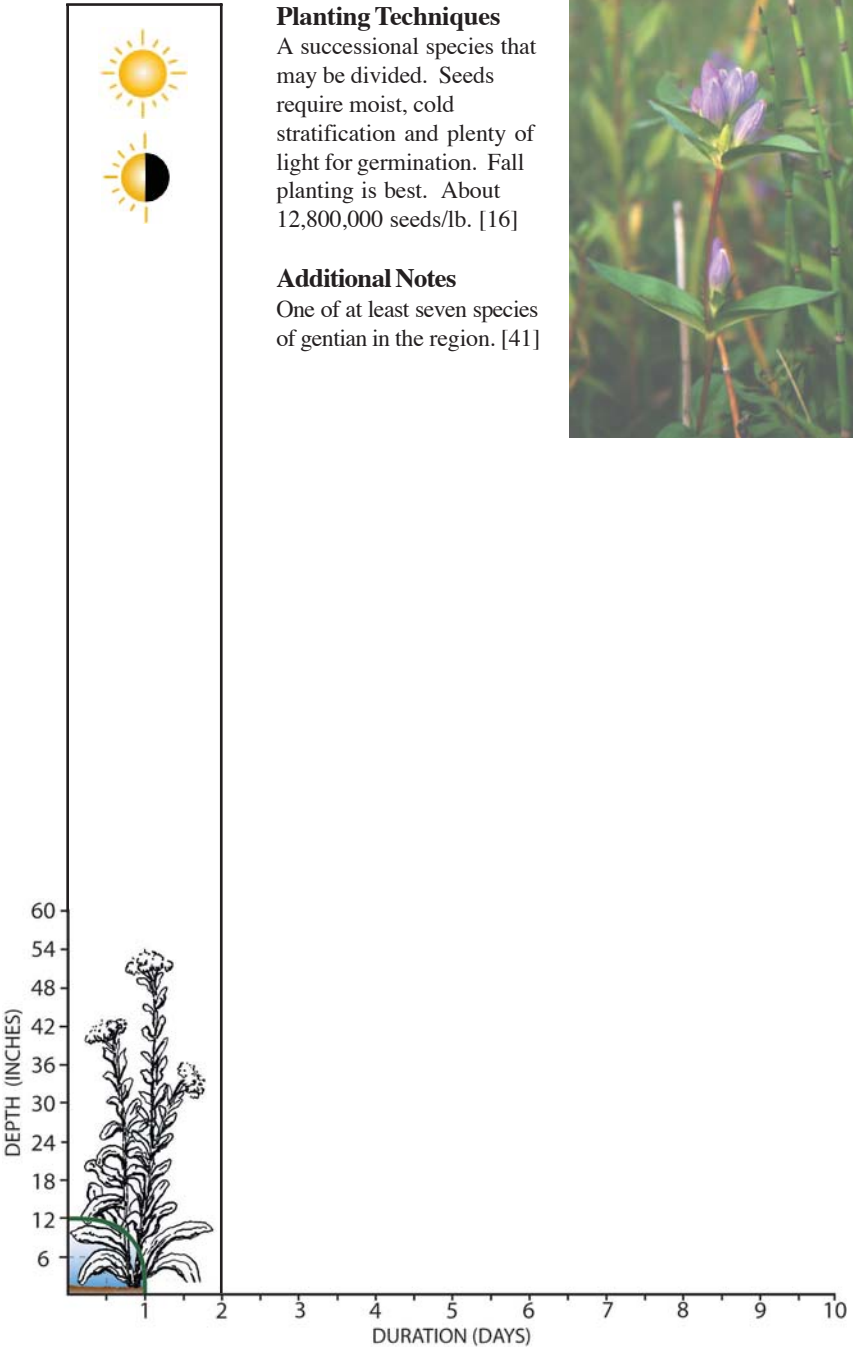
A successional species that may be divided. Seeds require moist, cold stratification and plenty of light for germination. Fall planting is best. About 12,800,000 seeds/lb. [16]

**Additional Notes**

One of at least seven species of gentian in the region. [41]



Photo: Paul Jackson





## *Glyceria grandis*

**Giant Manna Grass** - a.k.a. *Panicularia (Glyceria) grandis* -  
American, Reed, or Tall Manna Grass

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Shallow and deep marshes, fresh (wet) meadows, ditches, streams, lakes, ponds, open bogs, peatlands and fens (usually in shallow water and mud). [7, 11, 16] **Range:** Minn. (Eco-Region: All), Wis., Mich. Que. and N.S. to Alaska, s. to Va., Tenn., La., Neb., N.M., Ariz. and Wash. [7, 21]

### **Description**

**General:** Loosely clumped, perennial grass with culms growing 4-6' tall. Light-green-to-tan, cool-season plant. **Flower:** A large panicle 3" long. Spikelets each have 5-9 flowers. The lemmas are distinctly 7-ribbed and usually purple, blooming from June to August. **Leaf:** Long and flat, usually smooth underneath and rough on top and 1/3-1/2" wide. **Stem:** Clustered stout culms. **Fruit:** The seeds are rounded at the base and sharp at the point. **Root:** Rhizomes usually rooting from the lower nodes. **Soil:** Shallow water or wet ground of muddy shores, peat or bogs. [7, 11]

### **Normal Water Level**

This species prefers shallow water of 12" of inundation or less to wet/saturated conditions. [21, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Long – 8 days (decreasing 3"/day). Giant manna grass will tolerate regular inundation to saturation of 12" and has a moderate tolerance to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Unknown. **Insect:** Minor. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

### **Design Considerations**

Giant manna grass has been used for wetland restorations, especially in marshes, ditches and fens, where shallow water is constant or bounce is considerable. A good forage material for wildlife, and seems to increase with trampling and grazing. [14, 16]

### **Wildlife Use**

Giant manna grass provides good cover and food for waterfowl (especially wood ducks) and muskrats. It is grazed heavily by deer. [14, 32, 37]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants and especially seeds.

### **Planting Techniques**

Requires cold, moist stratification. Fall planting has better results. [16]

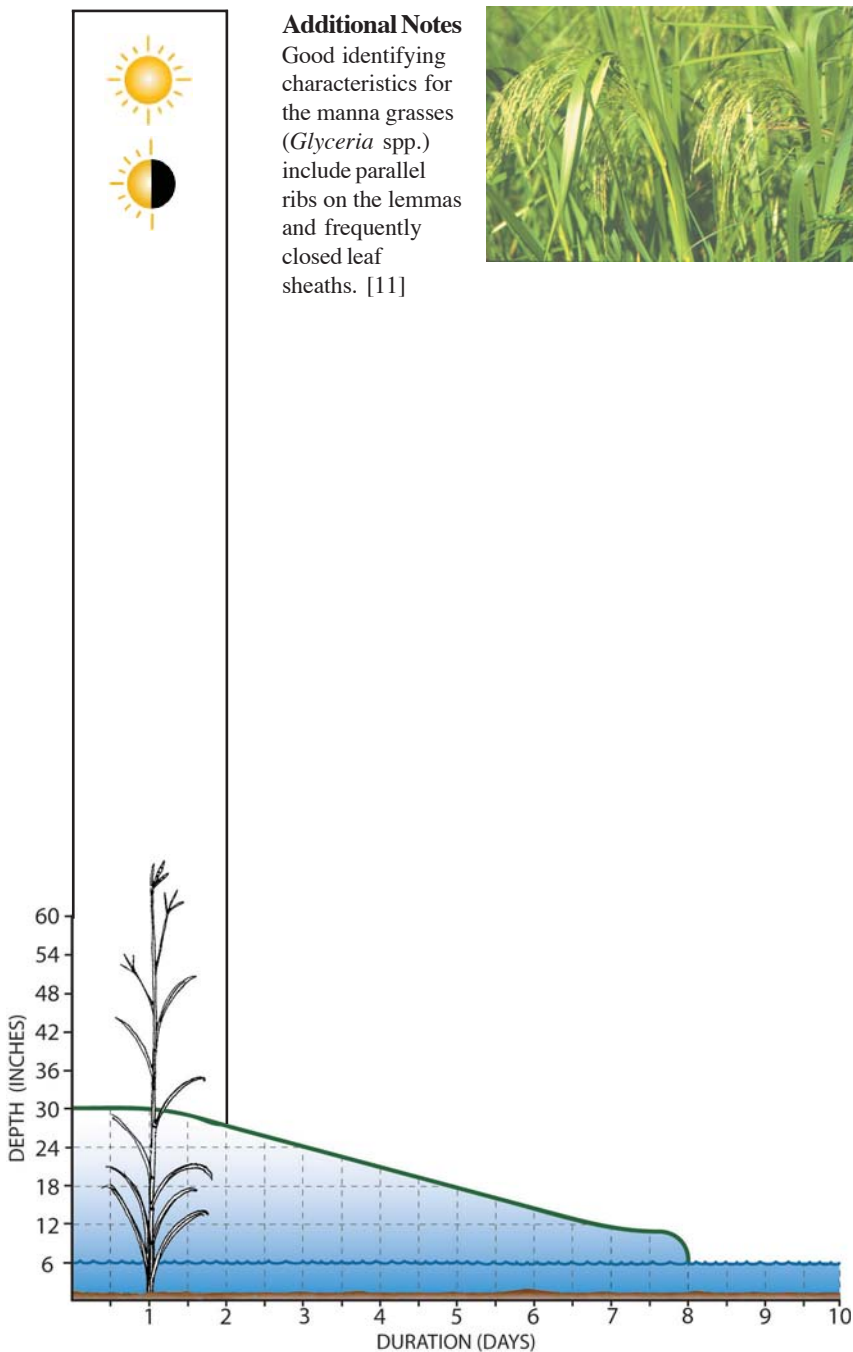
Indicator Status: OBL

**Additional Notes**

Good identifying characteristics for the manna grasses (*Glyceria* spp.) include parallel ribs on the lemmas and frequently closed leaf sheaths. [11]



Photo: Paul Jackson







# *Glyceria striata*

**Fowl Manna Grass - a.k.a. Fowl-Mannagrass**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Swamps, thickets, low areas in forests, wet savannas, wet meadows, springs, lakeshores and streambanks. [7, 16, 17] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Nfld. and Labr. to B.C., s. to Fla., Tex. and Calif. [7, 21]

## **General Description**

**General:** Loosely clumped, perennial, cool-season grass that is 1-4' tall and pale green. **Flower:** An open, loose panicle, 4-8" long and drooping. Ovate spikelets, often purplish, 3-7 flowered from June to August. **Leaf:** Greenish or purplish with slender, flat blades or folded, smooth, 1/16-1/4" wide with smooth sheaths. **Stem:** Erect, slender, 12-40" long. **Fruit:** Light brown achene from July to August. **Root:** Erect or decumbent at base and often rooting from the lower nodes. **Soil:** Moist, saturated, shallow water in most soil types. [7, 8, 44, 47]

## **Normal Water Level**

This species prefers innudated conditions of 3 to 6". [21, 44]

## **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Long – 8 days (decreasing 3"/day). Giant manna grass will tolerate regular inundation to saturation of 12" and is somewhat tolerant to flood duration. [1, 8]

## **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species has a low tolerance to general disturbance and stress. [1, 8, 44, 47]

## **Design Considerations**

Fowl manna grass has been used for wetland restorations, especially in marshes, ditches and fens, where shallow water is constant or bounce is considerable. It is a good pioneer species for vegetated swales, stream banks and shorelines. A cool-season grass that bunches, fowl manna grass is a good forage material for wildlife, and seems to increase with trampling and grazing. **Concerns:** This species establishes well from seed, though it is not very competitive with non-natives, such as reed canary grass. [16, 44]

## **Wildlife Use**

This species provides good cover and food for waterfowl (especially wood ducks) and muskrats. Grazed heavily by deer. [6, 32, 37, 44]

## **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants and seeds, although there may not be a local ecotype.

Indicator Status: OBL

### Planting Techniques

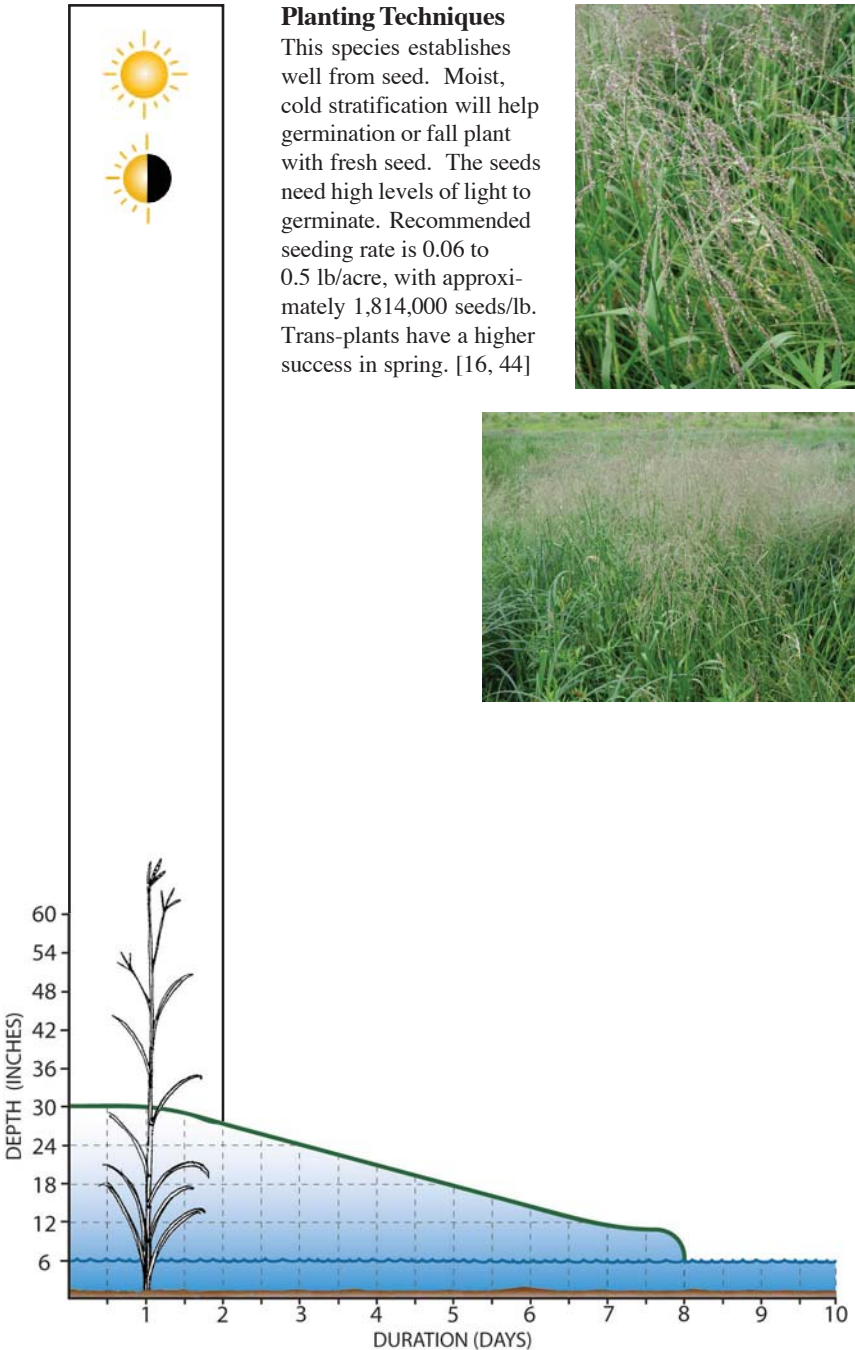
This species establishes well from seed. Moist, cold stratification will help germination or fall plant with fresh seed. The seeds need high levels of light to germinate. Recommended seeding rate is 0.06 to 0.5 lb/acre, with approximately 1,814,000 seeds/lb. Trans-plants have a higher success in spring. [16, 44]



Photo: Rusiy Schmidt



Photo: Rusiy Schmidt





## *Helenium autumnale*

Sneezeweed - a.k.a. Common Sneezeweed, False or Swamp Sunflower

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadows, sedge meadows, wet prairies, shores, stream banks, marshes, fens and tamarack swamps. It is often found along streams in large, dense clumps. [7, 11, 16, 35, 41, 44] **Range:** All but ne. Minn. (Eco-Region: 3-9), Wis., Mich. Que. to B.C., s. to Fla. and Ariz. [7, 21]

### Description

**General:** Native, perennial herb that grows 3-5'. **Flower:** Reduced, yellow ray flowers with 3 teeth; blooms from August to November. The numerous flower heads have raised, nearly globular centers and wedge-shaped, yellow rays. **Leaf:** Well-developed, alternate, flat, elongate leaves, the bases of which extend down the stem as flanges or wings. The leaf is stalkless, ½-1" wide and 3-6" long, with widely spaced teeth. **Stem:** Often the stems are clumped and are usually winged. **Fruit:** Achenes 4-to-5-angled, with as many intermediate ribs; pubescent on the angles and ribs. **Root:** Fibrous root system. **Soil:** The pH range is 6.0-7.0. Moist, low ground of many soil types. [7, 11, 35, 41, 44]

### Normal Water Level

This species prefers moist-to-wet/saturated conditions. [21, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). Sneezeweed will tolerate brief inundation like that found in wet prairies, fens and sedge meadows. [1, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** Moderate. **Nutrient:** Moderate to high. **Siltation:** Moderate to high. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 44, 47]

### Design Considerations

Sneezeweed is a wonderful plant for wetlands and landscape designs. It has a fibrous root system that is beneficial in stabilizing stream banks, shores and vegetated swales. It can provide cut and dried flowers. **Concerns:** It tends to be aggressive and forms large clumps, although that characteristic may be desirable to deter other invasive or non-native species during establishment. Many cultivars are available. [16, 44]

### Wildlife Use

This species provides seeds for songbirds and upland gamebirds. It is a butterfly attractant and provides cover for many species. [16, 21, 44]

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and plants.

Indicator Status: FACW+

### Planting Techniques

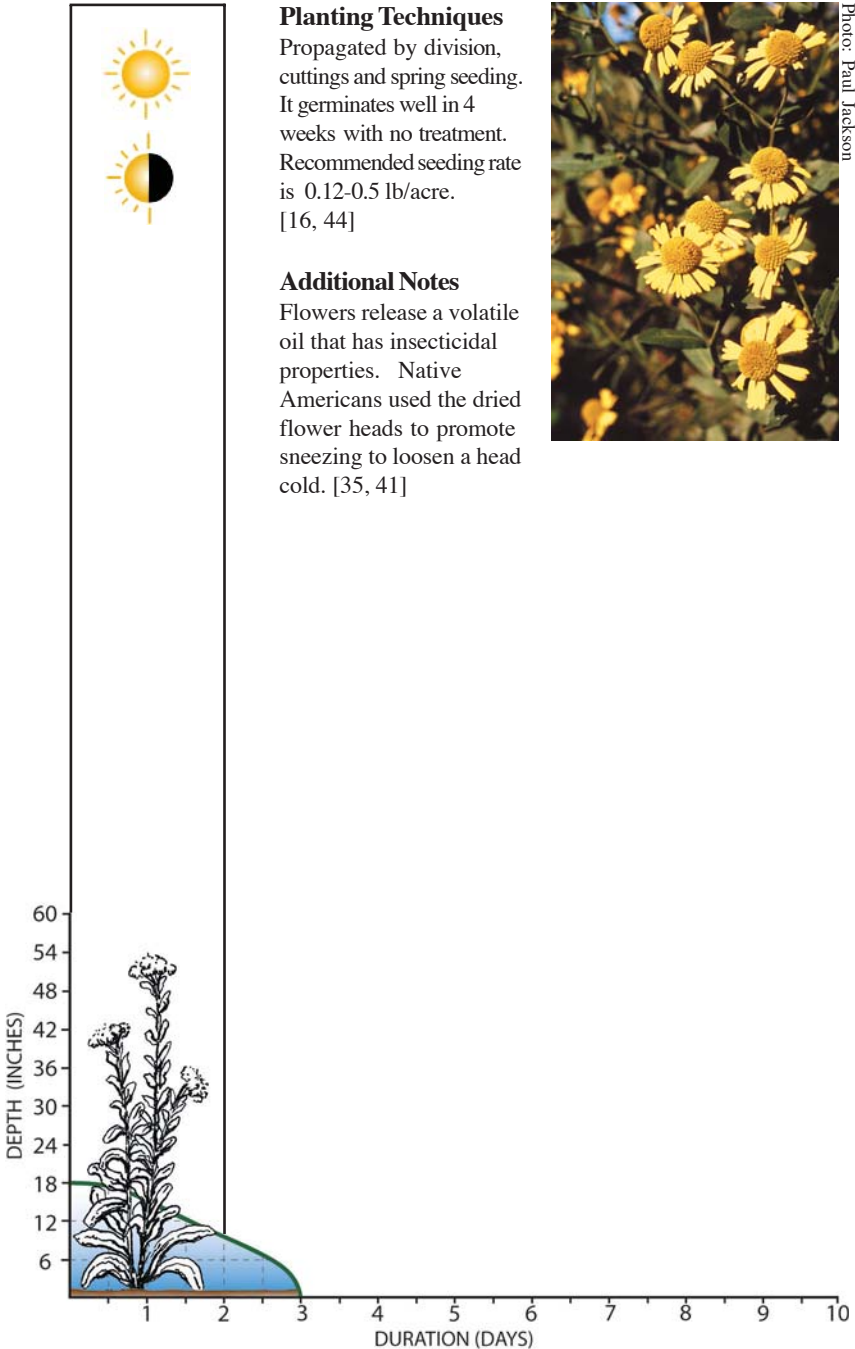
Propagated by division, cuttings and spring seeding. It germinates well in 4 weeks with no treatment. Recommended seeding rate is 0.12-0.5 lb/acre. [16, 44]

### Additional Notes

Flowers release a volatile oil that has insecticidal properties. Native Americans used the dried flower heads to promote sneezing to loosen a head cold. [35, 41]



Photo: Paul Jackson





# *Helianthus grosseserratus*

Sawtooth Sunflower - a.k.a. Serrated Sunflower

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadows, sedge meadows, low prairies, stream banks, swamps, ditches and roadsides. It also occurs along disturbed streambanks and in old fencerows. [7, 11, 16, 44] **Range:** Common; Minn. (Eco-Region: All), Wis, mostly s. LP of Mich. N.Y. to Sask., s. to Ark. and Tex.

## Description

**General:** A stately, perennial sunflower that produces an abundance of heads and stands up to 12' tall. **Flower:** Both yellow-to-cream ray and disc flowers are present from July to October. The conspicuous ray flowers are deciduous and sterile, whereas the disc flowers are perfect and fertile. **Leaf:** Lanceolate, sharply toothed leaves are densely hairy below and are often supported by winged leaf stalks and are alternate on the middle to upper stem. Basal leaves are absent or inconspicuous. **Stem:** Essentially without hairs below the inflorescence. **Fruit:** Achenes which are thick, moderately compressed at right angles to the involucellate bracts. **Root:** Coarse, fleshy, tuberous; spreading by elongate rhizomes and forming colonies. **Soil:** Prefers rich, moderately moist soil. [7, 11, 44]

## Normal Water Level

This species prefers moist-to-wet/saturated conditions, though it has been found in dry soils. [21, 44]

## Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). This species will tolerate seasonal inundation to greater levels. [44]

## Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Moderate. **Sitation:** Moderate. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 44, 47]

## Design Considerations

Sawtooth sunflower is a good pioneer species that self sows and grows from rhizomes quickly. It has been used for soil stabilization of vegetated swales and shores.

**Concerns:** Because this species self seeds and spreads by rhizomes, it can become weedy. This characteristic may be desirable if invasive plants are a concern. [16, 44]

## Wildlife Use

This sunflower, like many others, has large, nutritious seeds that are eaten by gamebirds (mourning doves, sharp-tailed grouse, pheasants and bobwhites) and songbirds (red-winged and yellow-headed blackbirds; crossbills; crows; eastern goldfinches; and English, Lincoln, savannah, vesper and white-crowned sparrows). It also provides nectar and pollen for bees and other insects. It is a host plant for the Gorgone checkerspot butterfly. Mammals that use this plant are the 13-lined ground squirrel and pocket gopher. [21, 32, 44]

Indicator Status: FACW-

### Nursery/Plant Information

**Available:** Widely.  
**Types:** Seeds and plants.

### Planting Techniques

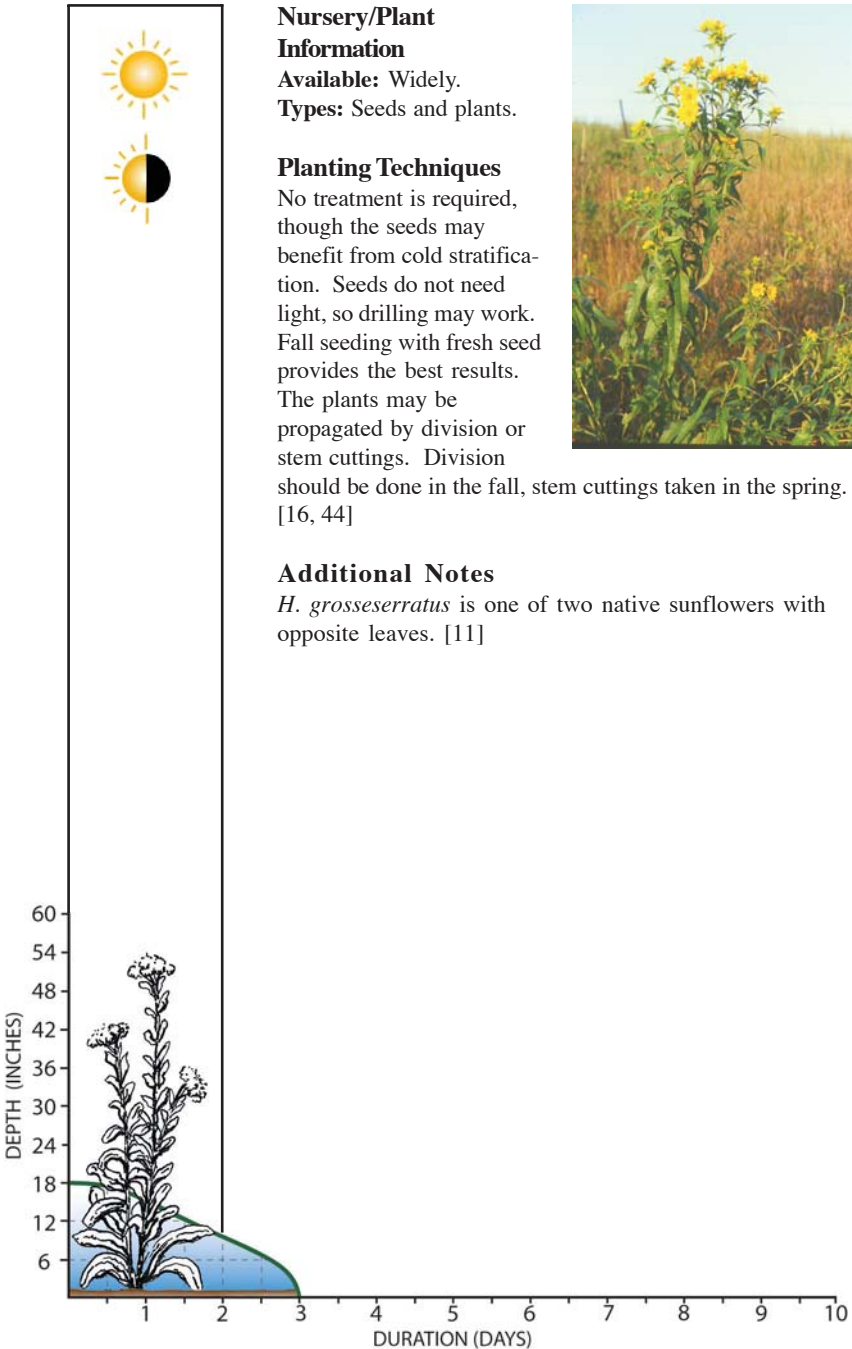
No treatment is required, though the seeds may benefit from cold stratification. Seeds do not need light, so drilling may work. Fall seeding with fresh seed provides the best results. The plants may be propagated by division or stem cuttings. Division should be done in the fall, stem cuttings taken in the spring. [16, 44]

### Additional Notes

*H. grosseserratus* is one of two native sunflowers with opposite leaves. [11]



Photo: Paul Jackson





## *Heuchera richardsonii*

**Prairie Alumroot** - a.k.a. Alum Root, Richardson's Alumroot, Prairie Coralbells

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Mesic and dry prairies, open woods, along roads, fields and rock outcroppings. [16, 17, 35, 41] **Range:** Minn. (Eco-Region: All), Wis., sc. Mich. Mich. and nw. Ind. to nw. Ark. and ne. Okla., w. and n. to Colo. and Alta. Upper Midwest and Great Plains. [17, 21]

### **Description**

**General:** Native, perennial herb 2-3' tall. **Flower:** The irregularly shaped green or brownish flowers are perfect, ¼" wide, on a tall, thin, leafless stalk; blooms from spring to summer. **Leaf:** A clump of basal leaves with rounded or heart-shaped blades, 3-4" wide, that are lobed and on a hairy stalk. Each leaf is coarsely toothed and made up of 3-5 lobes. An excellent foliage plant with burgundy-tinged leaves. **Stem:** Usually 2-3' tall. **Fruit:** Capsule 2-beaked. **Root:** Short rhizome. **Soil:** Mesic-dry sand/loam soils. [17, 35, 41]

### **Normal Water Level**

This species prefers mesic-to-dry conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 6". **Duration:** Short – 1 day (6" in 1 day). This species needs well-drained soils if flooded further.

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Low. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

### **Design Considerations**

Prairie alumroot has been used in rock gardens as an accent plant and in garden borders. It has beautiful foliage. It can be used in rain gardens with shallow inundation that dissipates quickly. **Concerns:** This plant grows low to the ground and is vulnerable to competition. [16]

### **Wildlife Use**

Prairie alumroot provides habitat for birds and animals.

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Seeds and plants.

### **Planting Techniques**

Fresh seed is needed for this species to be successfully germinated. It requires cool soils and significant light. It can be divided easily. Approximately 12,800,000 seeds/lb. [16]

Indicator Status: FAC-

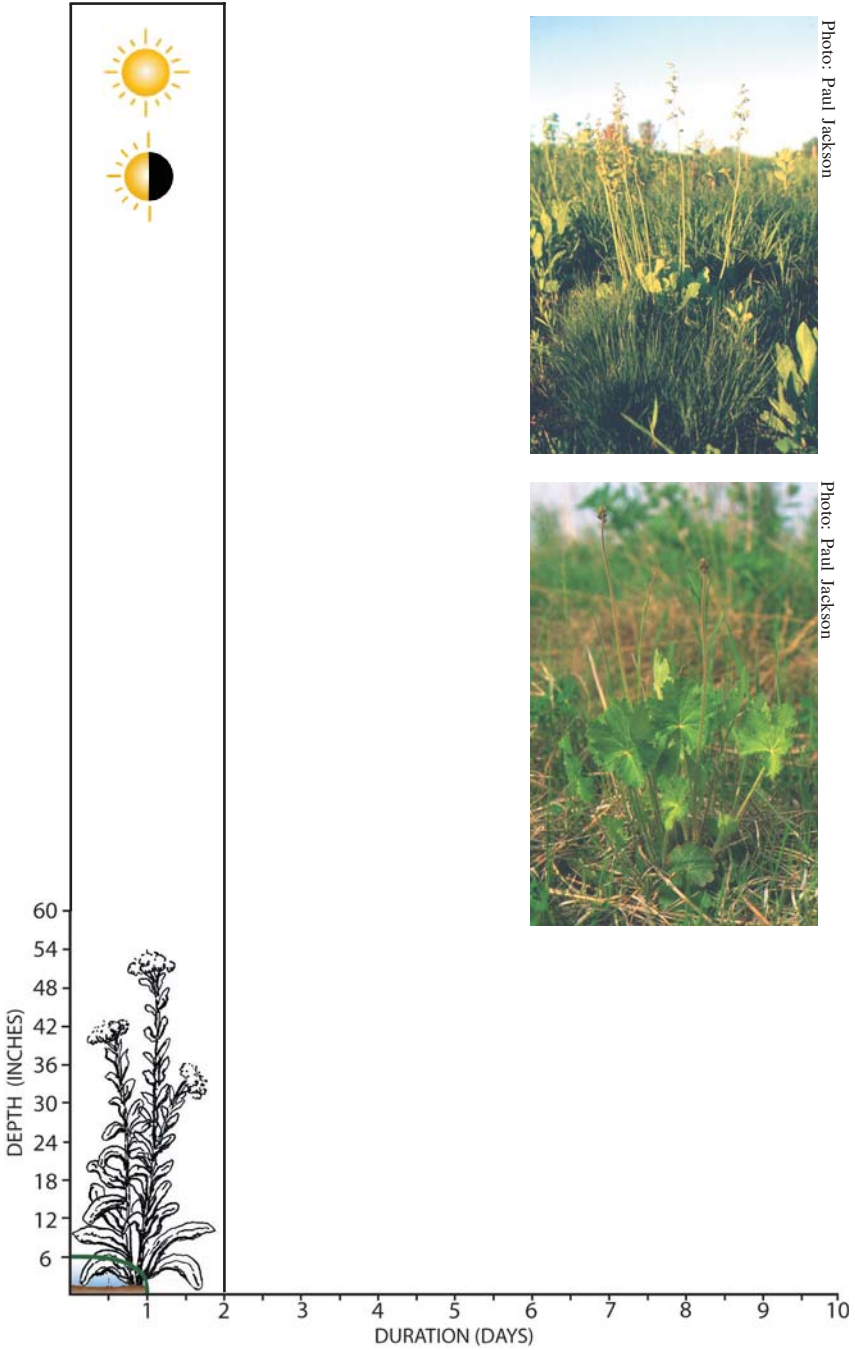


Photo: Paul Jackson

Photo: Paul Jackson





## *Ilex verticillata*

Winterberry - a.k.a. Black Alder, Winterberry Holly or Michigan Holly

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Swamps, stream banks, swamp forests, thickets, seepage areas in woodlands, cypress swamps, moist woods at bases of bluffs, shores, peatlands and open bogs. [7, 22] **Range:** E. Minn. (Eco-Region: 1, 5-8), Wis., Mich. Nfld. and Que. to Ont. and Minn., s. to Md., Ind. and n. Ill. [7, 21]

### Description

**General:** Multi-stemmed shrub or small, rounded tree to 25', though typically 6-8' tall. **Flower:** Greenish white flowers in June. This species is dioecious – plants of both sexes are needed to produce fruit. **Leaf:** deciduous, alternate, round-to-oval, tapered to the tip, dull green above, paler below with numerous incurved teeth margins. **Bark/Stem:** Twigs are smooth and finely ridged. **Fruit:** Female plants bear many red berries that persist into winter and are poisonous to humans. **Root:** Fine, fibrous, shallow lateral roots. **Soil:** Although winterberry tolerates most soils, it prefers acidic soils (pH 4.5-6). [7, 22]

### Normal Water Level

This species prefers upland moist to wet/saturated conditions. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** Medium. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). Winterberry is very tolerant to both seasonal and irregular flooding and moderately tolerant to flood duration. [1, 8, 22, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Unknown. **Insect:** Scale. **Other:** Winterberry can be damaged by wind and ice. It is somewhat tolerant to lighting, drought and heat, though it is very tolerant to O<sub>3</sub> and soil compaction. It is also moderately tolerant to oil/grease. It has a moderate-to-low tolerance to general disturbance and stress. [1, 2, 8, 22, 37]

### Design Considerations

This species is used along lake edges, though it will tolerate most upland soils. It is an ornamental plant (gorgeous in winter) in moist landscapes and restorations of bogs, thickets, stream banks and peatlands. It will do well in rain gardens and other landscape designs. **Concerns:** At least 3-4 plants should be planted together to ensure the proper sex ratio for berry production. Berries are poisonous to humans. [32]

### Wildlife Use

Many songbirds, particularly hermit thrushes, mockingbirds, robins, catbirds, bluebirds and brown thrashers, use the fruit extensively. Ruffed grouse, turkeys, pheasants and yellow-bellied sapsuckers also use winterberry for food. Mammals, such as deer, bear, cottontail rabbits, raccoons, white-footed mice and squirrels, also use this species as a food source. [6, 21, 22, 32, 37]

**Indicator Status: FACW+**

**Nursery/Plant Information**

**Available:** Widely. **Types:** Potted and bareroot stock.

**Planting Techniques**

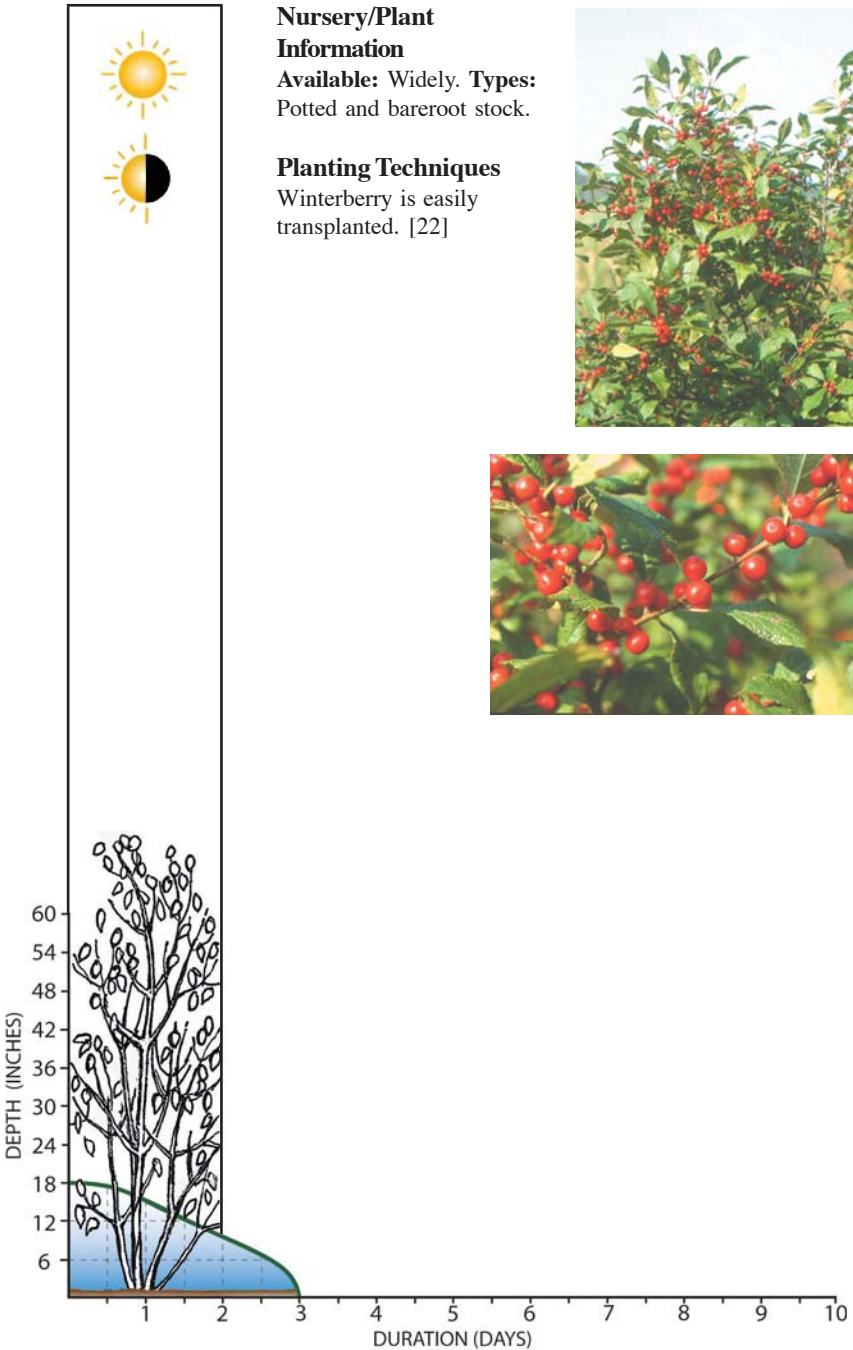
Winterberry is easily transplanted. [22]



Photo: Paul Jackson



Photo: Paul Jackson





## *Impatiens capensis*

**Jewelweed** - a.k.a. Touch-me-not, Spotted Touch-me-not, Orange Jewelweed

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Found in a wide variety of wetland habitats, including swamps, low areas in moist soils, flood plain forests, thickets, shrub-carrs, fresh (wet) meadows, stream banks, shores, marshes, springs and fens (often where disturbed). [7, 11, 16, 41]

**Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Nfld. and Que. to Sask., s. to Fla., Ala. and Tex. [7, 21]

### **Description**

**General:** Annual herb that grows 3-5' tall in wet areas. **Flower:** Pendent, conical, ¾-1" long, with a sharp-curved tube (spur) that curves forward. Flowers from June to September. Flower is usually orange-yellow with brown or reddish spots and a mouth that is half as wide as the flower is long. **Leaf:** Alternate, finely toothed, oval leaves, 1-4" long on petioles about 1/8" long. **Stem:** A succulent, smooth stem that is nearly translucent and contains a slippery juice that can be used to soothe the sting from nettles or poison ivy. **Fruit:** A thin, banana-shaped capsule that, when mature, pops open at the slightest touch (which gives this plant another common name, touch-me-not), throwing seeds in all directions. Within the seed's dark brown covering is a sky-blue seed. **Root:** Fibrous, shallow. **Soil:** Wet-to-mesic soils, though it prefers alluvial woodlands. [7, 11, 32, 41]

### **Normal Water Level**

This species prefers wet/saturated conditions, though will tolerate moist soils. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Long – 30 days (decreasing 6"/day for the first 2 days and then a total of 6" over the next 30 days). This species is somewhat tolerant to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun to shade. **Salt:** Low to moderate. **Nutrient:** Moderate. **Siltation:** High. **Insect:** Infrequent. **Other:** This species is tolerant to general disturbance and stress. [1, 45]

### **Design Considerations**

Jewelweed is an annual that can be used to revegetate an area quickly. It is an important nectar source. **Concerns:** Plants only live 1 year. [16]

### **Wildlife Use**

Jewelweed is an important nectar source for hummingbirds, orioles and bees. Gamebirds and mice eat the seeds. It provides cover for frogs and other reptiles. [21, 32, 41]

### **Nursery/Plant Information**

**Available:** Limited. **Types:** Seeds.

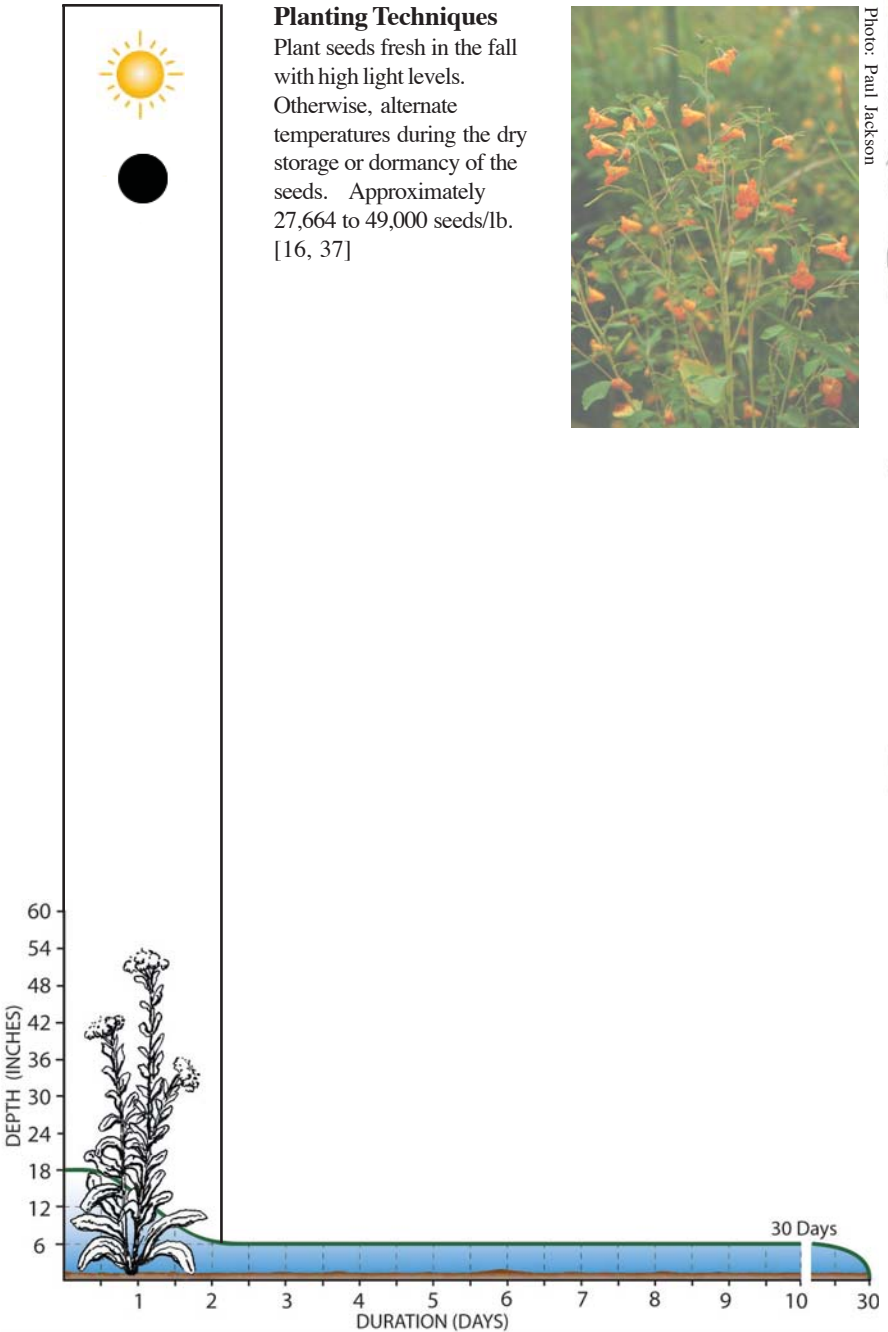
## Indicator Status: FACW

### Planting Techniques

Plant seeds fresh in the fall with high light levels. Otherwise, alternate temperatures during the dry storage or dormancy of the seeds. Approximately 27,664 to 49,000 seeds/lb. [16, 37]



Photo: Paul Jackson





## *Iris versicolor*

**Blueflag Iris** - a.k.a. Northern Blue Flag, Northern Iris, Blue Water Iris, Larger Blue Flag, Poison or Water-flag, Clajoux

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Marshes, shores, wet meadows, sedge meadows, open bogs, swamps, thickets, stream banks, shores, pond edges and wet depressions in forests (often in shallow water). [4, 7, 11, 16, 35, 41] **Range:** All but se. Minn. (Eco-Region: All), n. and c. Wis., UP and n. LP of Mich. Nfld. and Labr. to Man., s. to Va., Wis. and Minn. [7, 21]

### **General Description**

**General:** Native, perennial, emergent herb that forms colonies and reaches a height of 2½'. **Flower:** Usually light to deep blue, in bloom May to July. The flower has 3 spreading, downward-bent sepals and 3 shorter, ascending petals. The longer sepals are beardless (no bristles) with a white patch (throat) trimmed in yellow. The inferior ovary is bluntly angled. **Leaf:** Upright, sword-like, basal leaves that are more than 1" wide and 2-ranked. Leaves are folded on the midribs so that they form an overlapping, flat fan and are 8-30" long, similar to those of garden irises. **Stem:** Unwinged, erect, branched stems, up to 2' tall with conspicuous "cat-eye" cross section. **Fruit:** A large, green pod with rounded ends 1½-2½" long. The large seeds can be observed floating in the fall. **Root:** Thick, fleshy, creeping rhizomes. **Soil:** Wet-mesic sand/loam soils. [4, 7, 11, 35, 41, 44]

### **Normal Water Level**

This species prefers shallow water to wet/saturated conditions of 12" of inundation or less. [21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Medium. **Depth:** 12". **Duration:** Medium long – 4 days (decreasing 6" every 2 days). Blueflag iris can tolerate regular inundation, but young shoots should not be inundated. This species is moderately tolerant to flood duration and will decrease in abundance with an increase in depth. [1, 37, 44]

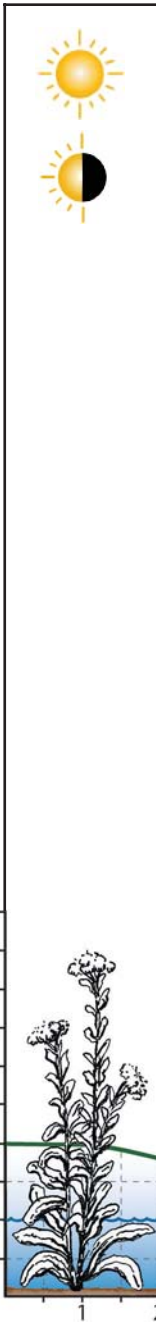
### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** Has a slow rate of spread and a moderately low tolerance to general disturbance and stress. [1, 37, 44]

### **Design Considerations**

Blueflag iris is used in the shoreline zones of wet meadows and vegetated swales. It is recommended for restorations of meadows, swamps, shorelines, open bogs and pools. It is a beautiful, decorative plant that is well suited for rain gardens and other landscape design. It provides cut flowers. **Concerns:** Severe dermatitis may result from handling rhizomes. It will not flower unless it is in full to partial sun. Many cultivars exist. [16, 44]

Indicator Status: OBL



### Wildlife Use

Blueflag iris provides nectar for hummingbirds and butterflies. Waterfowl and other birds eat the seeds. This species will persist under heavy grazing as cover for marsh birds. It provides food for muskrats and sometimes beaver. It provides cover for fish and amphibians, foraging habitat for snakes, and habitat for many insect species. [4, 6, 21, 32, 37, 44]



Photo: Dan Shaw

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds, rhizomes and plants.

### Planting Techniques

The seed requires moist, cold stratification for 120 days or less. Germination has been successful in greenhouse conditions that meet these requirements. Fall seeding with fresh seed will fulfill these requirements naturally, although birds and insects may eat the seeds. Recommended seeding rate is 0.06-0.25 lb/acre, with about 13,600-18,000 seeds/lb. Plants can be divided. Rhizomes and transplants give better results for permanent, on-site planting in spring. Plant rhizomes in 2-3" of saturated soil or plants in no more than 12" of inundation 0.5-1.5' apart or at a rate of 1,000/acre. Rhizomes can be toxic. [4, 16, 37, 41, 44]

### Additional Notes

*I. versicolor* is similar to southern blueflag iris (*I. virginica*) and sometimes is considered a variety of that species. Rootstocks are poisonous to cattle and people may develop skin reactions from handling. [7, 11, 35, 41]



## *Juncus balticus*

**Baltic Rush** - a.k.a. Stiff, Wire, Shore or Salt rush

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Wet sandy or gravelly shores, interdunal wetlands near the Great Lakes, meadows, ditches, marshes and seeps. It prefers sandy shores and brackish-to-fresh water. [7, 16, 24] **Range:** Common (especially near Lake Michigan); all but se. Minn. (Eco-Region: 1-6, 8, 9), e. Wis., Mich. Circumboreal, s. to N.Y., Pa., Ohio, Ill., Mo., n. Tex., N.M. and Calif.; S. Amer. [7, 21]

### **Description**

**General:** A grass-like, perennial herb that grows 1-2' tall. **Flower:** Clustered, greenish, tawny or brown flowers that bloom from May to August. Dense-to-spreading heads of single flowers on stalks. The heads appearing lateral, extending outward from the stem, 3/8-2¾" long. The tepals are lance-shaped, dark brown, with chaffy margins and 6 stamens. **Leaf:** Reduced, narrow leaves with red-brown sheaths at base of stem. The bracts are erect, round in section, 4-8" long, longer than the head and resemble a continuation of the stem. **Stem:** Dark green, simple stems that are in rows from the rhizomes and are pithy or hollow, slender and tough, 1-2' long. **Fruit:** Capsules ovate, somewhat 3-angled, red-brown 1/8-3/16" long, tapered to a sharp point. **Root:** Spreads by stout, brown-to-black rhizomes. **Soil:** Wet sandy and gravelly soils, which may be calcareous. [7, 24]

### **Normal Water Level**

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [21, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Long – 10 days (decreasing 2.4" every 2 days). Baltic rush will tolerate regular or seasonal flooding and a moderate tolerance for flood duration. [1, 37]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun. **Salt:** Unknown. **Nutrient:** Low. **Siltation:** Unknown. **Insect:** Generally not a problem. **Other:** This rush has a slow rate of spread and a high tolerance for general disturbance and stress. [1, 24, 37]

### **Design Considerations**

Baltic rush provides good wildlife habitat and is used in restorations, shores, dunes and meadows. It should be considered for sandy ditches and vegetated swales due to its use for erosion control and stabilization. [24, 37]

### **Wildlife Use**

This species provides good spawning grounds for rock bass, bluegills and other panfish. The roots occasionally provide food for muskrats, rabbits and moose. Waterfowl, upland gamebirds, marsh birds and songbirds eat the seeds. [24, 32, 37]

Indicator Status: OBL

### Nursery/Plant Information

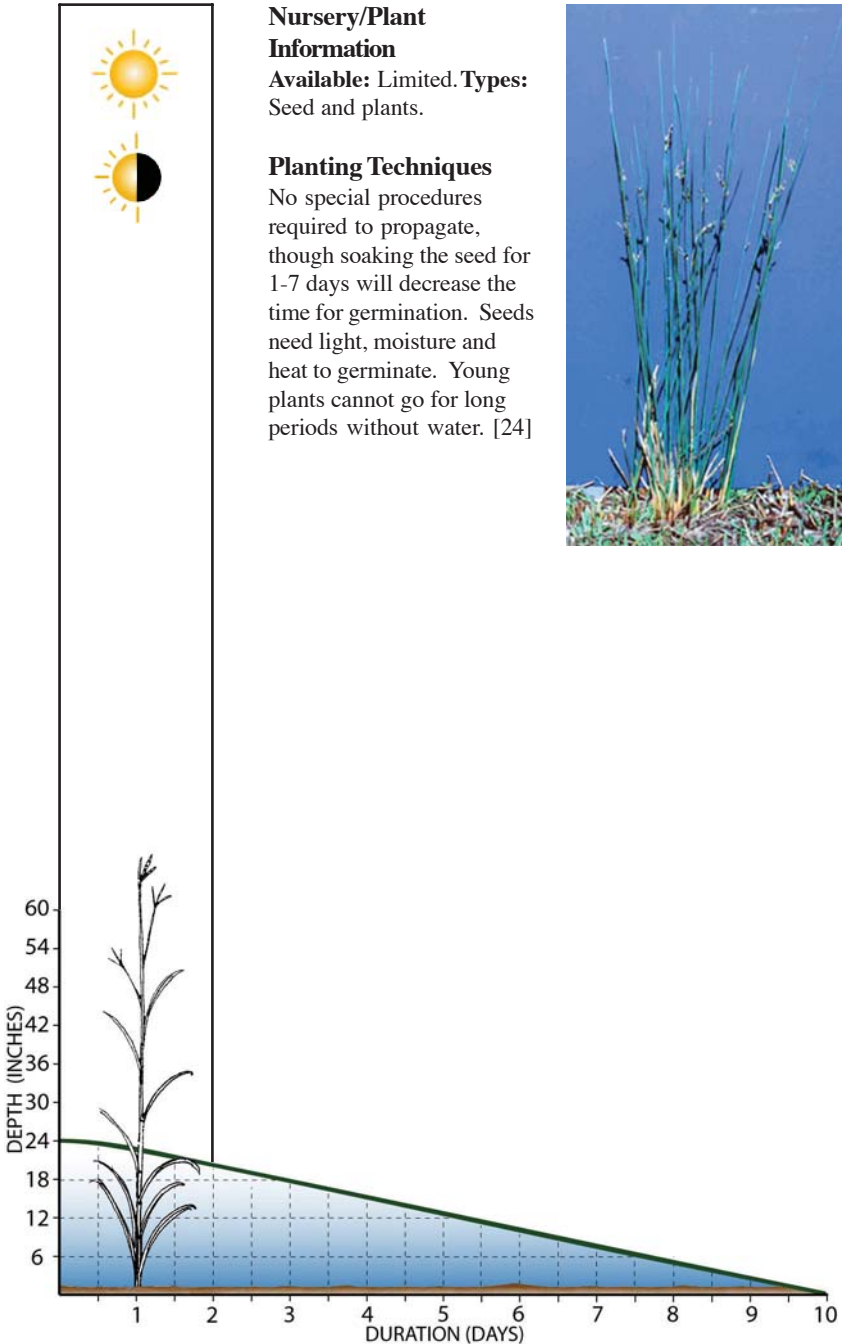
**Available:** Limited. **Types:** Seed and plants.

### Planting Techniques

No special procedures required to propagate, though soaking the seed for 1-7 days will decrease the time for germination. Seeds need light, moisture and heat to germinate. Young plants cannot go for long periods without water. [24]



*Photo: Selected North Dakota and Minnesota Range Plants*







## *Juncus effusus*

Soft Rush - a.k.a. Common Rush

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Marshes, shores, thickets, stream banks, bog margins, swales, shallow pools, roadsides, inland fresh meadows and wet meadows. [4, 7, 11, 16]

**Range:** Common; e. and c. Minn. (Eco-Range: 1, 2, 5-7), Wis., Mich. Throughout e. USA and se. Can. **Endangered in Iowa.** [7, 21]

### **Description**

**General:** A densely clumped, emergent, perennial herb. Soft rush has deep-green stems in clumps 2-4' tall. **Flower:** Many-flowered inflorescence, which appears to erupt from the side of the stem. Flowers are green, tawny or brown, blooming from July to August. Each flower consists of 6 tepals (3 sepals and 3 petals that are similar in color and size) surrounding a capsule. **Leaf:** Lacks a leaf blade and auricles, only a sheath is present, which appears to be a continuation of the stem. **Stem:** Pithy or hollow simple, stout stems 1-4' high. **Fruit:** A many-seeded capsule that has minute seeds. **Root:** Stout rhizomes. **Soil:** Tolerant of many saturated soils. [4, 7, 11, 44]

### **Normal Water Level**

This species prefers shallow water of 12" of inundation or less to wet/saturated conditions, although it will tolerate somewhat drier conditions. [6, 21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 2'. **Duration:** Medium long – 4 days (decreasing 6"/day and 6" over the next 2 days). This species will tolerate regular inundation and drought in summer. It is somewhat tolerant to flood duration and water depth increases. The population will increase with an increase in flood frequency. [1, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** Soft rush has a slow rate of spread. It has a moderate-to-high tolerance to general disturbance and is very tolerant to iron concentrations. [1, 37, 44]

### **Design Considerations**

This attractive, evergreen plant is a good contrast plant. It is used in vegetated swales, shorelines, restorations of wet meadows, marshes and thickets. It has been used successfully in rain water gardens. [16, 44]

### **Wildlife Use**

This species provides good spawning grounds for rock bass, bluegills and other panfish. The roots occasionally provide food for muskrats, deer, rodents, rabbits and moose. Waterfowl, upland gamebirds, marsh birds and songbirds eat the seeds. Soft rush provides nesting habitat for rails, ducks and insects. [4, 21, 32, 37, 44]

Indicator Status: OBL

### Nursery/Plant Information

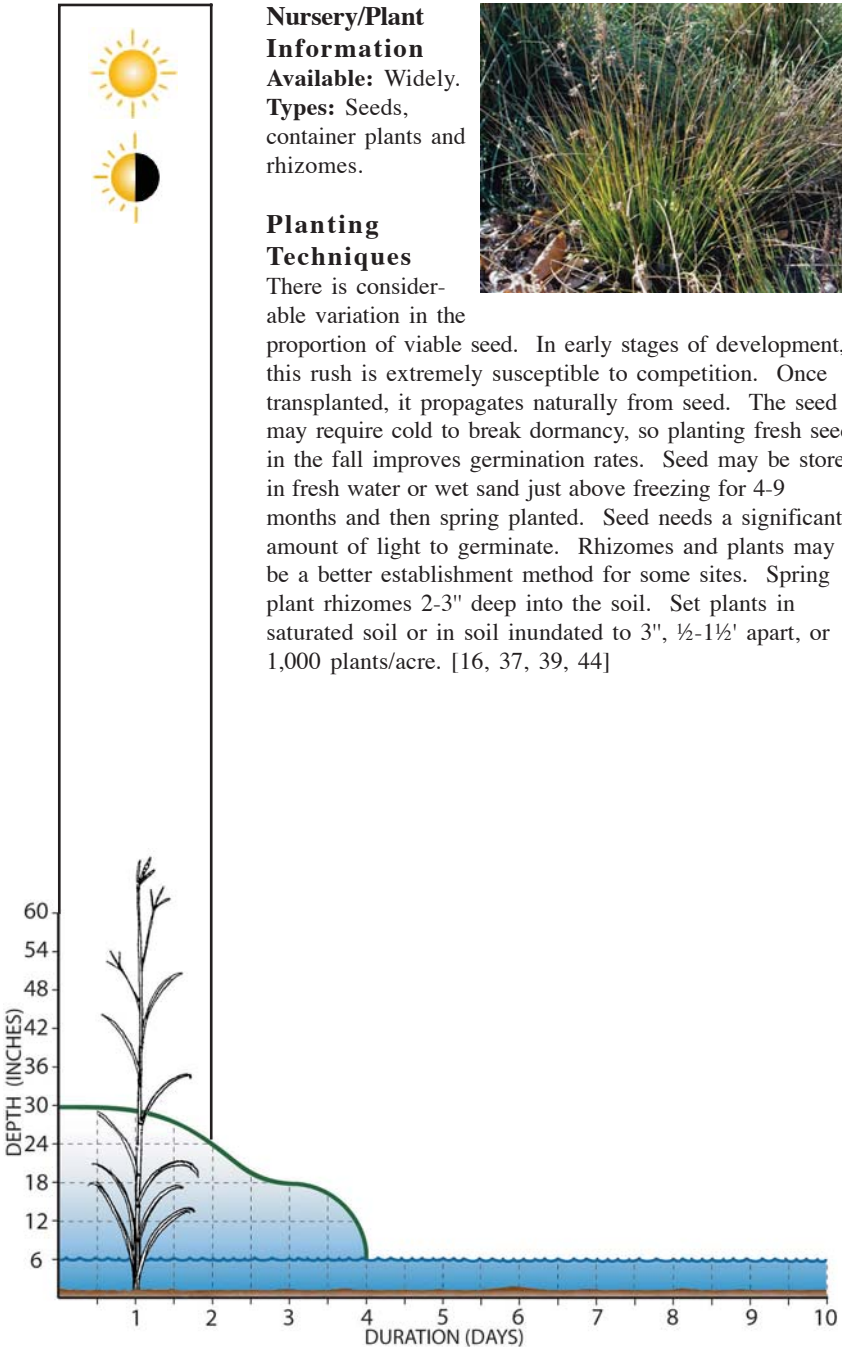
**Available:** Widely.  
**Types:** Seeds, container plants and rhizomes.

### Planting Techniques

There is considerable variation in the proportion of viable seed. In early stages of development, this rush is extremely susceptible to competition. Once transplanted, it propagates naturally from seed. The seed may require cold to break dormancy, so planting fresh seed in the fall improves germination rates. Seed may be stored in fresh water or wet sand just above freezing for 4-9 months and then spring planted. Seed needs a significant amount of light to germinate. Rhizomes and plants may be a better establishment method for some sites. Spring plant rhizomes 2-3' deep into the soil. Set plants in saturated soil or in soil inundated to 3", ½-1½' apart, or 1,000 plants/acre. [16, 37, 39, 44]



Photo: Rusty Schmidt





## *Juncus torreyi*

### Torrey Rush

#### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Sandy and gravelly shores, stream banks, shallow pools, wet meadows, marsh borders, springs and ditches. [7, 16, 17] **Range:** Mostly nw., c. and s. Minn. (Eco-Region 1, 3-6, 8, 9), Wis., LP and local in e. UP of Mich. Me. to B.C., s. to Ky., Ala., Tex., Colo. and Calif. [7, 21]

#### **Description**

**General:** Grass-like, perennial herb that stands to 3' tall, its succulent foliage topped with pompom-like flower heads and occurring in large clones of several hundred stems. **Flower:** Clustered greenish, tawny or brown flowers that bloom from July to October. **Leaf:** Narrow. **Stem:** Pithy or hollow simple stems. **Root:** Tuber-bearing rhizomes. **Soil:** Sandy and gravelly soils in shores and pools. Torrey's rush is alkali tolerant. [7, 17, 44]

#### **Normal Water Level**

This species prefers upland moist to wet/saturated conditions, although it will tolerate 3" of inundation. [21, 37, 44]

#### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 18". **Duration:** Long – 6 days (decreasing 3"/day). Torrey's rush will tolerate seasonal or irregular inundation from flooding for relatively short durations. [37, 44]

#### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** Torrey rush spreads slowly and is alkali tolerant. It has a moderate tolerance to general disturbance and stress. [1, 37, 44]

#### **Design Considerations**

Torrey rush has a rhizomatous root system that stabilizes soil well in vegetated swales, slopes and shorelines. It is used in wetland restorations, especially along stream banks, wet meadows, marsh borders and shores. It is an excellent choice for sandy or alkali conditions. It is a good contrast plant for shores, lake edges and other landscape designs. The stems and seed heads are good for cutting and dried arrangements. **Concerns:** This plant has an aggressive characteristic, though it spreads slowly. It may be considered as a competitor with invasive species. [16, 44]

#### **Wildlife Use**

This species provides good spawning grounds for rock bass, bluegills and other panfish. The roots occasionally provide food for ducks, muskrats and other rodents, deer, rabbits and moose. Waterfowl, upland gamebirds, marsh birds and songbirds eat the seeds. Torrey rush provides nesting habitat for rails, ducks and insects. [32, 37, 44]

Indicator Status: FACW

### Nursery/Plant Information

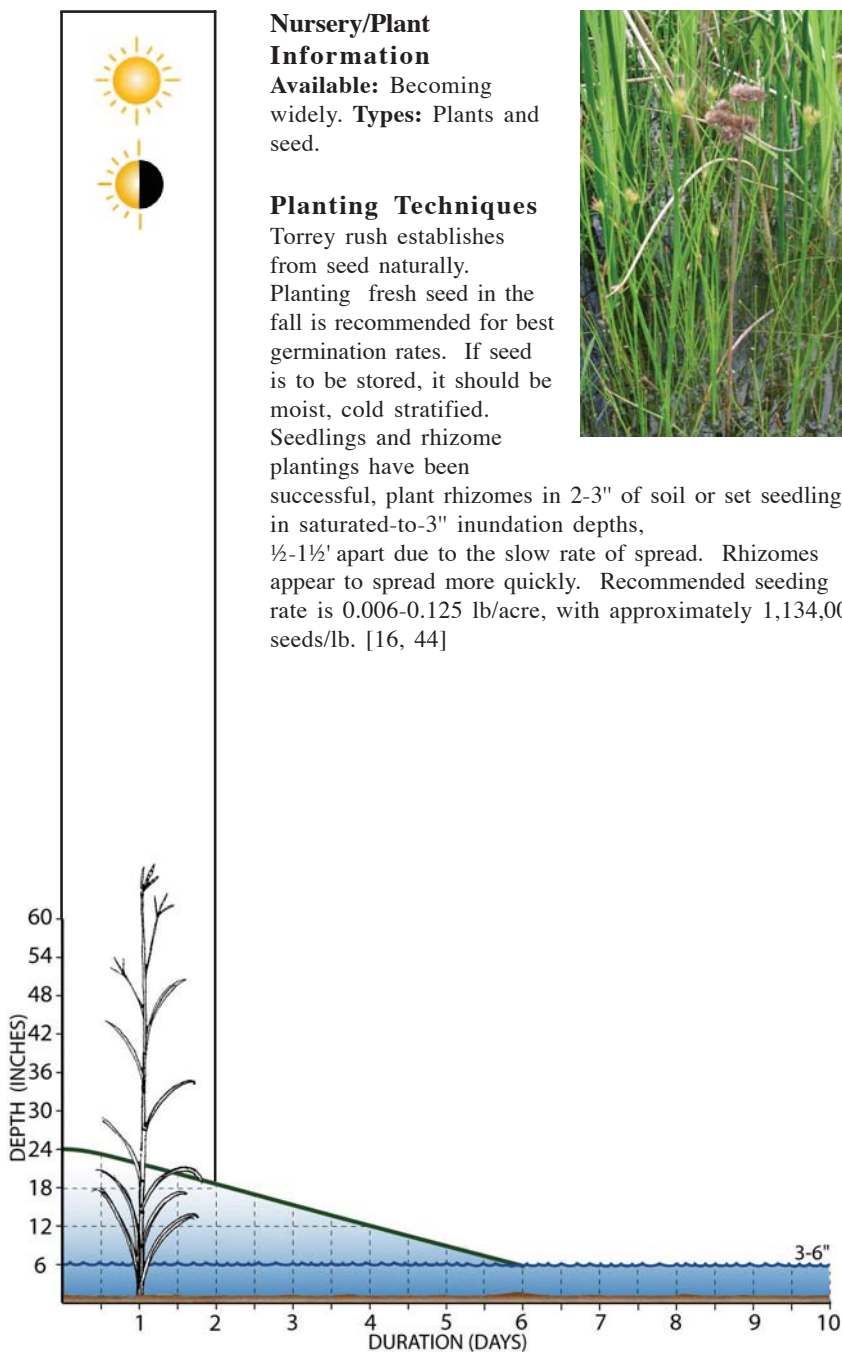
**Available:** Becoming widely. **Types:** Plants and seed.

### Planting Techniques

Torrey rush establishes from seed naturally. Planting fresh seed in the fall is recommended for best germination rates. If seed is to be stored, it should be moist, cold stratified. Seedlings and rhizome plantings have been successful, plant rhizomes in 2-3" of soil or set seedlings in saturated-to-3" inundation depths, ½-1½' apart due to the slow rate of spread. Rhizomes appear to spread more quickly. Recommended seeding rate is 0.006-0.125 lb/acre, with approximately 1,134,000 seeds/lb. [16, 44]



Photo: Rusy Schmidt





## *Larix laricina*

Tamarack - a.k.a. Eastern Larch or Hackmatack

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Cold, poorly drained swamps, coniferous swamps, muck, peatlands, bogs, black spruce bogs, stream borders, seep areas and wet lakeshores – confined to wet depressions. [7, 11, 22, 36] **Range:** N. and c. (but uncommon in se.) Minn. (Eco-Region: 1-3, 5-8), Wis., Mich. Nfld. and Labr. to Alaska, s. to n. N.J., W.Va., n. Ohio, ne. Ill. and Minn. [7, 21] **State Threatened:** Illinois.

### Description

**General:** A deciduous conifer up to 60' high and 30-35' wide that is frequently stunted and scrubby. It has a narrow crown, with a straight, tapering trunk and horizontal branches. One of the last trees to lose its leaves. **Leaf:** Clusters of soft, slender, needle-like, deciduous leaves that are  $\frac{3}{4}$ -1" long and 3-angled. They are light blue-green, turning yellow in autumn before they are shed. **Bark:** Reddish brown, scaly and thin. **Twigs:** Orange-brown, stout, hairless twigs with many spurs. **Fruit:** Cones that are  $\frac{1}{2}$ - $\frac{3}{4}$ " long, elliptical, rose-red turning brown, upright and stalkless. The cones fall in their second year and have several overlapping, rounded cone-scales and paired, brown, long-winged seeds. Young cones are purple. **Root:** Shallow, fibrous roots. **Soil:** Neutral-to-acidic soils (sphagnum moss may be lacking) when south of the vegetation tension zone and when growing on acidic, peat soils north. Tamarack is associated with black spruce (*Picea mariana*) and sphagnum mosses (*Sphagnum* spp.). It is also tolerant of drier, upland and mesic, loamy soils. [7, 11, 22, 36]

### Normal Water Level

This species prefers upland moist to wet/saturated, often acidic, conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Long – 5 days (decreasing 6" every 2.5 days). It is very tolerant of flooding for short periods. [1, 22]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** High. **Nutrient:** Low. **Siltation:** Moderate. **Insect:** Frequent – larch casebearer, larch sawfly (will defoliate stands infrequently, causing death or damage). **Other:** This species is frequently damaged by wind. It is sensitive to SO<sub>2</sub>, O<sub>3</sub>, HFI, HCl, Cl, drought, heat and mine spoils, though resistant to soil compaction. It has a moderately low tolerance to general disturbance and stress. [1, 2, 21, 22, 25, 36]

### Design Considerations

An ornamental tree for very cold climates. It is used in restorations (especially in wetlands, peat and woodland depressions). It is a wonderful specimen or mass grouping tree for lake or bog edges. It is well suited for rain gardens and other ornamental situations. [36]

**Indicator Status: FACW**

### **Wildlife Use**

Tamarack provides food for red crossbills, spruce grouse and songbirds. Porcupine, deer, hares and squirrels use this species for food and habitat. [21, 22, 32]



Photo: Jason Husveth

### **Nursery/Plant Information**

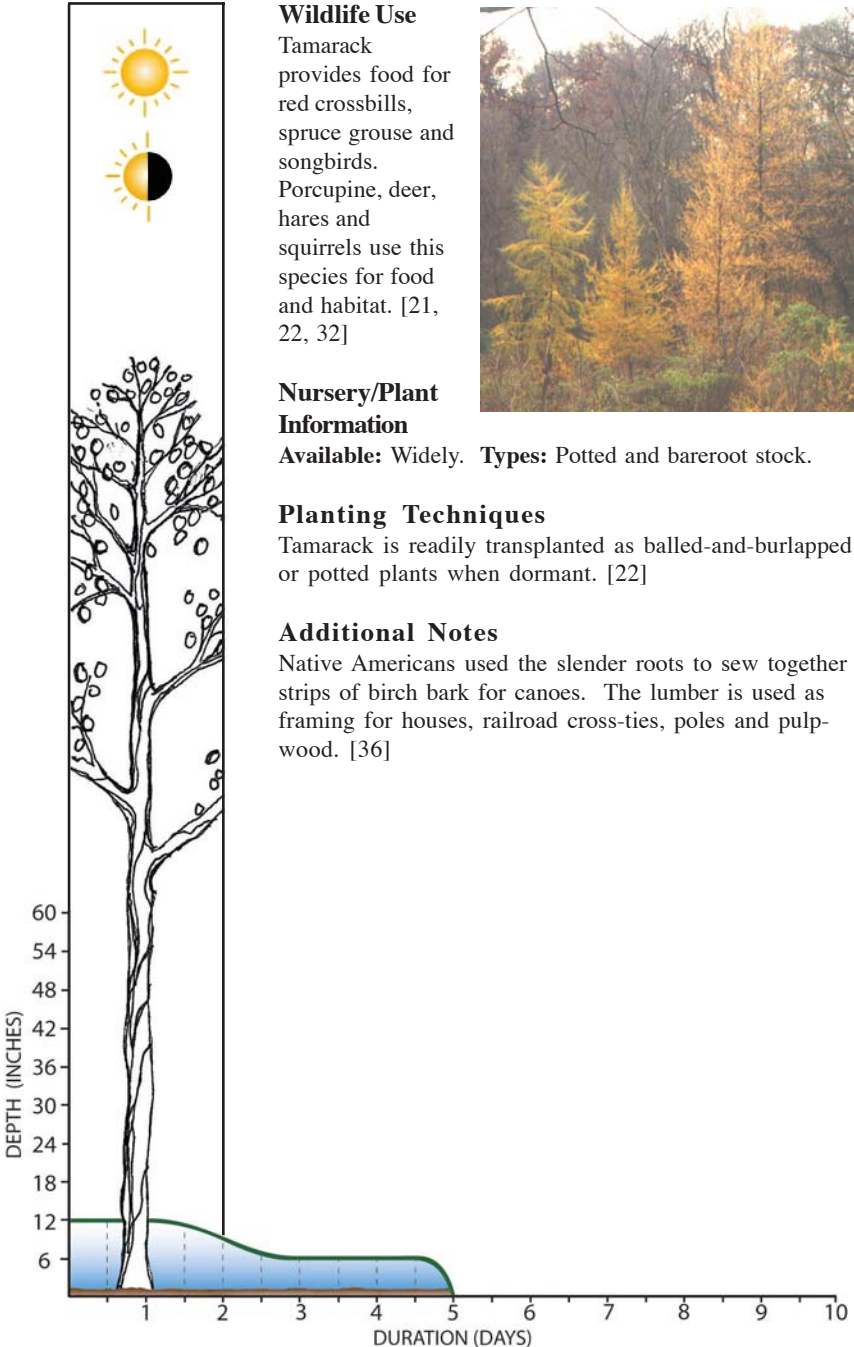
**Available:** Widely. **Types:** Potted and bareroot stock.

### **Planting Techniques**

Tamarack is readily transplanted as balled-and-burlapped or potted plants when dormant. [22]

### **Additional Notes**

Native Americans used the slender roots to sew together strips of birch bark for canoes. The lumber is used as framing for houses, railroad cross-ties, poles and pulpwood. [36]





## *Leersia oryzoides*

### Rice-cut Grass

#### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Muddy or sandy streambanks, shores, swales, wet meadows and marshes (sometimes forming large patches). [4, 7, 16] **Range:** Common to occasional; Minn. (Eco-Region: All), all but ne. Wis., Mich. Que. and N.S. to B.C., s. to Fla., Tex. and Calif.; Europe and e. Asia. [7]

#### Description

**General:** A native, perennial, emergent grass that is loosely clumped and 2-5' tall.

**Flower:** Open, greenish white panicle at end of stem and from leaf axils (these are often partly enclosed by leaf sheaths), with ascending, spreading branches. Spikelets are 1-flowered, oval, compressed, pale green, turning brown with age, without glumes and the lemmas are covered with bristly hair. It blooms from June to October.

**Leaf:** Flat, 8-12" long and 3/16-3/8" wide, with finely saw-edged leaves with rough, hairy sheaths and a flat-topped ligule. **Stem:** Weak and sprawling, rooting at nodes, 2-5' long. **Root:** Creeping rhizomes. **Soil:** Rich, fine, muddy or sandy soils near, or partly within, the waters edge, with a pH of 6.0-7.0. [4, 7, 32, 44]

#### Normal Water Level

This species prefers shallow water of 6" of inundation or less to moist or wet/saturated conditions. [37, 44]

#### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 30". **Duration:** Long – 6 days (decreasing 1' every 2 days for 4 days then a total of 6" the last 2 days). Young plants do not tolerate seasonal or regular inundation to submergence for more than 2-3 days. Mature plants will tolerate regular, seasonal or irregular inundation and flood duration. This species will tolerate drought, and it has been observed to tolerate regular water fluctuations. It decreases in abundance as flood depth increases. [1, 37, 44]

#### Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** Moderate. **Nutrient:** Moderate to high.

**Siltation:** Moderate to high; very tolerant for adult plants and it will decrease in abundance with seedlings. **Insect:** Infrequent. **Other:** Rice-cut grass has a moderate rate of spread and a moderate-to-high tolerance to general disturbance. [1, 37, 44, 45]

#### Design Considerations

Rice-cut grass is an excellent soil stabilizer, especially along fast-moving water, and has been used in stream bank stabilization, vegetated swales and shores. It is a good wetland cover crop and provides nesting and feeding cover for wildlife. Recommended restorations include wet meadows, marshes and stream banks. This species may be in the seed bank or be transported by wildlife. **Concerns:** Rate of spread is moderate to sometimes aggressive once plants are established, which may help keep out unwanted species. Keep away from high-use areas because the leaf edges cut skin. [6, 16, 26, 37, 44]

Indicator Status: OBL



### Wildlife Use

The seeds of this plant provide food for ducks, swamp and tree sparrows, and sora rails. The root-stock is eaten by black, mallard, ring-necked ducks, teal and muskrats. It provides food and cover for invertebrates, reptiles, amphibians and fish. [4, 6, 32, 37, 44]

### Nursery/Plant Information

**Available:** Widely.

**Types:** Seeds, rhizomes, rootstocks and container-grown plants.

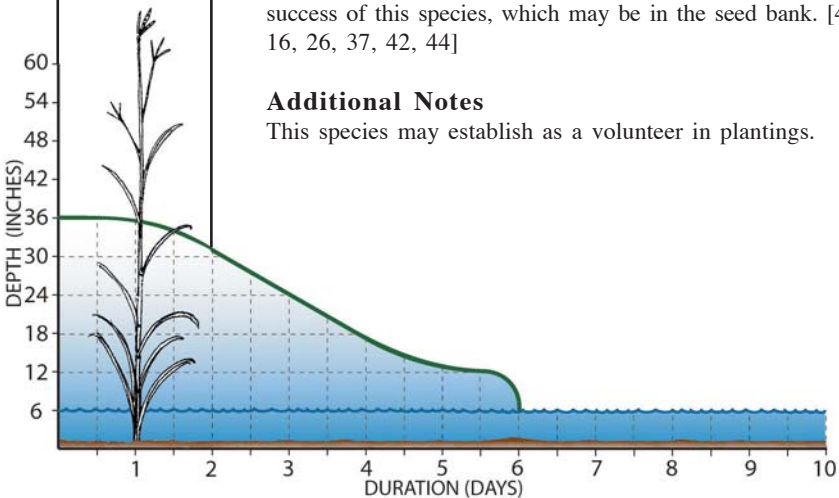


### Planting Techniques

Seeds require moist, cold stratification for 30 days, then they should be planted in saturated soils. Another option is to seed in the fall with fresh seed. Establishment from seeding restorations have been observed to be low. Recommended seeding rate is 0.1-0.25 lb/acre, with about 610,000-1,512,000 seeds/lb. Rhizomes should be planted 2-5" deep and seedlings should be planted in saturated or inundated soils to a depth of 3". Recommended spacing is 1-3' apart and drawdowns of water levels improve the success of this species, which may be in the seed bank. [4, 16, 26, 37, 42, 44]

### Additional Notes

This species may establish as a volunteer in plantings.







## *Liatris ligulistylis*

Meadow Blazingstar - a.k.a. Northern Plains Blazing Star or Meadow Blazingstar

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Mostly in damp, low places, occasionally drier; open, grassy meadows, prairies, savannas, hillside and jackpine forests. [17] **Range:** Minn. (Eco-Region: 3-9), Wis., Mich. Wis. to Alta., Colo. and N.M. [17, 21]

### Description

**General:** This tall (24-42"), native, perennial herb produces a brilliant, rosy-purple flower spike. **Flower:** Heads are arranged in a dense spike with small individual flowers. Each flower is tubular and perfect, rosy-purple, blooming from July to August with 30-100/head. **Leaf:** Green with a white mid-vein, 2-6" long, alternate, entire, narrow and sessile or with the blade tapering to the petiole. **Stem:** May grow to 42" tall and usually glabrous below the inflorescence. **Fruit:** Achenes 10-ribbed. **Root:** Thickened, usually corm-like rootstock. **Soil:** Moist to saturated, though will tolerate dry soils of many types. [17]

### Normal Water Level

Although this species prefers upland moist to wet/saturated conditions, it will tolerate dry soils. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 1 day (decreasing all 12" in 1 day).

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Low to moderate. **Siltation:** Low. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance. [1, 47]

### Design Considerations

A great nectar source and butterfly garden plant. It also provides wonderful cut and dried flowers. This species does well in most landscape designs, including rain gardens as long as the water depth is 6" or less and dissipates within a day.

**Concerns:** Many cultivars are available that can be mistaken for the native variety. Seedlings and seeds take a couple of years to flower.

### Wildlife Use

Meadow blazingstar is said to be the best butterfly attractant within the *Liatris* genus. Birds eat the seeds as well.

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and plants.

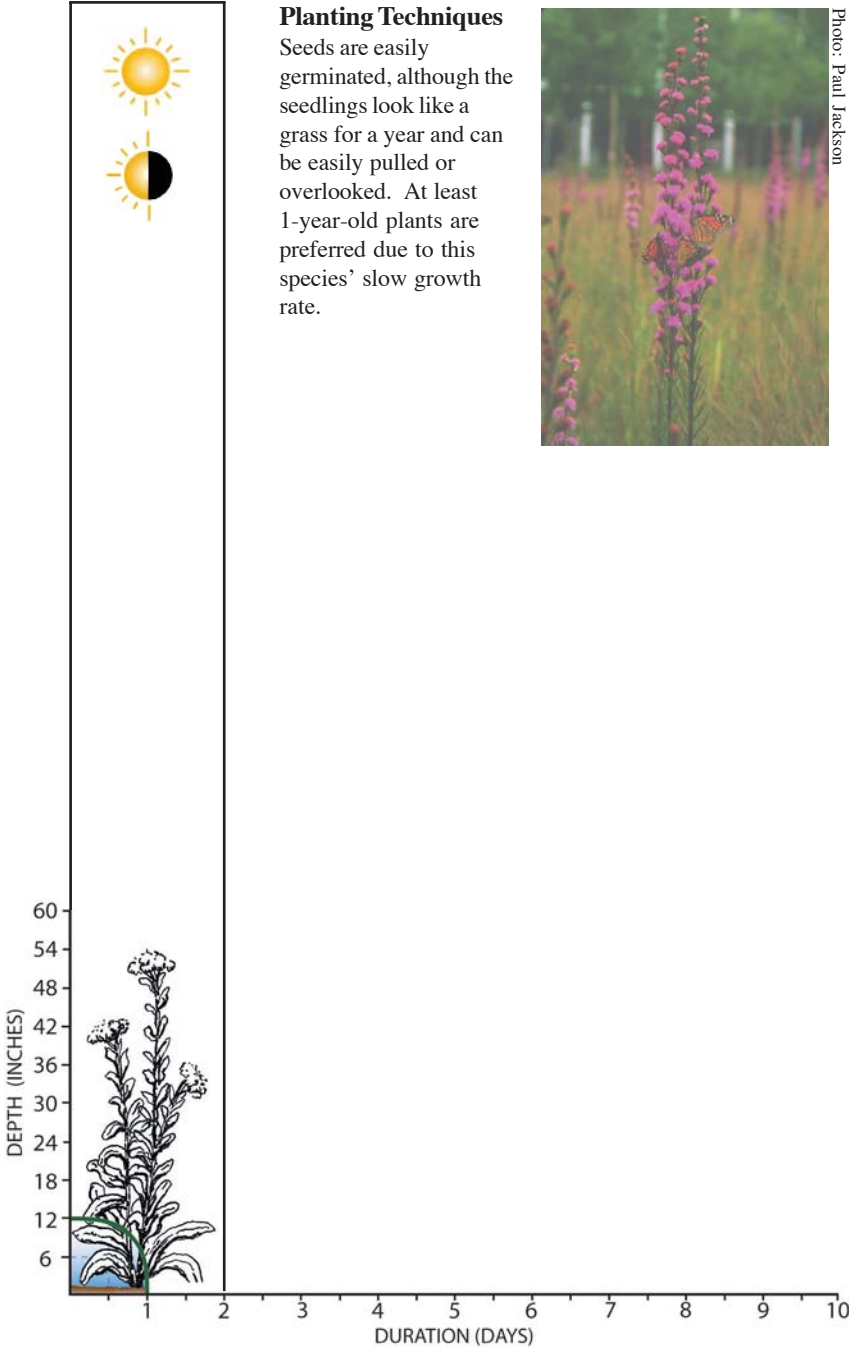
Indicator Status: FAC

### Planting Techniques

Seeds are easily germinated, although the seedlings look like a grass for a year and can be easily pulled or overlooked. At least 1-year-old plants are preferred due to this species' slow growth rate.



Photo: Paul Jackson





## *Liatris pycnostachya*

**Prairie Blazingstar** - a.k.a. **Prairie Gayfeather, Tall or Thick Spike Blazing Star, Prairie or Hairy Button-Snakeroot**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Wet meadows, wet and mesic prairies, marshes, lake edges, seepage areas and some calcareous fens. [11, 16, 17, 35, 41] **Range:** Sw. Minn. (Eco-Region: 1, 4-9), s. 2/3 of Wis., Mich. Ind. and Ky. to Minn., N.D., Tex. and Miss., and introduced e. to N.J. and w. N.Y. [17, 21] **State Endangered:** Indiana.

### **Description**

**General:** An erect, native, perennial herb with unbranched stems that are often 3-4' tall. **Flower:** The small, purple flowerheads are crowded and sessile (usually more than 20 heads) on a spike 6'-1½' long. Each head usually contains 5-7 perfect, tubular flowers. Blooms from July to mid-September. **Leaf:** Numerous, essentially linear (grass-like), alternate leaves that are gradually reduced upwards on the stem. Each leaf is up to 12" long and ½" wide, green with a white mid-vein. **Stem:** Hairy, usually stem. **Fruit:** Achenes 10-ribbed. **Root:** Thickened, usually corm-like rootstock. **Soil:** Wet, sandy soils, and in moist areas in prairies; will tolerate heavy soils. [11, 17, 35, 41]

### **Normal Water Level**

This species prefers upland mesic to wet/saturated conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Low. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day).

### **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun. **Salt:** Moderate. **Nutrient:** Moderate to low. **Siltation:** Low. **Insect:** Infrequent. **Other:** It has a moderate tolerance to general disturbance and stress. [1, 47]

### **Design Considerations**

Prairie blazingstar is a good plant for moist and wet restorations of prairies and meadows. It is a wonderful butterfly plant that provides good cut and dried flowers. It will be successful in rain gardens and other landscape designs where water fluctuation is minimal or dissipates in a day or less. **Concerns:** Wind can damage this plant, so plant with other tall, sturdy plants and grasses, such as big bluestem. Many cultivars of this plant exist. [35]

### **Wildlife Use**

Prairie blazingstar is a great nectar source and butterfly attractant. It is relished by deer and cattle. [21, 41]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants and seeds.

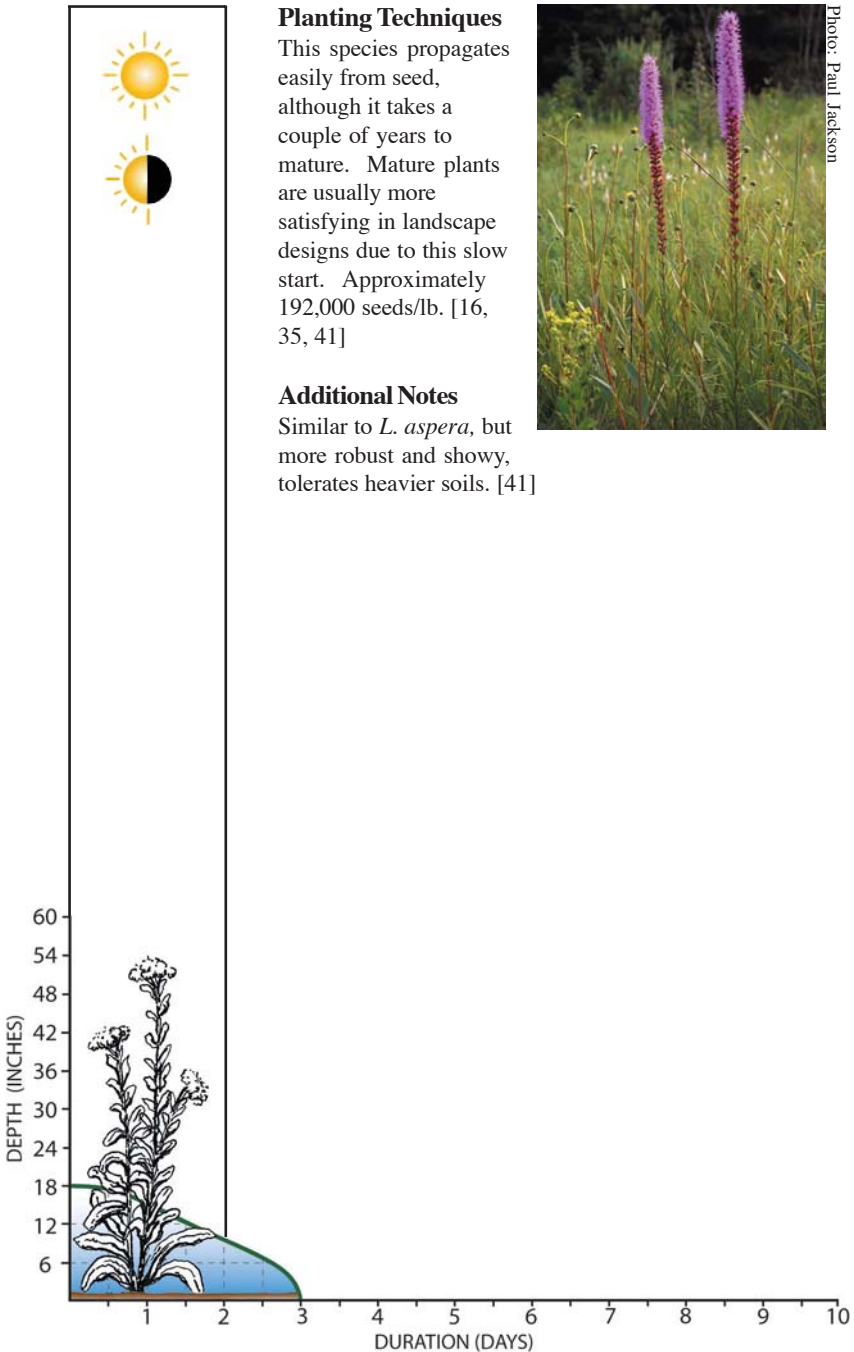
Indicator Status: FAC-

### Planting Techniques

This species propagates easily from seed, although it takes a couple of years to mature. Mature plants are usually more satisfying in landscape designs due to this slow start. Approximately 192,000 seeds/lb. [16, 35, 41]

### Additional Notes

Similar to *L. aspera*, but more robust and showy, tolerates heavier soils. [41]





## *Lilium superbum*

Turk's-cap Lily - a.k.a. Michigan Lily

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Bogs, meadows, low woods, wet prairies, fens and moist savannas. [16, 17] **Range:** Minn. (Eco-Region: 1-3, 5-9), Wis., w. N.Y. and s. Ont. to Man., s. to Tenn. and Ark. [17, 21]

### Description

**General:** Stout, erect perennial herb to 8' in height. **Flower:** 1 to many flowers, nodding from long, erect stalk. Blooms from June to August. The tepals are strongly recurved, lanceolate, orange, spotted with purple, with widely separated anthers. **Leaf:** Whorled, the upper alternate, the blades lanceolate, tapering to both ends and usually spiculate-scabrous along the margins and on the veins beneath. **Stem:** Stout, erect stem with many narrow leaves. **Fruit:** A capsule with many closely packed, flat seeds. **Root:** A scaly bulb. **Soil:** Wet, wet mesic, mesic soil with a pH of 5.0-7.0. [17]

### Normal Water Level

This species prefers upland moist to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species is somewhat tolerant to flood duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Low to moderate. **Insect:** Infrequent. **Other:** It has a moderately low tolerance to general disturbance and stress. [1, 47]

### Design Considerations

Turk's-cap lily is a nectar source for hummingbirds and other wildlife. It is well adapted for wet-to-mesic conditions of meadows, bogs, fens and wet prairies. Restoration sites with these conditions should be considered.

### Wildlife Use

This species provides nectar for hummingbirds and orioles. Deer also eat this plant. [21]

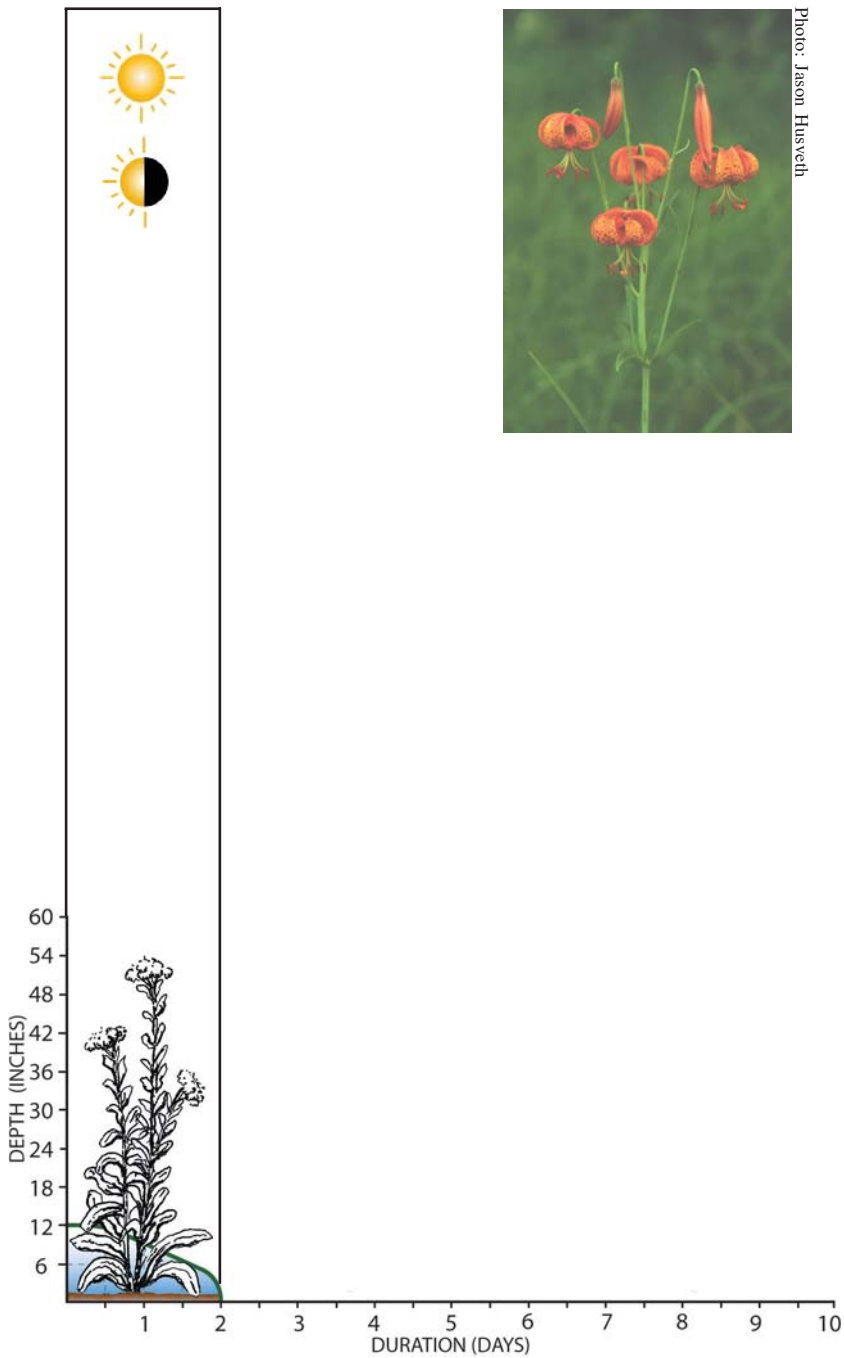
### Nursery/Plant Information

**Available:** Limited. **Types:** Plants only; difficult to start from seed.

### Planting Techniques

Seed germination is difficult; cold, moist stratification is required and plants mature slowly. Mature plants divide well. Approximately 108,800 seeds/lb. [16]

Indicator Status: FAC+





## *Lobelia cardinalis*

Cardinal Flower - a.k.a. Red Cardinal-flower

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Flood plain forest, swamps, thickets, stream banks, shores, wet meadows and ditches (sometimes in shallow water). [7, 11,16, 35, 41]

**Range:** Ec. and se. along Miss. River in Minn. (Eco-Region: 7-8), Wis., s. UP and LP of Mich. N.B. to Minn., s. to Fla. and Tex. [7, 21]

### Description

**General:** Native, perennial herb 2-4' tall. **Flower:** Intense red flowers that alternate on a stem in an elongate cluster 1-2' long. Each flower is about 1" across and has 3 spreading lower petals and 2 upright petals united into a tube toward their base. Blooms from July to September. **Leaf:** Thin, smooth, dark green with some crimson, lanceolate-to-lance-ovate, and irregularly serrate up to 6" long and nearly clasp the stem. **Stem:** Usually a simple, reddish stem with milky, acrid juice. **Root:** Shallow, fibrous roots. **Soil:** Wet-to-mesic rich loams. [7, 11 ,35, 41]

### Normal Water Level

This species prefers moist-to-wet/saturated conditions. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 18". **Duration:** Long – 5 days (decreasing 6" the first day and then 6" every 2 days thereafter). Cardinal flower will tolerate seasonal and regular flooding and is somewhat tolerant to flood duration. [1, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Unknown.

**Insect:** Infrequent. **Other:** This species has a slow rate of spread and a moderate-to-low tolerance to general disturbance and stress. [1, 37]

### Design Considerations

Cardinal flower, a very attractive plant, is used in gardens, rainwater gardens, wetland restorations, stream bank stabilization and habitat restoration. It provides wonderful cutflowers. It is also a good nectar source. **Concerns:** Because this plant has shallow roots, the soil it grows in must be kept moist to wet at all times. Many gardens have failed because of this, some sun is necessary to flower. Only the hummingbird pollinates this species, so seeds are not always available. Plants may not be long lived. [16, 35, 41]

### Wildlife Use

A great nectar source for hummingbirds, orioles and butterflies, though it can only be pollinated by hummingbirds. [6, 21, 32, 37, 41]

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and plants.

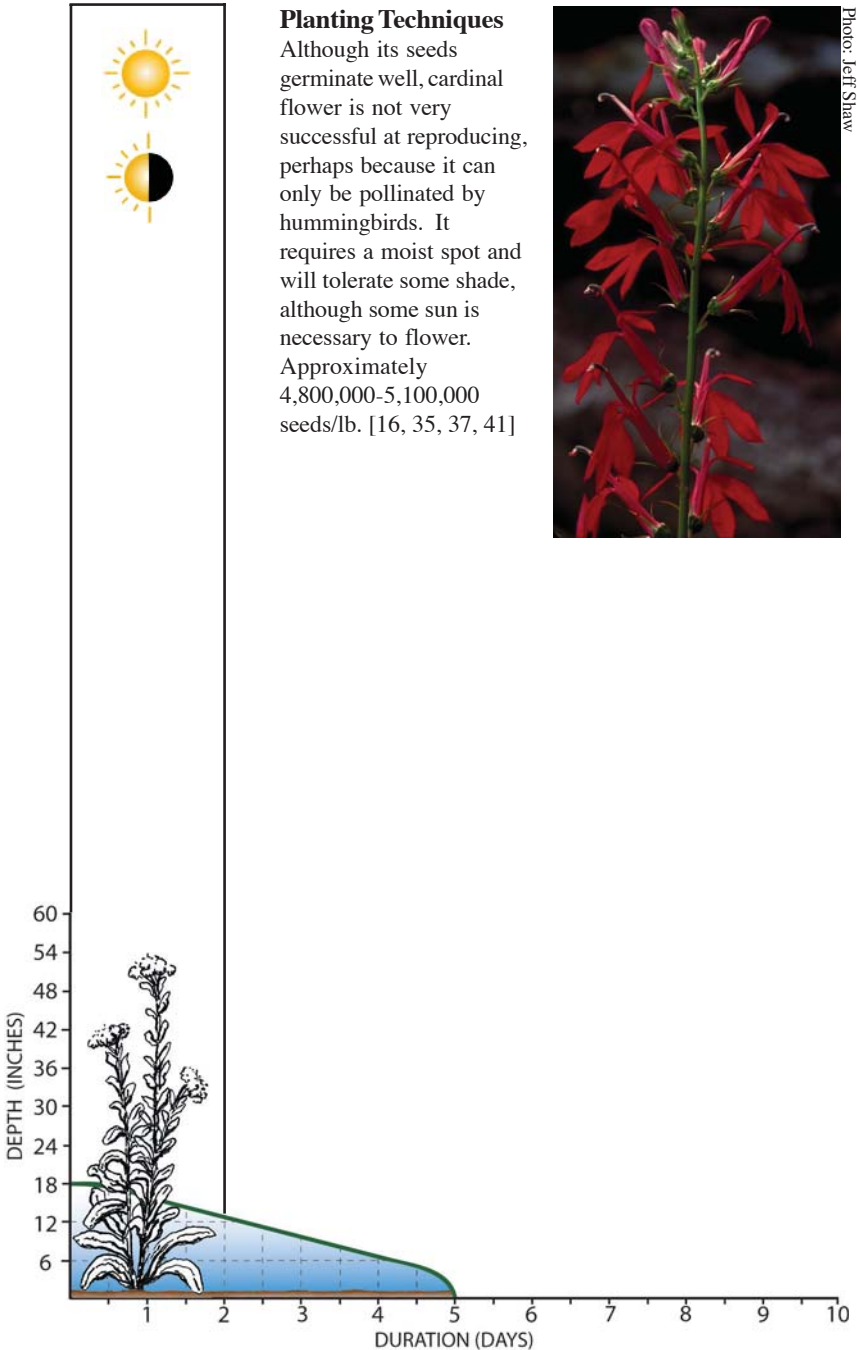
Indicator Status: OBL

### Planting Techniques

Although its seeds germinate well, cardinal flower is not very successful at reproducing, perhaps because it can only be pollinated by hummingbirds. It requires a moist spot and will tolerate some shade, although some sun is necessary to flower. Approximately 4,800,000-5,100,000 seeds/lb. [16, 35, 37, 41]



Photo: Jeff Shaw







## *Lobelia siphilitica*

**Blue Lobelia** - a.k.a. *Lobelia siphilitica* - Blue Cardinal-flower, Great Blue Lobelia or Hi-belia

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Swamps, flood plain forests, mesic savannas, thickets, stream banks, calcareous fens, peatlands and wet meadows. [7, 16, 35] **Range:** Common; Minn. (Eco-Region: 1, 4-9), Wis., local in e. UP of Mich. Me. to Man., s. to N.C., Tex. and Colo. [7, 21]

### **Description**

**General:** Erect, native, perennial herb usually 20-30" tall. **Flower:** Resembles that of the cardinal flower but is blue or occasionally white; alternate on a stem in an elongate cluster to 1' long. Each flower is about 1" across and has 3 spreading lower petals and 2 upright petals united into a tube toward their base. Blooms from July to October. Flowers in the axils of leafy bracts of this plant, the lower bracts lanceolate, the upper reduced. Leaf: Thin, narrowly oblong to lanceolate, mostly 3-5", narrowed to a sessile base and irregularly serrate. **Stem:** Leafy stem. **Root:** Shallow, fibrous roots. **Soil:** It prefers rich, lowland wood, meadows and swamps. [7, 35]

### **Normal Water Level**

This species is widely adapted to upland moist-to-wet/saturated conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Long – 5 days (decreasing 6" the first day and 6" every 2 days thereafter). This species is somewhat tolerant to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Moderate. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

### **Design Considerations**

Blue lobelia is an attractive forb well suited to perennial gardens, rainwater gardens and other landscape designs. It provides wonderful cutflowers. Recommended restorations include calcareous fens, wet meadows, stream banks and rich woodlands or swamps. **Concerns:** Blue lobelia self seeds readily in gardens. [16]

### **Wildlife Use**

Blue lobelia provides nectar and songbirds eat its seeds. Deer also like this plant. [21, 32]

### **Nursery/Plant Information**

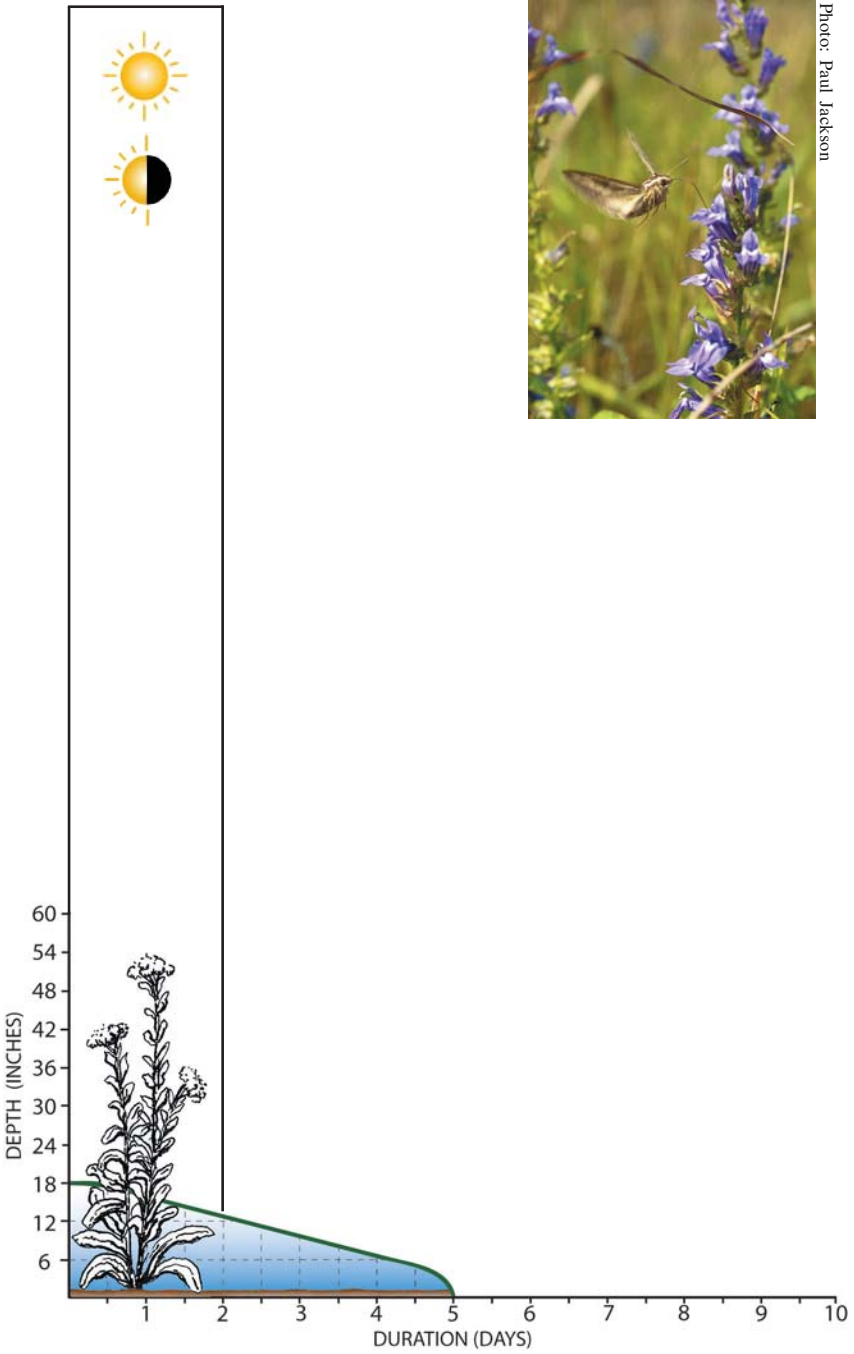
**Available:** Becoming widely. **Types:** Plants and seeds.

### **Planting Techniques**

Approximately 7,520,000 seeds/lb. Plant near the soil surface. [16]

Indicator Status: FACW+

Photo: Paul Jackson





## *Lysimachia thyrsiflora*

**Tufted Loosestrife** - a.k.a. Swamp Loosestrife

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Thickets, shores, fens, bogs, marshes, low places in forested swamps, often in shallow water and found among cattails and sedges. [7, 35]

**Range:** Minn. (Eco-Region: All), occasional in Wis., Mich. Circumboreal, s. to N.J., Ohio, Ill., Mo., Neb., Colo., Idaho and Calif. [7, 21]

### **Description**

**General:** Perennial, upright herb which is conspicuously dotted with glands and usually 1-2' tall. **Flower:** "Tufts" of small, yellow flowers crowded in dense racemes in the leaf axils. Each flower is mostly 6-parted on which are dark markings. Blooms from June to August. **Leaf:** Opposite, narrow, linear leaves 1-5" long, smooth above and smooth or sparsely hairy below with no petioles. **Stem:** Erect stems are smooth or with patches of brown hairs, 12-28" long, unbranched or branched on lower stem. **Fruit:** A small capsule less than 3/16" wide. **Root:** Spreads by stoloniform rhizomes. [7, 35]

### **Normal Water Level**

This species prefers shallow water of 3" of inundation or less. [21, 35, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Medium long – 4 days (decreasing 6" every 2 days). [1, 37]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun. **Salt:** Unknown. **Nutrient:** Unknown.

**Siltation:** Unknown. **Insect:** Infrequent. [1]

### **Design Considerations**

Tufted loosestrife is a good substitute for the invasive, non-native purple loosestrife. It prefers similar habitats of many types of wetlands and may be found among cattails and sedges in shallow water. Consider using this plant in wetland restorations and mitigation sites, if you can find a supplier.

### **Wildlife Use**

No information available.

### **Nursery/Plant Information**

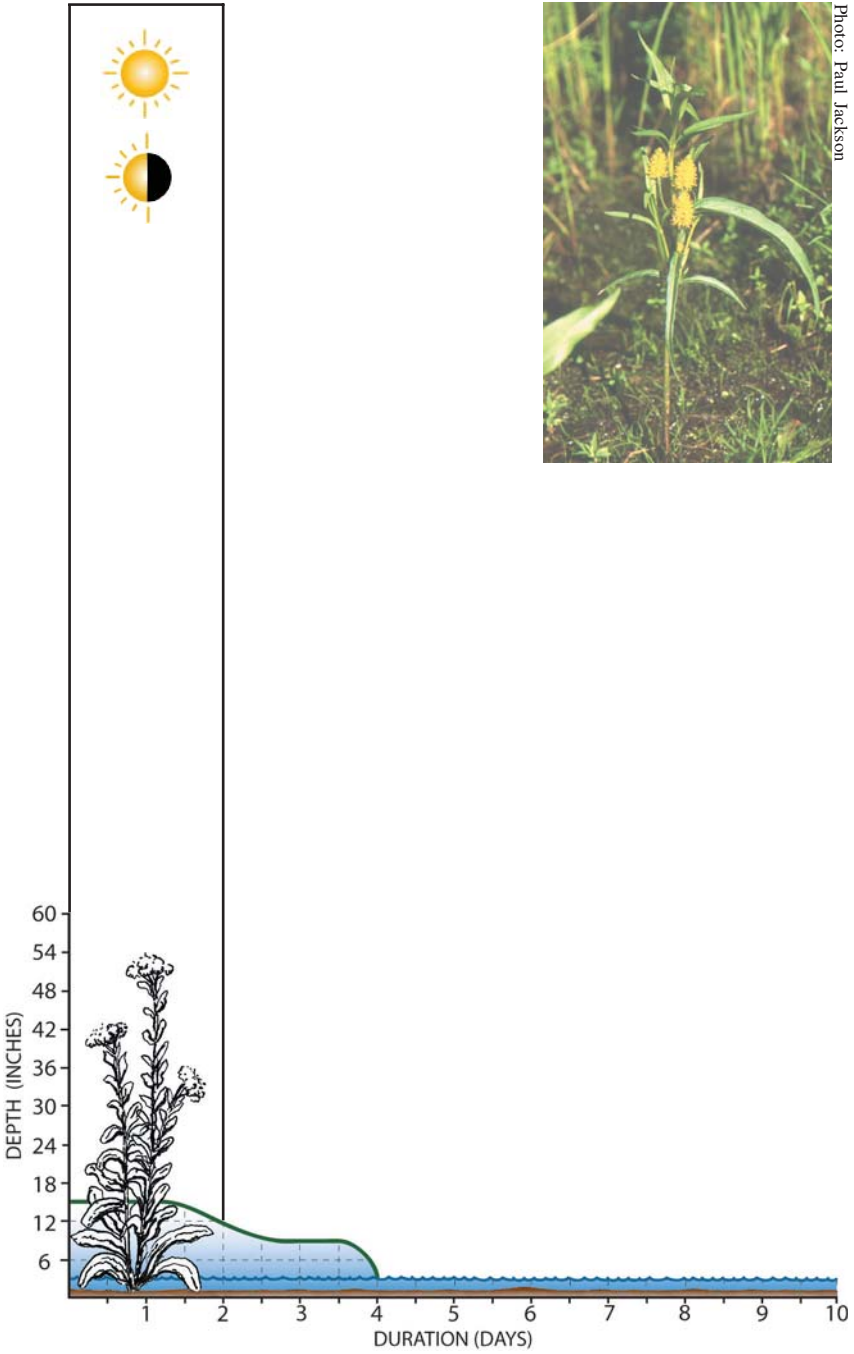
**Available:** Very limited. **Types:** Seeds only.

### **Planting Techniques**

Plant the small seeds near the soil surface.

Indicator Status: OBL

Photo: Paul Jackson





## *Lythrum salicaria*

**Purple Loosestrife** - a.k.a. **Spiked Loosestrife, Spiked Lythrum, Salicaire, or Bouquet Violet**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Introduced from Europe and sometimes planted as an ornamental, escaping to deep and shallow marshes, wet ditches, wet meadows, stream banks, cranberry bogs and shores. It is a serious threat to outcompete our native flora and has little value to wildlife. It is often associated with wetlands that have been disturbed by agricultural use, drainage, pasturing, siltation or water level fluctuations. [4, 7, 11, 35, 41] **Range:** Most common in c. and s. portions of our region. Ec. near Mississippi River, local elsewhere in Minn. (Eco-Region: All), Wis., LP of Mich. especially s., local in UP. Naturalized over much of e. and c. USA, s. Can.; local in w. USA. Within the Twin Cities, it is most abundant in the Lake Minnetonka area west of Minneapolis, and has become abundant in many marshes and along streams since about 1940. [7]

### **General Description**

**General:** A stout, non-native, perennial herb often 3-6' tall. A very showy plant that often grows in large clones. **Flower:** Conspicuous, elongate clusters of purple flowers, 4-15" long composed of 6 crinkled petals. Each flower is ½-¾" wide, rising on short stalks near the leaf axils. Blooms from June to September. **Leaf:** Leaves are opposite or whorled, lance-shaped in 3s, entire, sessile, and sometimes clasping the stem and usually 1-4" long. One of the few plants that has both opposite and whorled leaves on the same plant. **Stem:** Woody, square or multiple-sided stems. **Fruit:** A capsule enclosed by the sepals. **Root:** Spreading and forming colonies by thick, fleshy rhizomes which send up new shoots. **Soil:** Tolerates many permanently saturated soil types. [4, 7, 11, 35, 41]

### **Normal Water Level**

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions, though it has been seen growing on floating mats. [37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 36". **Duration:** Long – 10 days (decreasing 12" every 2 days). Purple loosestrife tolerates water fluctuation at regular, irregular and seasonal periods. [1, 37]

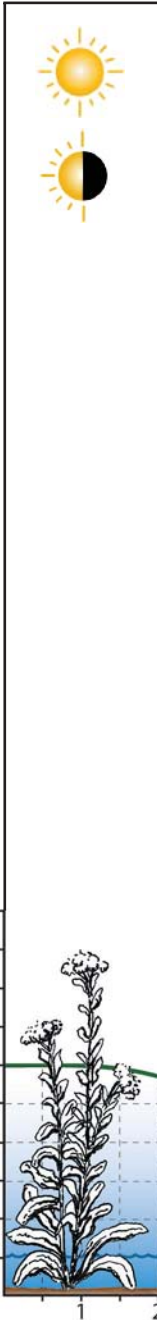
### **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun. **Salt:** High. **Nutrient:** Unknown. **Siltation:** High. **Insect:** Insects are used as a biological control for this species. **Other:** Purple loosestrife spreads rapidly. It is highly invasive and considered a pest species in the Midwest. [1, 37, 47]

### **Design Considerations**

No design considerations other than to eradicate this species.

Indicator Status: OBL



### Wildlife Use

This species has little wildlife value. The large colonies that this species creates actually result in a loss of plant and animal diversity because it replaces higher-valued plant species. [4, 7, 11]

### Nursery/Plant Information

This species does not seem to be available commercially anymore.

### Planting Techniques

This species is a serious threat to our native flora and is of little value to wildlife. In addition to spreading vegetatively, a single plant may produce several hundred thousand seeds each year. **Do not plant this species.** [4, 7, 11, 35, 41]

### Additional Notes

Purple loosestrife was once grown as a garden plant because of its striking, magenta flower spikes. Efforts are underway to reduce the loosestrife population by releasing beetles that feed on the plant's roots and leaves. [41]



Photo: Dan Shaw





# *Matteuccia struthiopteris*

**Ostrich Fern** - a.k.a. *Pteridium nodulosum* or *Matteuccia struthiopteris* var. *persylvanica*

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet woods, floodplain hardwoods, swampy woods, thickets, stream banks, seeps and ditches. Often found growing on alluvial deposits. [7, 11]

**Range:** Minn (Eco-Region: All), Wis, Mich. Circumboreal; Nfld. to Alaska, s. to Va., Ohio, Mo., S.D. and B.C.; Europe. This species typically occurs north of the tension zone. [7, 21]

## Description

**General:** Large, colony-forming perennial fern with erect, coarse, stout, leafy crowns growing to a height of 6'. **Leaf:** Two types of fronds. The sterile fronds are green and pinnate, which alternate and gradually reduce toward the base of the frond with a fine pubescence along the rachis. The fertile fronds are shorter, brown at maturity, and have inrolled pinnae, which enclose the sporangia. They are produced midsummer to early fall and persist through the winter. **Fruit:** Sori hidden by inrolled pinnule margins with green spores. **Root:** Black, scaly, stoloniferous, rhizomes deep and long-creeping, producing erect, leafy crowns. **Soil:** Often growing on alluvial deposits. [7, 11]

## Normal Water Level

This species prefers upland moist to wet/saturated conditions. [21]

## Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 1 day (decreasing the entire 12" in 1 day). This species has a moderate tolerance to flood duration. [1]

## Sensitivities or Other Tolerances

**Exposure:** Part sun to full shade. **Salt:** Low. **Nutrient:** Low to moderate.

**Siltation:** Low to moderate. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

## Design Considerations

A lovely, large fern that is used in wet woods, shaded landscapes that are moist, along wooded stream banks and seeps. It is ideal for alluvial deposits and other rich woodland soils. **Concerns:** Because this species spreads by rhizomes and forms large colonies, it may be aggressive in certain conditions. This may be desirable in some instances to compete with invasive species.

## Wildlife Use

Ferns are widespread, especially in moist woodlands. Yet as a wildlife food source, they are used to a minor extent. Their leaves are eaten by deer, hares and grouse especially when other green plants are scarce. Ferns provide good cover for small mammals and songbirds. [21, 32]

Indicator Status: FACW

**Nursery/Plant Information**

**Available:**

Widely.

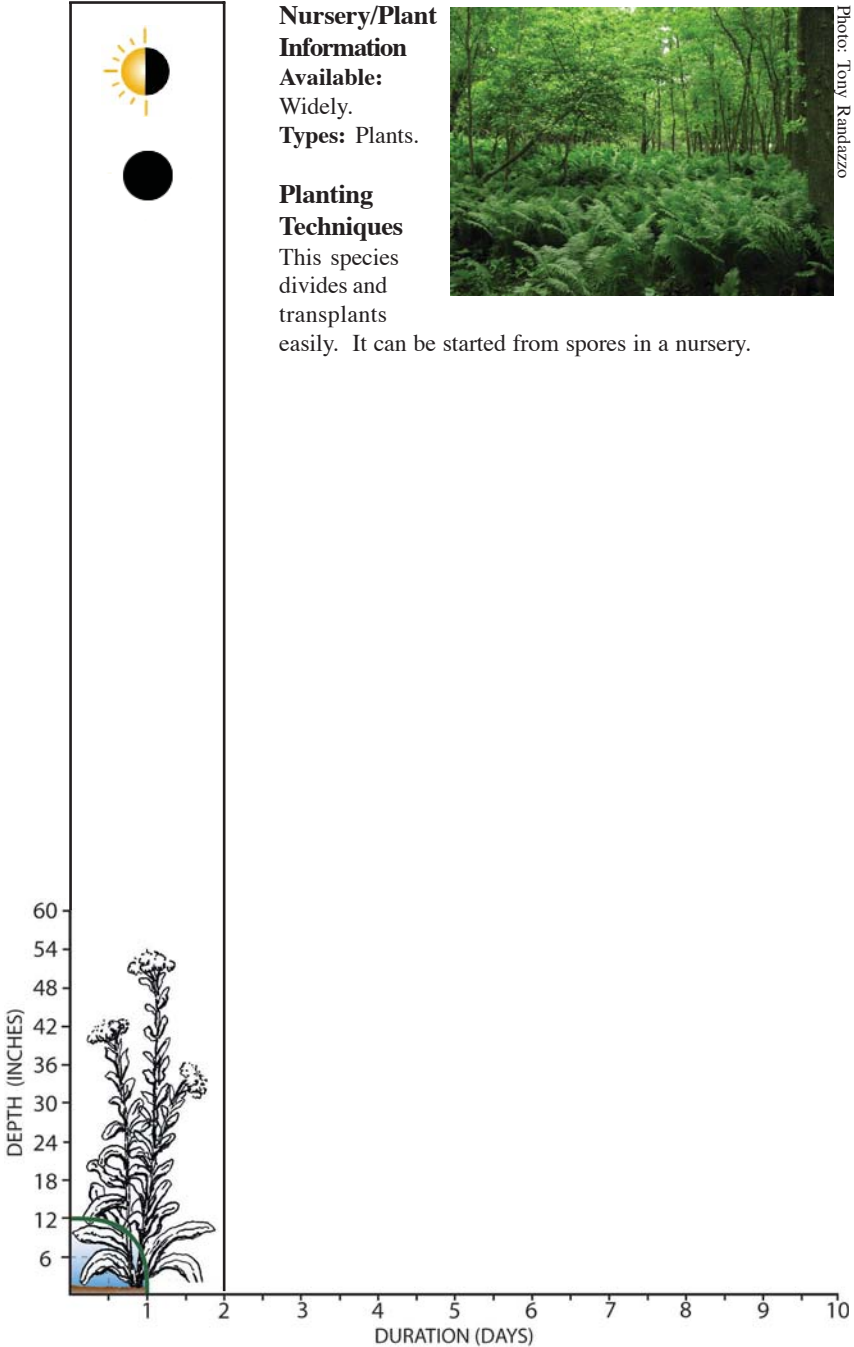
**Types:** Plants.

**Planting Techniques**

This species divides and transplants easily. It can be started from spores in a nursery.



Photo: Tony Randazzo







## *Monarda fistulosa*

Wild Bergamot - a.k.a. Horsemint or Bee Balm

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Mesic and dry prairies, savannas, open or brushy places, fields, often common on roadsides. [16, 17, 35, 41, 44] **Range:** Minn. (Eco-Region: All), Wis., Mich. Que. to Man. and B.C., s. to Ga., La. and Ariz. [17, 21]

### Description

**General:** A native perennial herb that is usually 3-4' tall and clumped.

**Flower:** Lavender flowers that have 2 lips and are arranged in heads with lance-shaped, bracteal leaves. Heads are a round cluster, 1-2" wide; individual flowers are ¼" long and tubular with a lower curved petal and a thin, straight petal. Blooms from July to August. **Leaf:** Hairy, opposite leaves with an odor of mint and citrus when crushed. The leaves are coarsely toothed, lance-shaped, 1-3" long and grow on short petioles. **Stem:** Erect, often branched, square stems that are usually hairy at least above, and produce a strong odor. **Root:** Spreads by rhizomes. **Soil:** Tolerates a wide variety of soil conditions. [17, 35, 41, 44]

### Normal Water Level

This species prefers upland moist to dry conditions. [21, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). Wild bergamot has minimal inundation tolerance and is somewhat tolerant to flood duration. [1, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full sun to part shade. **Salt:** Moderate. **Nutrient:** Moderate.

**Sitation:** Moderate. **Insect:** Low to moderate. **Other:** This species often suffers from mildew and is moderately tolerant to general disturbance. [1, 44, 47]

### Design Considerations

Wild bergamot is a beautiful mint that is used in slope and buffer stabilization because of its ability to hold soil. This species provides wonderful cut and dried flowers. It is used in landscape design where it may be a little unruly due to its aggressive behavior. It is an early successional species that is used in restorations, especially moist-to-dry prairies. It provides wildlife habitat and makes a great mint tea. **Concerns:** This species, though short lived, can be very aggressive. [16, 44]

### Wildlife Use

A nectar source for butterflies, bees and hummingbirds. It is also palatable in early growth by grazing species, such as deer, cattle and geese. [16, 21, 41, 44]

### Nursery/Plant Information

**Available:** Widely. **Types:** Plants and seed.

**Indicator Status:** FACU

### Planting Techniques

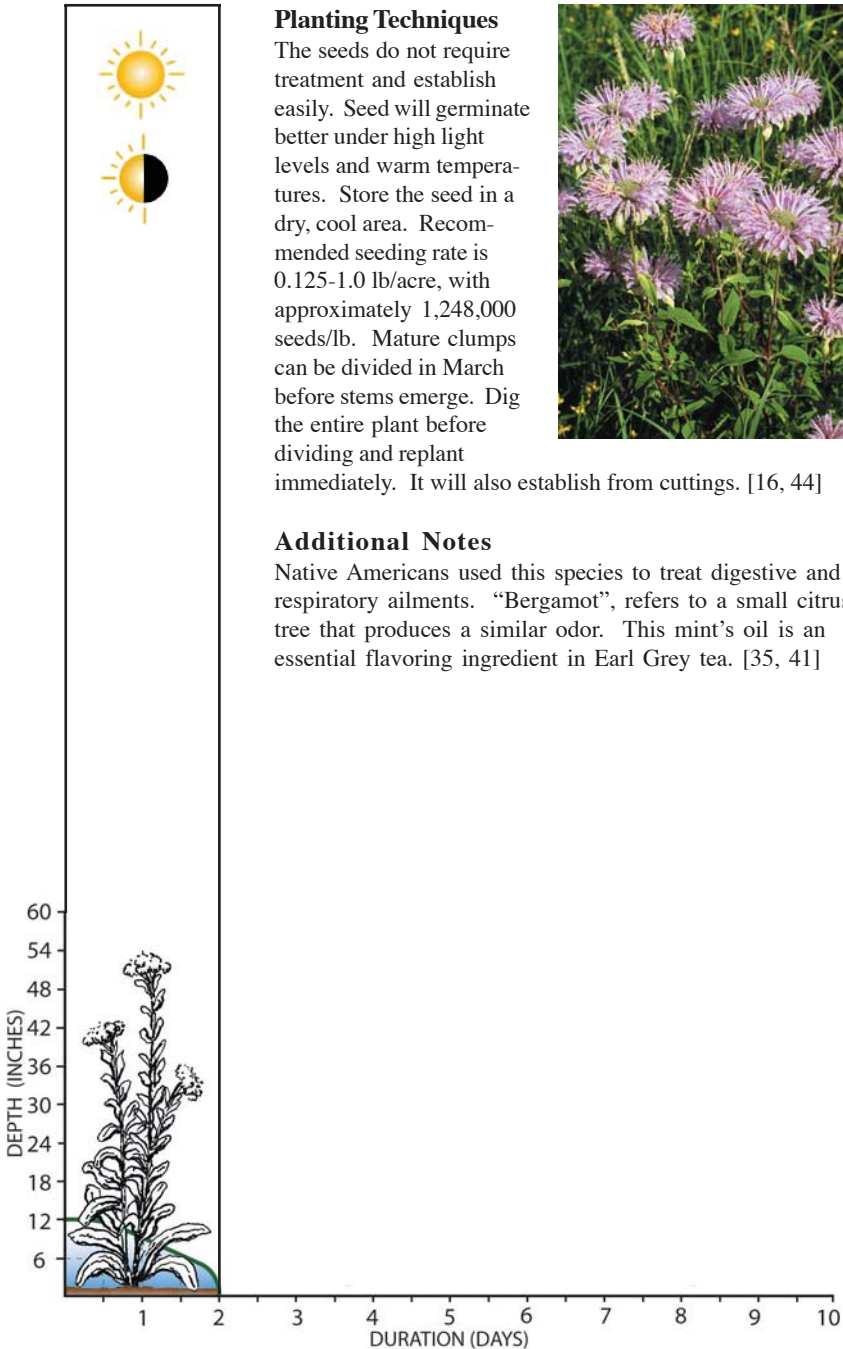
The seeds do not require treatment and establish easily. Seed will germinate better under high light levels and warm temperatures. Store the seed in a dry, cool area. Recommended seeding rate is 0.125-1.0 lb/acre, with approximately 1,248,000 seeds/lb. Mature clumps can be divided in March before stems emerge. Dig the entire plant before dividing and replant immediately. It will also establish from cuttings. [16, 44]



Photo: Paul Jackson

### Additional Notes

Native Americans used this species to treat digestive and respiratory ailments. “Bergamot”, refers to a small citrus tree that produces a similar odor. This mint’s oil is an essential flavoring ingredient in Earl Grey tea. [35, 41]





## *Onoclea sensibilis*

### Sensitive Fern

#### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Swampy woods, low areas in moist forests, alder thickets, shrub-carrs, wet meadows, calcareous fens, shaded ponds, roadsides and ditches (it can be found in wet or moist wheel ruts). [7, 11, 16] **Range:** All but sw. and extreme nw. Minn. (Eco-Region: 1-8), Wis., Mich.; Nfld. to Man., s. to Fla. and Tex. [7, 21]

#### **Description**

**General:** This distinctive fern has broad, green fronds and separate brown, fertile fronds that are attractive year-round. It grows 12-24" tall and forms large patches. A mass of pale red fiddle-heads forms in the spring. **Leaf:** Sterile fronds can reach 24" tall. It is deciduous, leathery, light green in color, and simple. The deeply pinnatifid leaflets occur as 8-12 paired segments that are 0.5-2" wide, with a characteristic net venation. The upper side of leaflet is smooth and the bottom side has scattered white hairs, usually on the veins. The rachis is broadly winged as are the upper leaflets. The fertile fronds are about 12" tall, turning dark brown at maturity and develop in midsummer to persist through winter. They are upright, with many short leaflets that form small, inrolled, bead-like divisions (pinnules). These divisions contain the spore cases. **Root:** Spreads by branching rhizomes. **Soil:** Prefers saturated, fertile soils. [7, 11]

#### **Normal Water Level**

This species prefers shallow water of 3" of inundation or less to wet/saturated conditions. [21, 37]

#### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 12". **Duration:** Medium long – 4 days in summer (decreasing 6" every 2 days), 30 days in spring. Sensitive fern can tolerate regular, irregular and seasonal inundation with moderate tolerance to flood duration. [1, 37]

#### **Sensitivities or Other Tolerances**

**Exposure:** Partial sun to full shade. **Salt:** Low. **Nutrient:** Low. **Siltation:** Low. **Insect:** Infrequent. **Other:** Sensitive fern has a moderate rate of spread and is moderately tolerant to general disturbance and stress. [1, 37, 47]

#### **Design Considerations**

Sensitive fern is a good ground cover in wet to inundated areas of partial sun or less. It will work well in rain water gardens that do not dry out completely. A good wetland restoration plant for shrubby or wet meadow areas, especially in calcareous conditions. Good winter interest and useful in dried flower arrangements. [16]

#### **Wildlife Use**

Ferns are widespread, especially in moist woodlands. Yet as a wildlife food source they are used only to a minor extent. Their leaves are eaten by deer, hares and grouse especially in seasons when other green plants are scarce. Ferns are a good habitat cover plant for small mammals and songbirds. [21, 32, 37]

**Indicator Status: FACW**

**Nursery/Plant Information**

**Available:** Becoming widely. **Types:** Plants only.

**Planting Techniques**

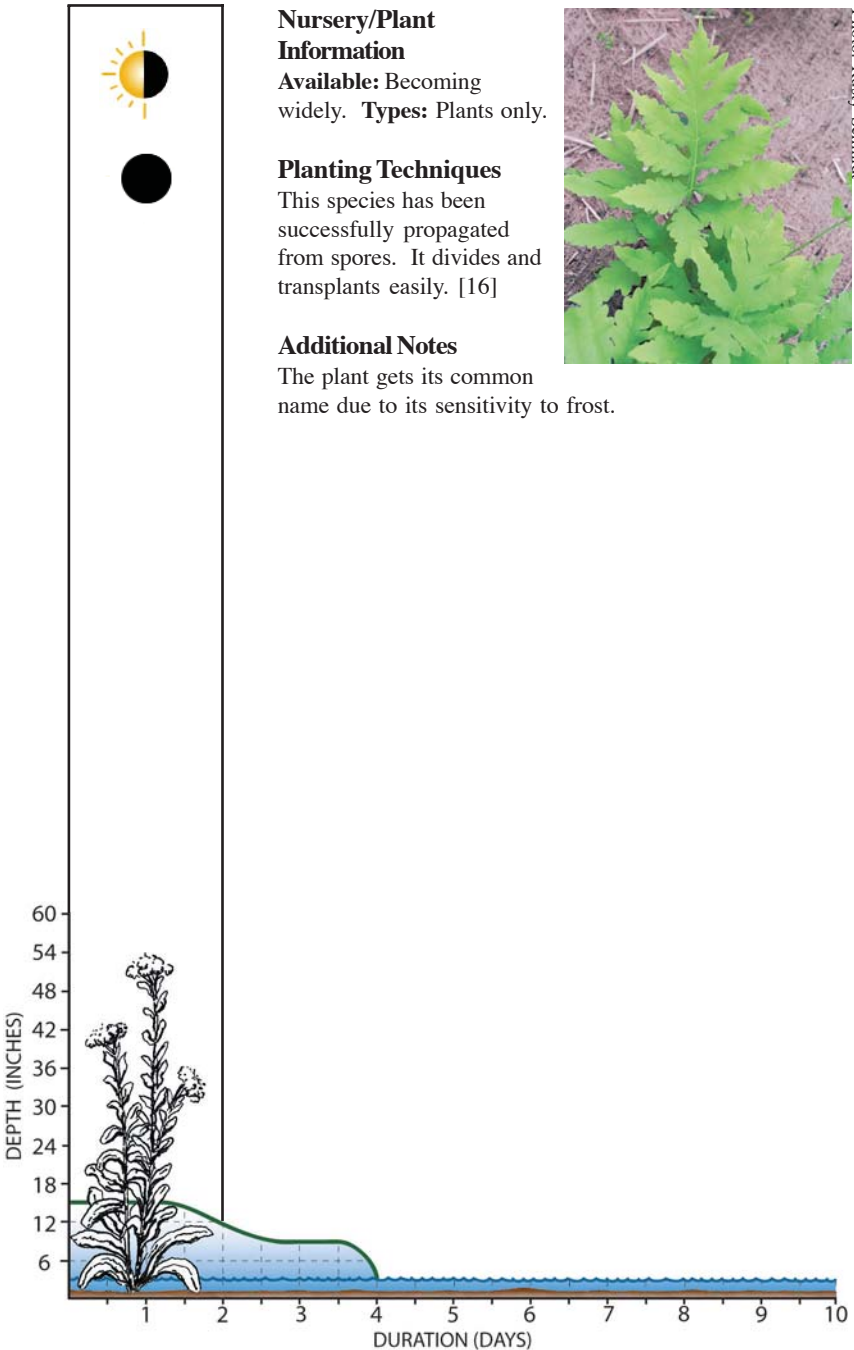
This species has been successfully propagated from spores. It divides and transplants easily. [16]

**Additional Notes**

The plant gets its common name due to its sensitivity to frost.



Photo: Rusty Schmidt





# *Osmunda regalis*

**Royal Fern** - a.k.a. Flowering Fern

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Bogs, swamps, forests, alder thickets, and shallow pools (soil is usually acidic). [7, 17] **Range:** Ne. and ec. Minn. (Eco-Region: 1, 6, 8), Wis., Mich. Circumboreal, Nfld. to Sask., s. to Fla., Tex. and tropical Amer. [7, 21]

## **Description**

**General:** Royal fern is a unique perennial fern 3' or more tall. **Leaf:** Highly attractive foliage of numerous erect fronds, reddish at first but becoming green. Blades are broadly ovate, 15-30" long and 12-20" wide with 2-pinnate opposite divisions (pinnules). The pinnules are well-spaced, oblong, rounded at tips, with entire or finely toothed margins. The fronds are rounded in back with broad, stipule-like basal wings. The fertile fronds have the uppermost several pinnae replaced by sporangia clusters. **Stem:** Smooth, green or red-green petioles to  $\frac{3}{4}$  length of blade.

**Root:** Stout rhizomes, with persistent leaf bases and fibrous roots but lacking scales.

**Soil:** Prefers acidic soil. [7, 17]

## **Normal Water Level**

This species prefers shallow water of 3" of inundation or less to wet/saturated conditions. [21, 37]

## **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 12". **Duration:** Medium long – 4 days in summer (decreasing 6" every 2 days). Royal fern is tolerant to regular, irregular and seasonal inundation with a moderate tolerance to flood duration. [1, 37]

## **Sensitivities or Other Tolerances**

**Exposure:** Full sun to full shade, though prefers partial shade. **Salt:** Low.

**Nutrient:** Low. **Siltation:** Low to moderate. **Insect:** Infrequent. **Other:** This species has a slow rate of spread and a moderately low tolerance to general disturbance and stress. [1, 37, 47]

## **Design Considerations**

Royal fern is a beautiful specimen plant for landscape designs and rainwater gardens. It is also a good ground cover plant for buffers to wetlands, especially pools, swamps and thickets. **Concerns:** Slow rate of spread.

## **Wildlife Use**

Ferns are widespread, especially in moist woodlands; yet, as a wildlife food source, they are used only to a minor extent. Their leaves are eaten by deer, hares and grouse, especially in seasons when other green plants are scarce. Ferns are a good habitat cover plant for small mammals and songbirds. [32, 37]

## **Nursery/Plant Information**

**Available:** Becoming widely. **Types:** Plants only.

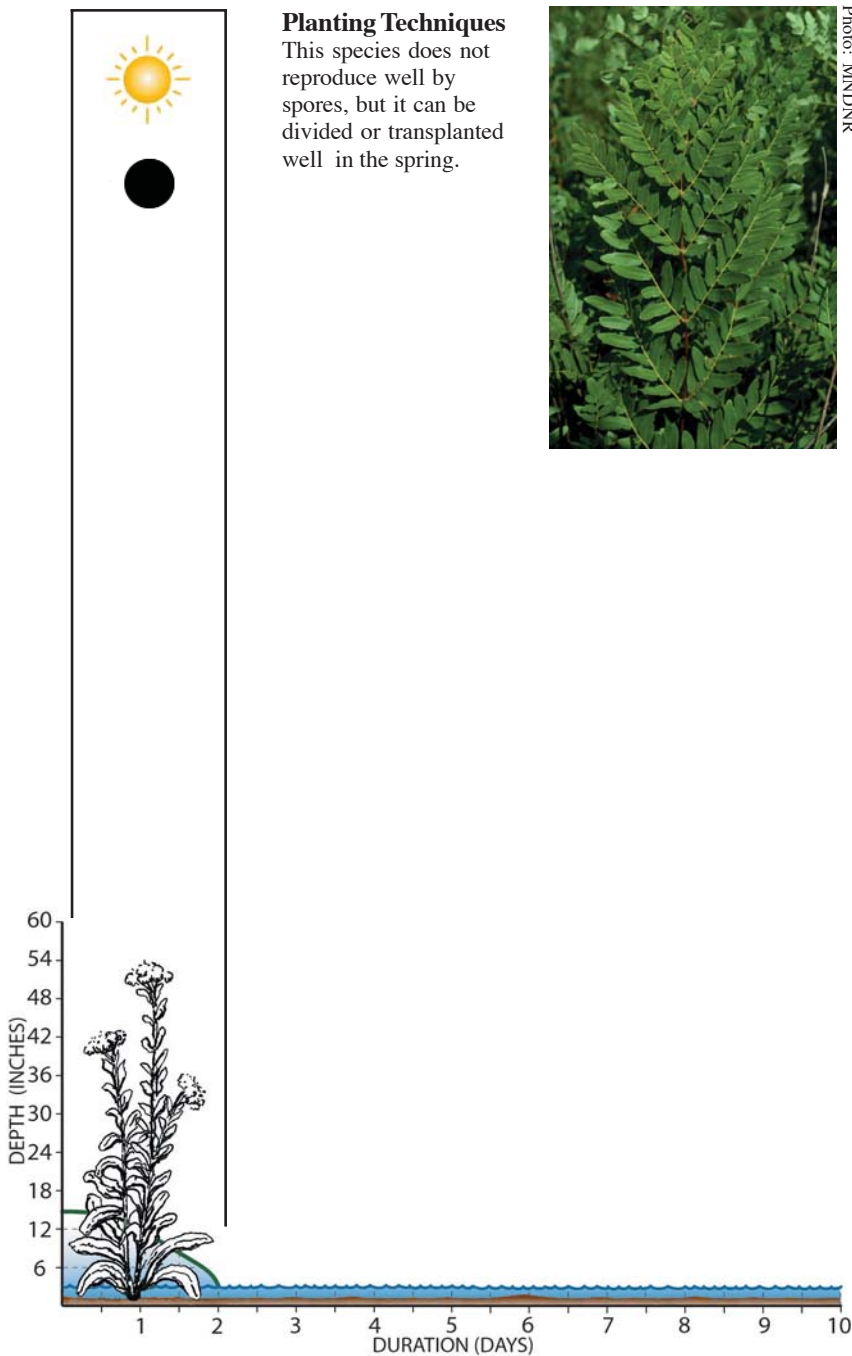
Indicator Status: OBL

### Planting Techniques

This species does not reproduce well by spores, but it can be divided or transplanted well in the spring.



Photo: MINDNR





## *Panicum virgatum*

### Switchgrass

#### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Open woods, dunes, shores, brackish marshes, mesic prairies and buffer slopes. [16, 17, 44] **Range:** Minn. (Eco-Region: All), Wis., Mich. N.S. and Que. to Man. and Mont., s. to Ariz., Mex. and W.I. [17, 21]

#### **Description**

**General:** Coarse, native, perennial grass growing to 6½'. Stout and erect. It is a fast-growing clump. **Flower:** Attractive, open beige inflorescence from July to October. The inflorescence freely branches in a pyramidal shape 8-15" long. The spikelets are ovoid, soon widened distally by spreading of the glumes and sterile lemmas. The leaves are conspicuously veined. **Leaf:** Firm, elongated linear, smooth leaves, 8-20" long and ½" wide. The ligule is a dense zone of silky hairs. **Stem:** 6' tall stems bearing open panicles of spikelets. **Root:** Hard, scaly rhizomes, often forming large tufts. **Soil:** Suited to soils ranging from mesic to wet, though prefers dry-to-moist, sandy soils, especially along shores. [17, 44]

#### **Normal Water Level**

This species prefers mesic conditions, though it will tolerate dry to wet/saturated conditions. [6, 21, 37, 44]

#### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). Switchgrass will tolerate irregular and seasonal inundation as well as drought and somewhat tolerant to flood duration. The seedlings decrease in abundance with a flood-depth increase. [1, 8, 37, 44]

#### **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun. **Salt:** Moderate to high. **Nutrient:** Low to moderate. **Siltation:** Moderate. **Insect:** High. **Other:** This species has a slow rate of spread and a moderate tolerance to general disturbance. [1, 8, 37, 44]

#### **Design Considerations**

Switchgrass has been used in stream bank, buffer, transitional and slope stabilization, especially where sandy. It is an excellent soil stabilizer. It is ideal winter cover for wildlife, pasture lands, waterways and other low, moist areas. It has an airy-looking head that makes a great space filler and is used in dried arrangements. **Concerns:** It is an aggressive species that may be appropriate for competing with invasive or non-native species. [6, 16, 37, 44]

#### **Wildlife Use**

This species is an important source of food for ground-feeding songbirds and gamebirds (snipe, turkey, pheasant, mourning dove, redwing blackbird, bobolink, cardinal, cowbird, junco and all sparrows for this area). Teal, widgeon and black duck eat the seeds and young foliage. Muskrats and rabbits eat the foliage and

**Indicator Status:** FAC+

plants. This species is also a wonderful cover for many wildlife species. [16, 32, 37, 44]

**Nursery/Plant Information**

**Available:** Widely.

**Types:** Seed and plants.

**Planting Techniques**

Switchgrass germinates best with alternating temperatures, high-light levels and warm temperatures of approximately 70 degrees F.

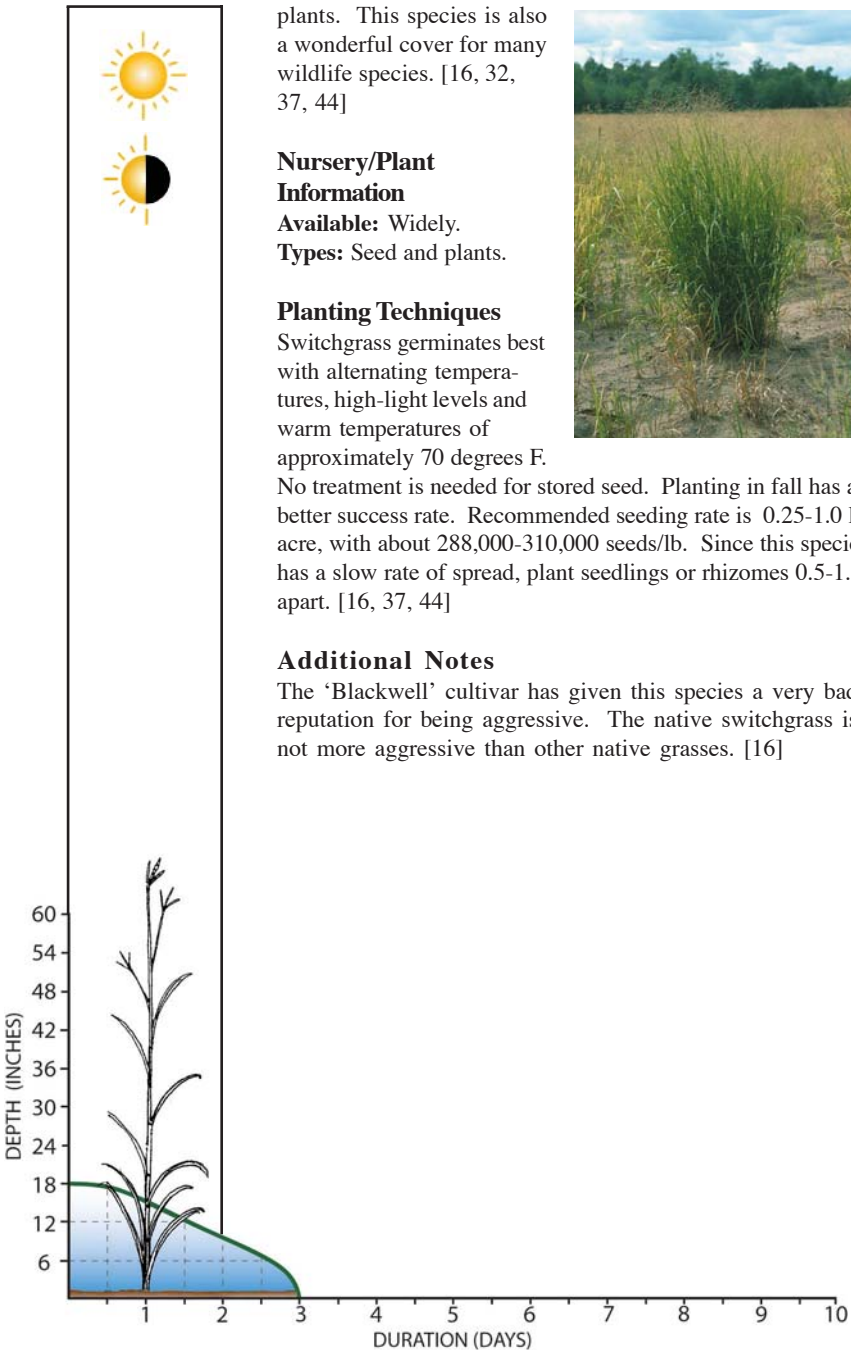
No treatment is needed for stored seed. Planting in fall has a better success rate. Recommended seeding rate is 0.25-1.0 lb/acre, with about 288,000-310,000 seeds/lb. Since this species has a slow rate of spread, plant seedlings or rhizomes 0.5-1.5' apart. [16, 37, 44]

**Additional Notes**

The 'Blackwell' cultivar has given this species a very bad reputation for being aggressive. The native switchgrass is not more aggressive than other native grasses. [16]



Photo: Paul Jackson







# *Phalaris arundinacea*

## Reed Canary Grass

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadows, shallow marshes, ditches, shores, shrub swamps, wooded swamps and streambanks. Reed canary grass is an extremely aggressive species that often forms persistent, monotypic stands on sites disturbed by agricultural use, drainage, filling, siltation and other factors. [4, 7, 11] **Range:** Common to abundant; Minn. (Eco-Range: All), Wis., Mich. Circumboreal, Nfld. to Alaska, s to N.C., Mo., Okla., N.M., Ariz. and Calif. [7, 21]

### Description

**General:** Tall, probably a non-native strain, perennial grass that typically forms large, dense colonies. **Flower:** A narrow, densely flowered panicle, 2-10" long, often purple-tinged. The branches are short and upright. Spikelets break above the glumes, with 1 fertile flower and 2 small, sterile lemmas below. Glumes are lance-shaped, tapered to tip, becoming straw-colored with age with 3 veins. The fertile lemma is ovate, shiny and blooms from June to July. **Leaf:** Flat and smooth, and usually 4-8" long and 1" wide, with smooth sheaths and a large, dry, papery ligule. **Stem:** Stout, smooth, branched stems 2-6' tall. **Root:** Spreading by rhizomes. **Soil:** Disturbed soils of any type, although it prefers it moist to wet. [4, 7, 11]

### Normal Water Level

This species prefers shallow water of 12" of inundation or less to wet/saturated conditions, although it will tolerate drier soils. Waterlogged conditions in the spring can stop growth of the rhizomes. [9, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 24". **Duration:** Long – 8 days (decreasing 6" every 2 days). This species will tolerate and even prefers regular and seasonal inundation with duration. Seedlings will decrease in abundance with flood depth increases, where mature plants are moderately tolerant. Mature plants are also tolerant with frequency increases and moderately so with flood depth decreases. [1, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** High. **Nutrient:** High with increased abundance with an increase of N. **Siltation:** Moderate, 0-8 cm/year. **Insect:** Infrequent. **Other:** Reed canary grass has a rapid rate of spread. It has a high tolerance to general disturbance and stress. It has a moderate tolerance to iron concentrations. [1, 37]

### Design Considerations

It has no design considerations other than to remove and manage this species. Reed canary grass has been planted for erosion control on upland and wetland sites, and for lowland pasture. The European strain of this grass has essentially assimilated the native strain. **Concerns:** Reed canary grass is an extremely aggressive, probably non-native species that often forms persistent, monotypic stands on sites disturbed by agricultural use, drainage, filling, siltation and other factors, often to the detriment of other plants. [4, 7, 11, 37]

**Indicator Status:** FACW+

### Wildlife Use

This species provides cover for many types of wildlife, especially prairie voles, marsh wrens, red-winged blackbirds and wood ducks. Buntings and Savannah sparrows eat the seeds. [4, 32, 37]

### Nursery/Plant Information

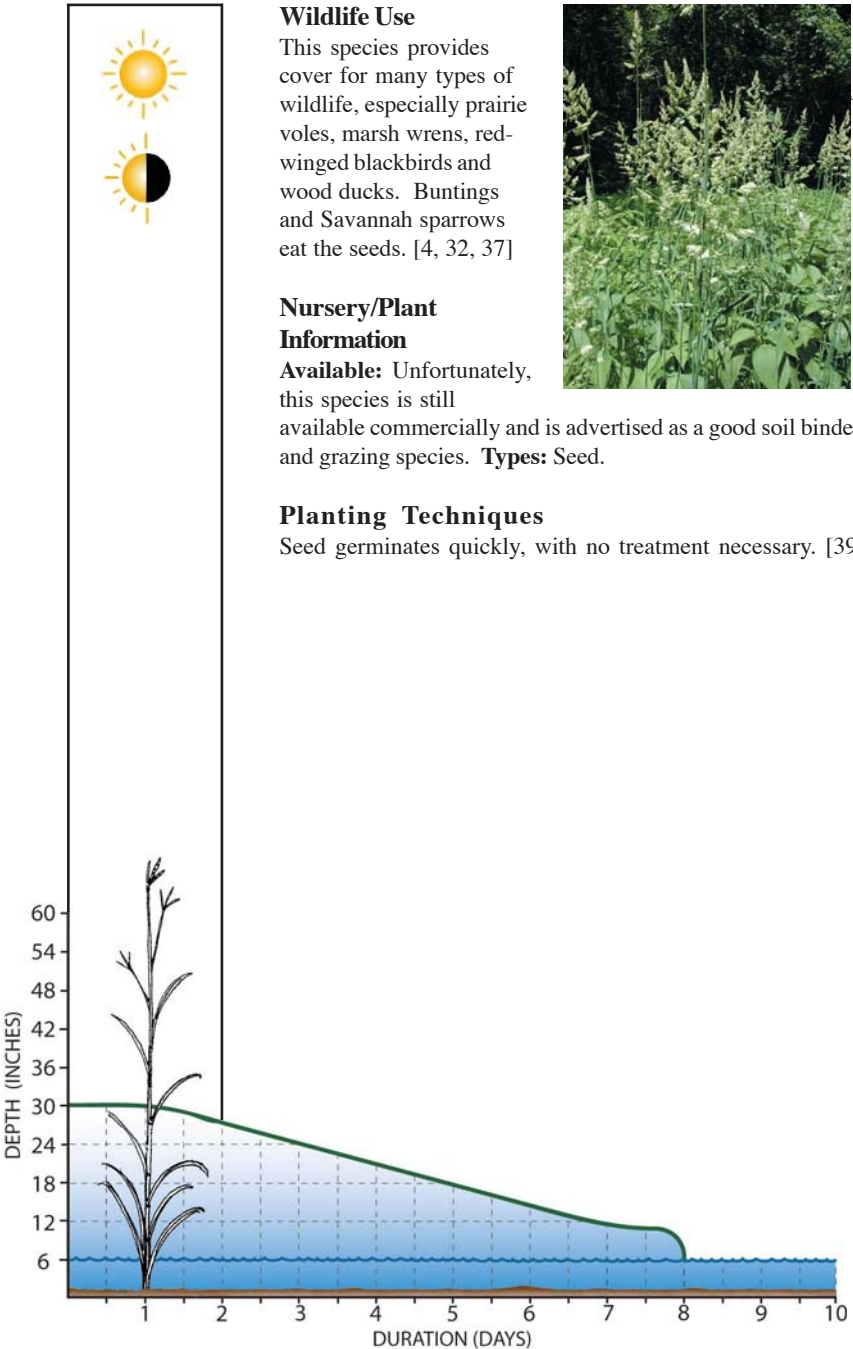
**Available:** Unfortunately, this species is still available commercially and is advertised as a good soil binder and grazing species. **Types:** Seed.

### Planting Techniques

Seed germinates quickly, with no treatment necessary. [39]



Photo: Rusty Schmidt





## *Physocarpus opulifolius*

Ninebark - a.k.a. Common Ninebark or Eastern Ninebark

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Stream banks, lake shores, swamps, rocky or sandy creek banks, sluggish streams, pond shores, seepage areas, bogs, moist limestone cliffs and rocky shores of the west side of Lake Superior. [7, 16, 22] **Range:** E. Minn., especially near Lake Superior and the Mississippi River (Eco-Region: 1,5-8), Wis., Mich.; Que. to N.D. and Colo., s. to N.C., Tenn. and Ark. [7]

### Description

**General:** Mound-forming shrub with closely spaced stems that grows 8-10' tall.

**Flower:** White flowers that are 5-parted, no wider than 3/8" with many in stalked, rounded clusters at ends of branches and in bloom from May to June. **Leaf:** Ninebark's maple-like leaves are alternate; ovate in outline; mostly 3-lobed; dark green above, paler and often sparsely hairy below. The margins are irregularly toothed, with 3/8-3/4"-long petioles. Yellow-green foliage turns to maroon-purple in autumn.

**Bark:** Loose bark, shredding in long, thin strips. **Twigs:** The long, greenish branches are covered with loose bark, slightly angled, smooth or finely hairy.

**Fruit:** A red-brown pod to 3/8" long in round clusters. The 3 or 4 seeds in each pod are shiny and produced from June to July. **Root:** Fibrous, shallow, lateral roots. **Soil:** Loams to clay soils. [7, 8, 22]

### Normal Water Level

This species prefers upland dry to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). This species is very flood tolerant, though seedlings are somewhat tolerant to flood duration and saplings are moderately tolerant. [1, 8, 22]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Low. **Siltation:** Unknown.

**Insect:** High. **Other:** Ninebark is damaged occasionally by wind and ice. It is resistant to drought, heat and soil compaction. This species has a moderate tolerance to general disturbance and stress. [1, 8, 21, 22, 25]

### Design Considerations

Ninebark is a popular foundation shrub because it is tough and easy to maintain. It is also a good shrub for restorations along streams, lakes, swamps, calcareous conditions and areas along Lake Superior. [7,16]

### Wildlife Use

This species provides food for waterfowl, marsh birds, shorebirds, upland gamebirds and small mammals. It is highly sought after by deer. The fruit is not edible to humans. [21, 22, 32]

Indicator Status: FACW-

### Nursery/Plant Information

#### Available:

Widely.

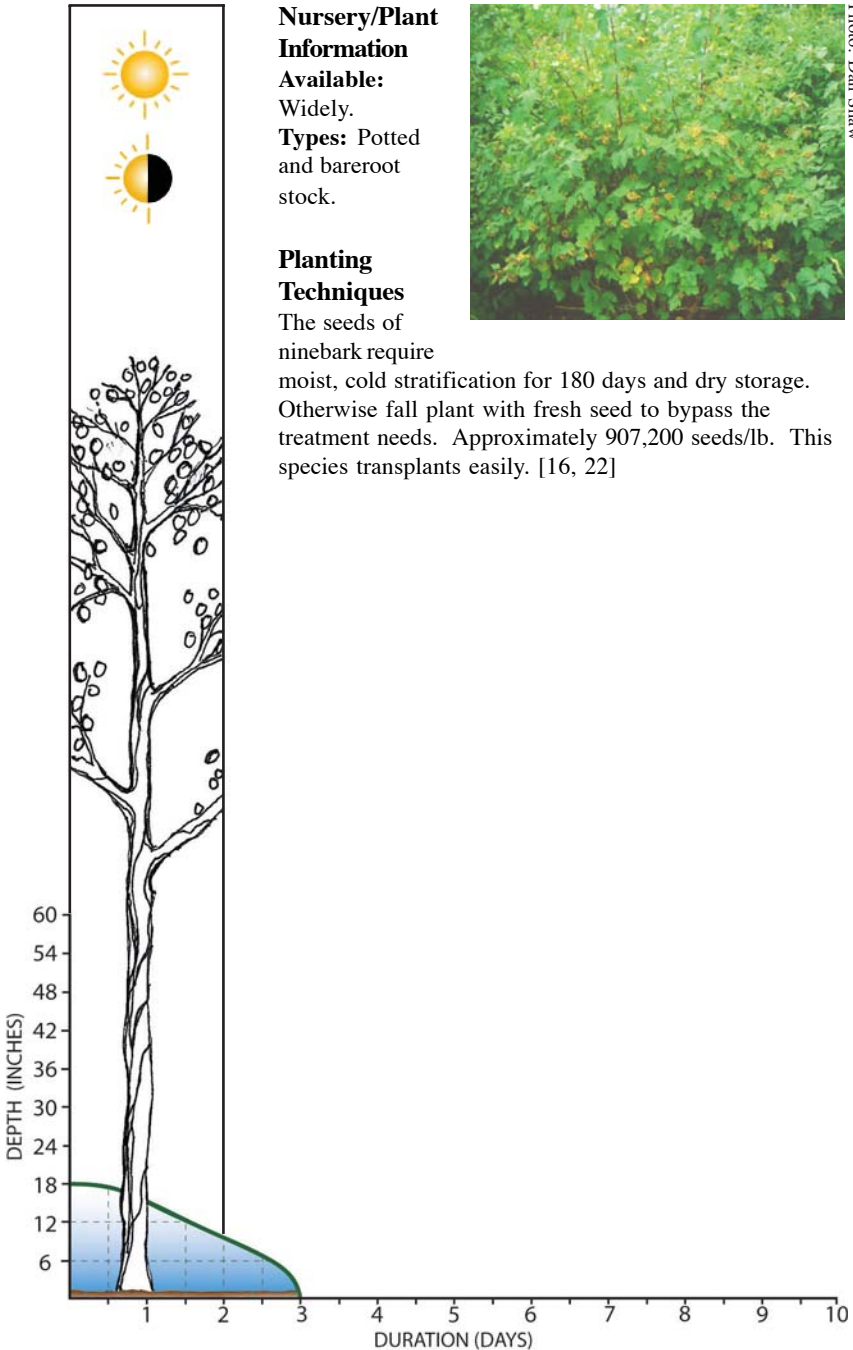
**Types:** Potted and bareroot stock.

### Planting Techniques

The seeds of ninebark require moist, cold stratification for 180 days and dry storage. Otherwise fall plant with fresh seed to bypass the treatment needs. Approximately 907,200 seeds/lb. This species transplants easily. [16, 22]



Photo: Dan Shaw





## *Physostegia virginiana*

Obedient Plant - a.k.a. *Physostegia virginiana speciosa* - Obedience,  
Lion's Heart, False or Showy False Dragonhead

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Sedge meadows, low prairies, marshes, moist and open woods, stream banks, shores, swamps, flood plain forests, thickets and ditches. [7, 16, 35] **Range:** Minn. (Eco-Region: All), Wis., Mich. Que. to Man., s to Va., Tenn., Ill., Mo. and ne. Kan. [7, 21]

### General Description

**General:** Erect, native, perennial herb, usually 2-3' tall. **Flower:** The showy, rosy-pink-purple flowers are about 1" long, borne in a spirelike, often branched, cluster that blooms from July to October. When the flower is pushed into a new position, it will remain there, giving the species its alternate name, obedient plant. **Leaf:** Elongate, oval, lance-shaped, opposite leaves that are smooth and without hairs, typically  $\frac{3}{4}$ -6" long, with sharp teeth margins and stalkless, not clasping. **Stem:** Erect stems 2-3' long that are often branched near top, 4-angled and smooth, without hairs. **Fruit:** a small achene forming from July to September. **Root:** Spreading by rhizomes. **Soil:** Tolerant of many types. [7, 35]

### Normal Water Level

This species prefers shallow water of 3" of inundation or less to wet/saturated conditions and will tolerate moist, upland conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species is somewhat tolerant to flood duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 47]

### Design Considerations

A wonderful landscape plant that is a popular perennial for gardens. Obedient plant has been used successfully in rain water gardens and should be considered in lakescaping, pond edges and other shoreland zones. It provides good cut flowers. **Concerns:** This species has rhizomes and can be aggressive, though that may be desirable when competing against invasive or non-native species. Many cultivars are available. [7, 16]

### Wildlife Use

Obedient plant is a good nectar source for hummingbirds and butterflies. [16, 21]

### Nursery/Plant Information

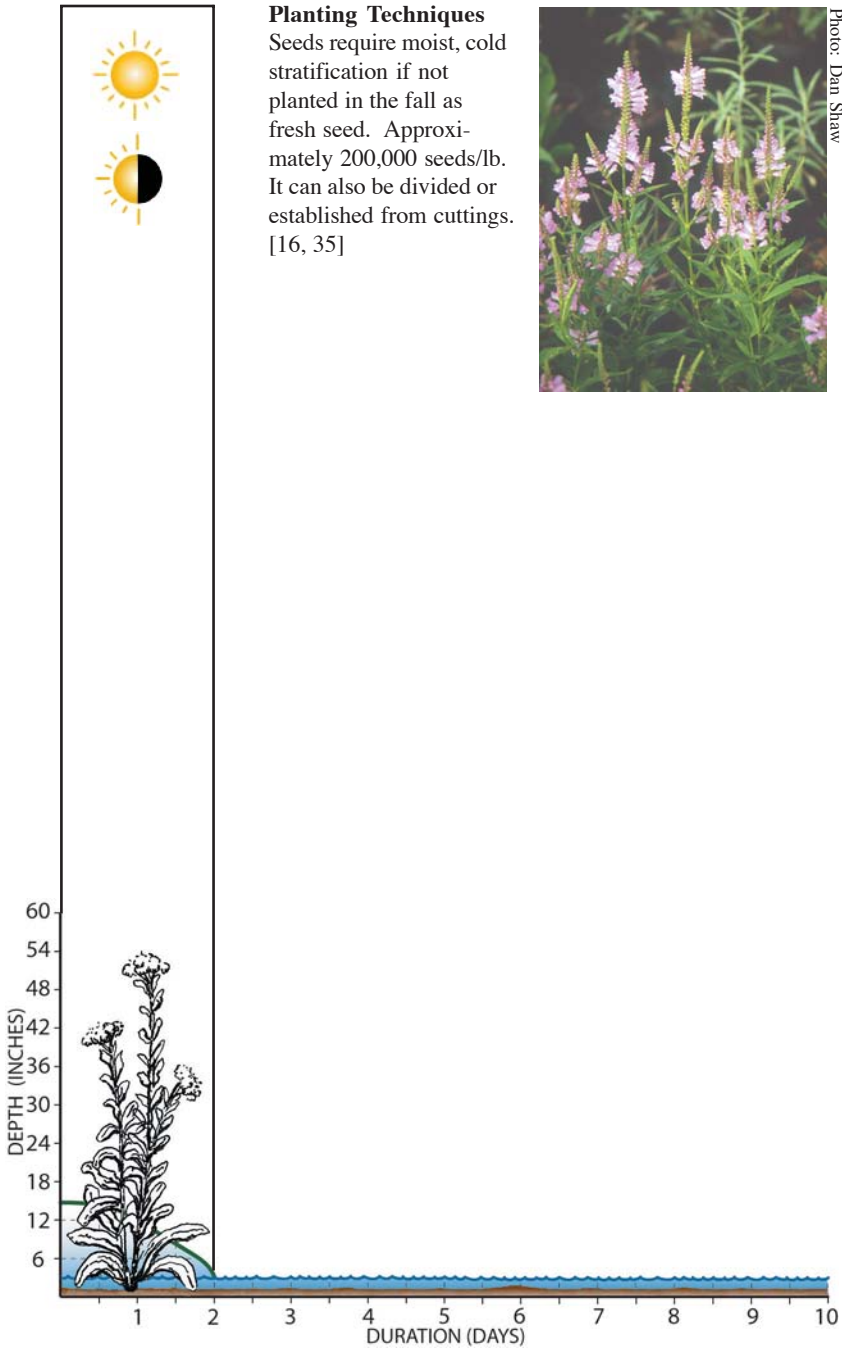
**Available:** Widely. **Types:** Plants and seed.

**Indicator Status: FACW**

**Planting Techniques**  
Seeds require moist, cold stratification if not planted in the fall as fresh seed. Approximately 200,000 seeds/lb. It can also be divided or established from cuttings. [16, 35]



Photo: Dan Shaw





## *Polygonum amphibium*

Water Smartweed - a.k.a. *P. amphibium stipulaceum*, *P. coccinum* –  
Water Knot Weed; Marsh, Knotted or Nodding Smartweed

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Ponds, lakes, marshes, bog pools, shores, backwater areas and quiet streams. [7, 11] **Range:** Minn. (Eco-Region: All), Wis., Mich. Widespread in N. Hemisphere. [7, 21]

### Description

**General:** A highly variable perennial floating or emergent herb typically 3' tall. **Flower:** Usually a solitary terminal spike of densely crowded red-pink flowers. Blooms from June to August. **Leaf:** This species is divided into two forms -- an aquatic form and a "terrestrial" form. Both forms have several lance-shaped leaves along the elongate stem. The aquatic form (formerly known as *P. natans*) has submergent and glabrous, floating leaves  $\frac{3}{4}$ -6" long and under  $\frac{3}{4}$ " wide. The terrestrial form (formerly known as *P. coccineum*) has erect, densely hairy leaves usually less than 2" wide. **Stem:** Prostrate or erect stems to a length of under 3' when terrestrial and under 6' when aquatic. The ocrea of at least the aquatic form exhibits a green flange at its summit. **Fruit:** Lens-shaped achene, shiny, dark brown from June to September. **Root:** Spreading, long, forking rhizomes. **Soil:** Moist-to-wet soils with a pH range of 5.4-8.8. [7, 11, 44]

### Normal Water Level

This species prefers areas with 36" of inundation or less. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 12". **Duration:** Short - 2 days though will have extended duration at 18". This species will tolerate a wide range of inundation at a regular to seasonal conditions and moderate duration. It is very tolerant to flood depth increases and will increase in abundance with depth decreases. [1, 37, 44]

### Sensitivities or Other Tolerances

**Exposure:** Partial to full sun. **Salt:** Low. **Nutrient:** Moderate to low. **Siltation:** Moderate to high. **Insect:** Infrequent. **Other:** It will tolerate waves and a wide range of inundation conditions. This species has a moderate-low tolerance to general disturbance and stress. [1, 44]

### Design Considerations

Water smartweed has been used in shoreland, wave-reducing and erosion-control zones. It should be considered for ponds, lakes, marshes and backwater-area restoration sites. This species is a good food source for wildlife. It will establish from the seedbank and is favored by drawdowns. **Concerns:** This species grows in large, dense beds, which may choke out other vegetation. [26, 42, 44]

### Wildlife Use

Water smartweed a good food source for wildlife. It is popular with waterfowl and valued by many of our most common and best-loved songbirds. The waterfowl include black, mallard, pintail, redhead, ring-necked, scaup, teal and wood ducks, Canada geese

**Indicator Status:** OBL



and trumpeter swans. The songbirds include redwing blackbird; cardinal; rose-breasted grosbeak; junco; redpoll; and fox, savannah, song, swamp, vesper, white-crowned and white-throated sparrow. This species also serves as a major food source for the purplish copper butterfly and provides cover for fish. Chipmunks and mice also use this plant as food. [6, 21, 32, 44]

### **Nursery/Plant Information**

**Available:** Limited. **Types:** Plants and rhizomes.

### **Planting Techniques**

The achenes of water smartweed should be cold, wet stratified for 90+ days. Germination requires high light levels. Fresh seeding in the fall has better establishment rates. Smartweeds does well from seedbanks, and drawdowns may promote germination. This species can also be established by taking cuttings from the top part of the stems and burying the lower portion of the cuttings. Or, cuttings can be broadcast and gently raked into loose soil and then rolled to firm the surface. Rhizomes may also be planted in moist soils. Seedlings can be planted in muddy soil to a depth of 12". Spring drawdowns followed by shallow flooding has improved establishment. Water smartweed is a fast colonizer. [6, 26, 42, 43, 44]



Photo: Jason Husveth



Photo: Jason Husveth





## *Pontederia cordata*

Pickerelweed - a.k.a. Pickerel Plant

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Lakes, ponds, rivers, marshes, bogs, swamps and Mississippi River backwaters, often forms large colonies (shallow water to 1 m deep). [4, 7, 11, 41] **Range:** E. Minn. (Eco-Region: 1, 6, 7), w. ½ of Wis., but local in UP of Mich. N.S. to Ont. and Minn., s. to S. Amer. [7, 21]

### Description

**General:** Pickerelweed is a nonpersistent, emergent, native, herbaceous perennial that is found in shallow water (rarely more than 3' deep) or saturated substrates to a height of 40". **Flower:** Violet-blue (rarely white) flowers are packed into a dense spike, 4-6" long that blooms from June to August. Individual flowers are ½" long and have 3 upper petals (the middle upper petal has 2 small, yellow spots) and 3 lower petals. **Leaf:** Heart-shaped to lanceolate leaves up to 7" long that has a potential of rosettes of submerged, ribbon-like leaves. The leaves are long-petioled and are dark green and glossy. **Stem:** Stout, upright, to 48" long, with 1 leaf. **Fruit:** A small, 1-seeded utricle produced from June to September. **Root:** Spreading, thick and creeping rhizomes, which form colonies. **Soil:** Shallow water or saturated substrates of muck or mud. [4, 7, 11, 41]

### Normal Water Level

This species prefers shallow water 12-18" deep, though it will tolerate wet/saturated conditions or water depths of 36" or less. It also prefers fresh or slightly brackish water. [11, 37, 41]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Medium long – 4 days (decreasing 6" every 2 days). Pickerelweed will tolerate regular flooding of small levels and moderate duration. It is very tolerant to flood depth increases and will increase in abundance with depth decreases. [1, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full sun to partial shade. **Salt:** Low. **Nutrient:** Unknown. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderately low tolerance to general disturbance and stress. [1, 6]

### Design Considerations

Pickerelweed has been used in restorations of back waters, slow-moving streams and lake shores. It is a very decorative plant for water gardens and lake shores. It provides good habitat. **Concerns:** Pickerelweed does not always persist after planting, although once established it can produce very large beds.

### Wildlife Use

Pickerelweed provides seeds for waterfowl, especially black and wood ducks. Muskrats eat the plants and roots. It also provides wonderful cover for frogs and fish. The small solitary bee, *Halictoides novae-angliae*, will visit this plant exclusively for nectar

**Indicator Status:** OBL

and pollen. [4, 6, 21, 32, 37, 41]

**Nursery/Plant Information**

**Available:** Widely. **Types:** Roots, seeds and plants.

**Planting Techniques**

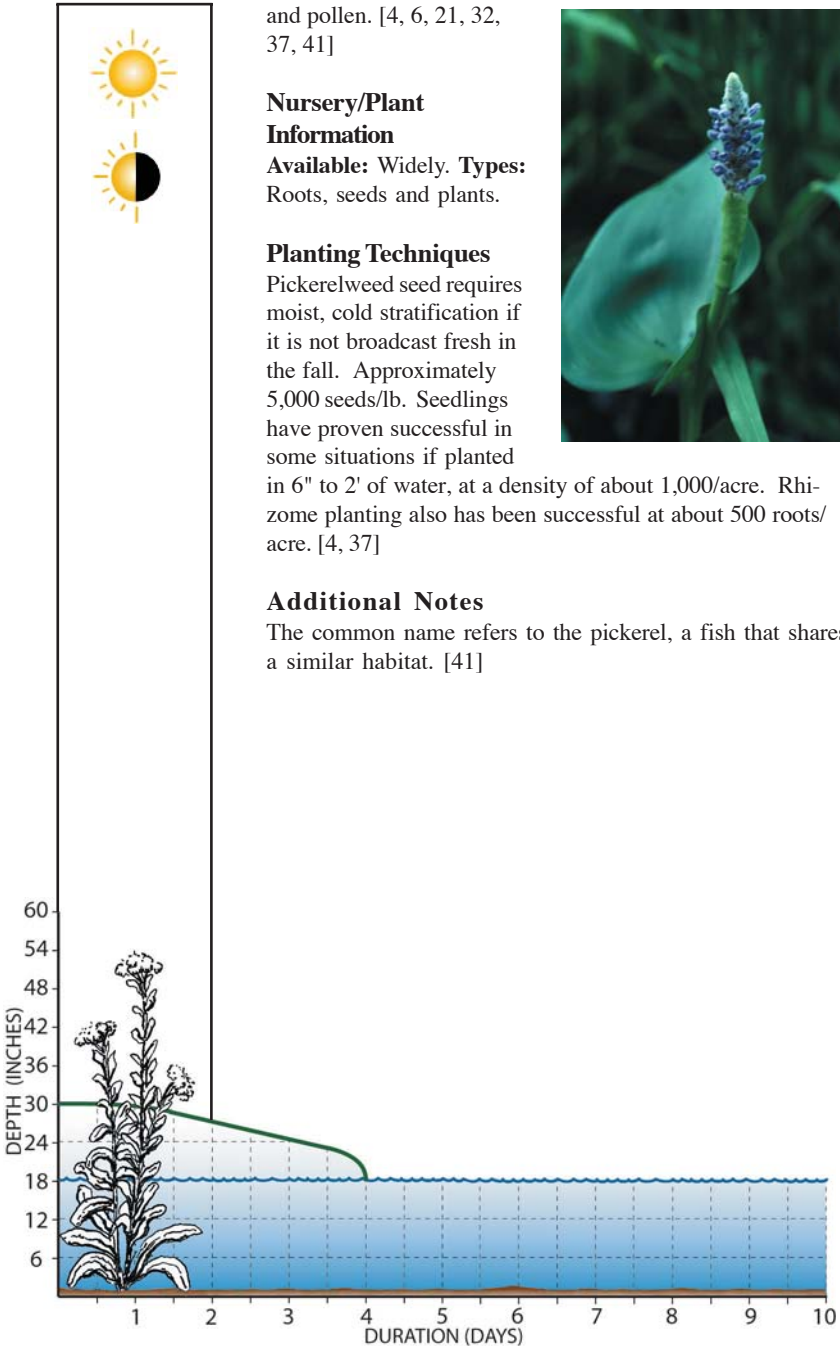
Pickerelweed seed requires moist, cold stratification if it is not broadcast fresh in the fall. Approximately 5,000 seeds/lb. Seedlings have proven successful in some situations if planted in 6" to 2' of water, at a density of about 1,000/acre. Rhizome planting also has been successful at about 500 roots/acre. [4, 37]

**Additional Notes**

The common name refers to the pickerel, a fish that shares a similar habitat. [41]



Photo: Jason Husweh





## *Populus deltoides*

Eastern Cottonwood - a.k.a. Carolina Poplar, Southern Cottonwood  
or Cottonwood

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Flood plain forest, stream banks, wet ravines, sand bars, shores, wet meadows, windbreak, shelterbelt plantings and ditches. It is typically a pioneering species of disturbed sites, such as berms, ditches, sand bars and quarries. [7, 11, 22, 36]  
**Range:** All but ne. Minn. (Eco-Region: 2-9), c. and s. Wis., s. Mich. Que. to Sask., s. to Fla., Tex. and Ariz. [7, 21]

### Description

**General:** Large, deciduous tree 75-100' or more tall, with a large trunk (often 3 to 4' or more in diameter) and a broad, rounded crown of spreading and slightly drooping branches. **Flower:** Brownish catkins 2-3½" long. The male and female catkins are on separate trees that flower April to May. **Leaf:** Triangular, long-pointed leaves 3-7" long and 3-5" wide that are usually straight at the base with curved, coarse teeth. The leaves are slightly thickened and shiny green in color, turning pale yellow in autumn. The leafstalks are long, slender and slightly flattened. **Bark:** Young bark is yellowish-green and smooth, turning light gray, then thick, rough and deeply furrowed. **Twigs:** Brownish, stout twigs with large resinous or sticky buds. **Fruit:** 3/8"-long, elliptical capsules that are light brown and mature in spring. The capsules split into 3 or 4 parts, with many on slender stalks in catkins 8" long and spreading thousands of tiny, cottony seeds that are carried by the wind long distances. **Root:** Shallow, fibrous roots. **Soil:** Tolerates most moist and wet/saturated soils, especially sandy or alluvial. [7, 8, 11, 22, 36]

### Normal Water Level

This species prefers upland moist-wet/saturated conditions, though it will also tolerate drier conditions. The best growth for this species is when the water level is 2' below surface. [5, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 60". **Duration:** Long – 30 days (decreasing 12" every 2 days, then will level out at 18" until 30 days). Eastern cottonwood will tolerate seasonal flooding for long periods. For flood duration, tolerant as an adult, moderately so as a sapling and somewhat tolerant as a seedling. Seedlings are unaffected by flood depth increases in the spring, though fall flooding will decrease the population. [1, 8, 22, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full sun. **Salt:** High. **Nutrient:** Moderate. **Siltation:** High.

**Insect:** Frequent – bronze birch borer, poplar borer, poplar tent maker. **Other:** Cottonwood is frequently susceptible to poplar canker, Cytospora canker, Fusarium canker, leaf blister, branch gall and dieback. Wind and ice frequently damage it due to its very weak wood, and it is sensitive to lightning. It does have resistance to drought, heat, oil/grease, metals, mine spoils and soil compaction. This species has a moderate tolerance to general disturbance and stress. [1, 2, 8, 10, 22, 37]

### Design Considerations

This species has been planted as a shade tree and for shelterbelts. Although it is short lived, it is one of the faster growing trees, which may help shade or reforest a restoration quickly.

**Indicator Status: FAC+**

**Concerns:** Many people consider it weedy as it can spread little seedlings quickly across a site. Some authorities discourage its planting due to its cottony seeds. Another concern is that it is a favorite species of beavers (if they are an issue for your site). [36]



Photo: [www.cala2.umn.edu/la5574](http://www.cala2.umn.edu/la5574)

### Wildlife Use

Eastern cottonwood provides habitat for many species, especially during winter. Ruffed and sharp-tailed grouse eat the buds and catkins in the winter and spring, as do the evening grosbeak and purple finch. The sap is utilized by the yellow-bellied sapsucker. The tender bark, twigs and foliage are eaten freely by rabbits, deer, elk and moose. The wood and bark is a favorite of beaver and porcupine. Many songbirds use this species for nesting and habitat as do small mammals such as chipmunks, squirrels and mice. [21, 22, 32, 37]

### Nursery/Plant Information

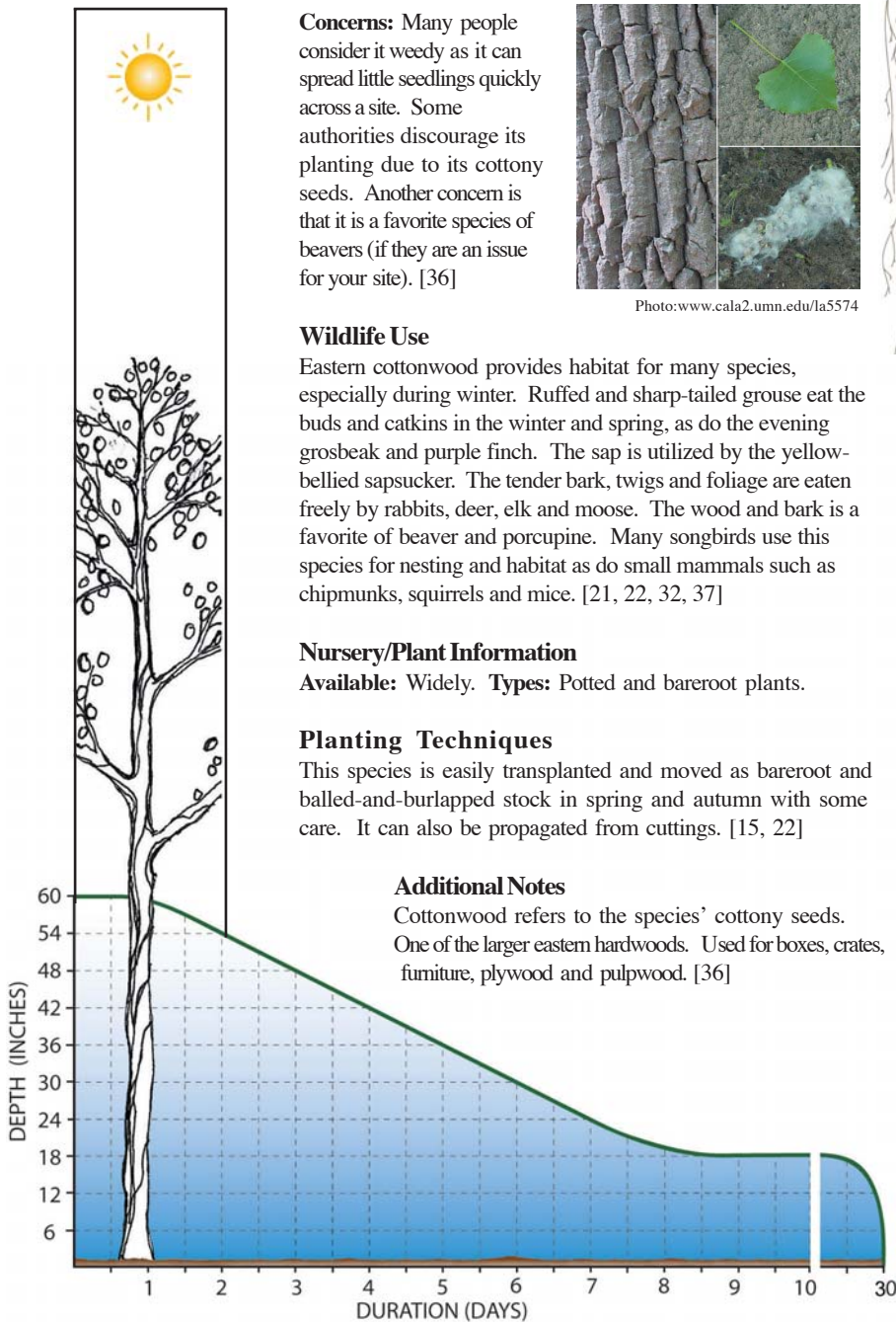
**Available:** Widely. **Types:** Potted and bareroot plants.

### Planting Techniques

This species is easily transplanted and moved as bareroot and balled-and-burlapped stock in spring and autumn with some care. It can also be propagated from cuttings. [15, 22]

### Additional Notes

Cottonwood refers to the species' cottony seeds. One of the larger eastern hardwoods. Used for boxes, crates, furniture, plywood and pulpwood. [36]





## *Populus tremuloides*

Quaking Aspen - a.k.a. Trembling Aspen, Golden Aspen or Popple

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Moist upland woods, seeps and streamsides, often on cut-over or burned land. Quaking aspen often invades abandoned agricultural lands and vacant urban lands. [17, 11, 22, 36] **Range:** Minn. (Eco-Region: All), Wis., Mich. Labr. to Alaska, s. to N.J., Va., Tenn., Mo. and Mex. [17, 21]

### Description

**General:** The most widely distributed, native, deciduous tree in North America with a narrow, rounded crown of thin foliage, growing 40-50' tall and 20-35' wide. Trunk may have a diameter of 1-1½'. **Flower:** Sexes are on separate trees with pistillate catkins 1-2½" long, brownish, blooming in early spring before the leaves emerge. **Leaf:** Simple, alternate, nearly round 1¼-3" long leaves that have an abrupt, short point with a rounded base and finely saw-toothed margins. They are shiny green above, dull green beneath and turn golden-yellow in autumn, with slender, flattened leafstalks. Leaves tremble in the slightest breeze. **Bark:** Young bark is whitish, smooth and thin. As it matures, it turns dark gray, furrowed and thick. **Twigs:** Shiny brown, slender and hairless. **Fruit:** Narrowly conical, light-green capsules ¼" long in drooping catkins to 4" long that mature in late spring and split in 2 parts, with many, tiny, cottony seeds. **Root:** Shallow, fibrous, prolific sprouts form broad colonies. **Soil:** Tolerates most soil types, although it prefers sandy and gravelly slopes and wet-moist, limy soils where it can form large colonies from an extensive root system. [17, 11, 22, 36]

### Normal Water Level

Although this species will tolerate saturated soils, it prefers upland moist to dry conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). This species is intolerant of flooding with somewhat of a tolerance to duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Full sun. **Salt:** Moderate to high. **Nutrient:** Low. **Siltation:** Unknown. **Insect:** Frequent – poplar borer, poplar gall, scale, red humped caterpillar. **Other:** This species is frequently susceptible to leaf spot, shoot blight, Cytospora canker, Hypoxylon canker and other cankers. It is also frequently damaged by wind and ice and is sensitive to SO<sub>2</sub>, O<sub>3</sub>, lighting and soil compaction. It can be sensitive to HFI, drought, heat and mine spoils. It has a moderately high tolerance to general disturbance and stress. [1, 2, 22, 25]

### Design Considerations

Quaking aspen has been used primarily for reforesting an area quickly, due to its pioneer qualities, especially in cut-over and burned areas. It is also a primary pulpwood species.

**Indicator Status:** FAC

Photo: Paul Jackson

**Concerns:** It has been very popular with the lumber industry lately, with cultivars being introduced for even faster growth. It can overtake native plant communities, especially prairies. Suckering can be a problem in gardens. Quaking aspen is a favorite food of beaver. [11, 22, 36]

**Wildlife Use**

Quaking aspen provides habitat for many species, especially during the winter. Ruffed and sharp-tailed grouse eat the buds and catkins in winter and spring, as do the evening grosbeak and purple finch. The sap is utilized by the yellow-bellied sapsucker. The tender bark, twigs and foliage are eaten freely by rabbits, deer, elk and moose. The wood and bark is a favorite of beaver and porcupine. Many songbirds use this species for nesting and habitat as do small mammals, such as chipmunks, squirrels and mice. [11, 22, 32, 36]

**Nursery/Plant Information**

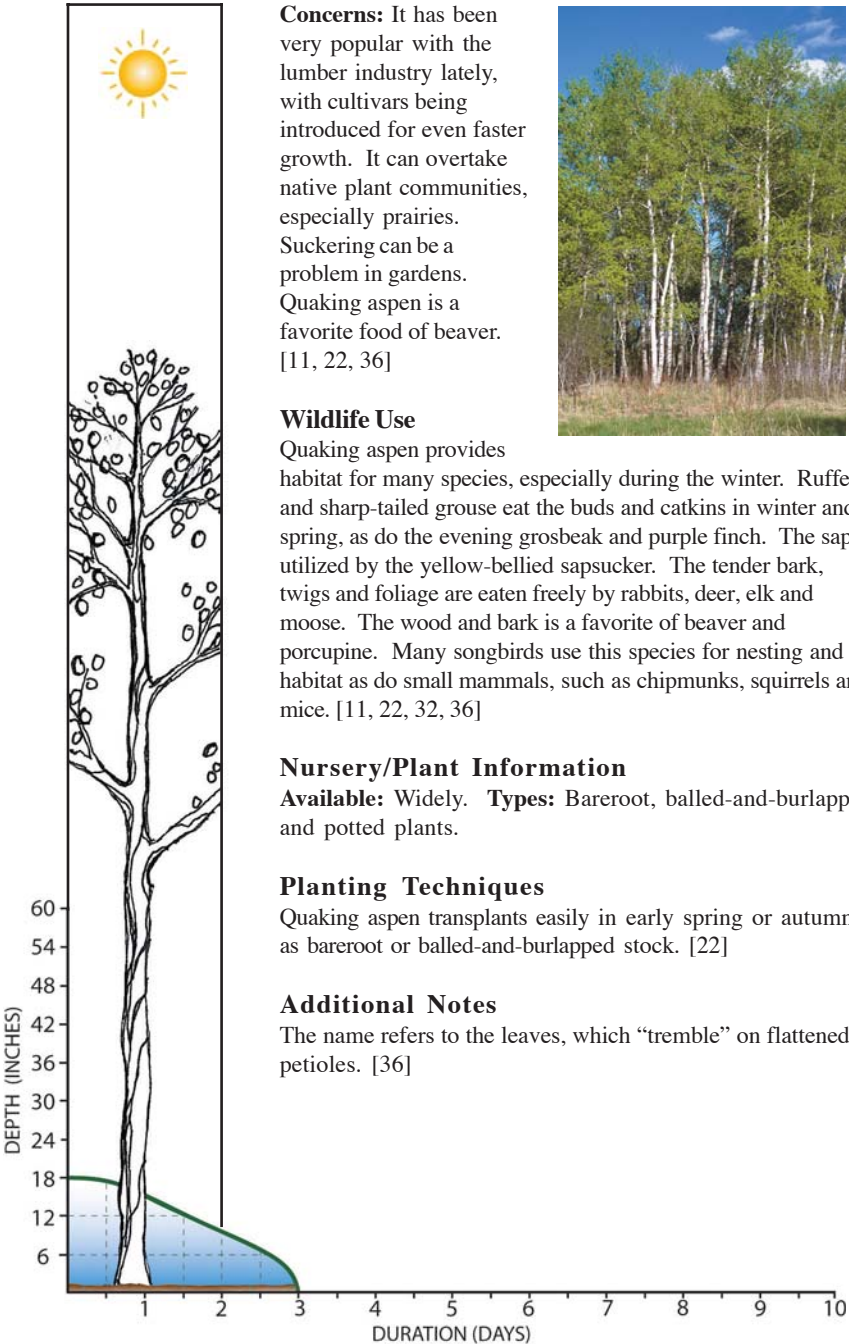
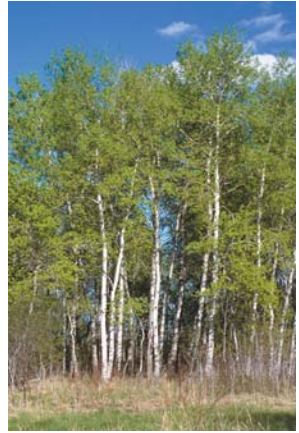
**Available:** Widely. **Types:** Bareroot, balled-and-burlapped and potted plants.

**Planting Techniques**

Quaking aspen transplants easily in early spring or autumn as bareroot or balled-and-burlapped stock. [22]

**Additional Notes**

The name refers to the leaves, which “tremble” on flattened petioles. [36]





## *Potentilla palustris*

Marsh Cinquefoil - a.k.a. Purple Marshlocks

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Open bogs (especially in pools and wet margins), conifer swamps and shores, sometimes with the lower parts growing in water. [17, 35]

**Range:** All but extreme w. and s. Minn. (Eco-Region: 1-3, 5-6, 8), all but sw. Wis., Mich. Circumpolar subarctic, Greenland and Labr. to Alaska, s. to N.J., Ohio, Iowa, N.D., Wyo. and Calif. [17]

### Description

**General:** Erect, reddish, native, perennial herb. **Flower:** Ends in a loose cluster of single or paired flowers from leaf axils. The sepals are dark red or purple, ovate to lance-shaped, ¼-¾" long, with 5 petals (sometimes 10) with a short, slender tip and 25 dark-red stamens. **Leaf:** Pinnately divided compound leaves all from the stem, with 3-7 leaflets. The leaflets are oblong to oval, 1-4" wide, mostly rounded at the tip. The leaf has a waxy underside with sharp, forward-pointed margins. The lower leaves are long petioled, while the upper leaves are nearly stalkless, with stipules forming wings around the petioles of the lower leaves, becoming shorter upward. **Stem:** Woody base stem 12-30" long, ascending to sprawling or floating in shallow water, often rooting at the nodes. The lower stems are smooth, while the upper stems are sparsely hairy. **Fruit:** Smooth, red-to-brown achenes are attached to the enlarged, spongy receptacle, from June to August. **Root:** Long, stout rhizomes. [17, 35]

### Normal Water Level

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [35]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species is moderately tolerant to flood duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** Moderate. **Nutrient:** Moderate.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderately low tolerance to general disturbance and a moderate tolerance to iron concentrations. [1, 47]

### Design Considerations

Marsh cinquefoil is recommended for bog, conifer swamps and shores in shallow water or saturated soils.

### Wildlife Use

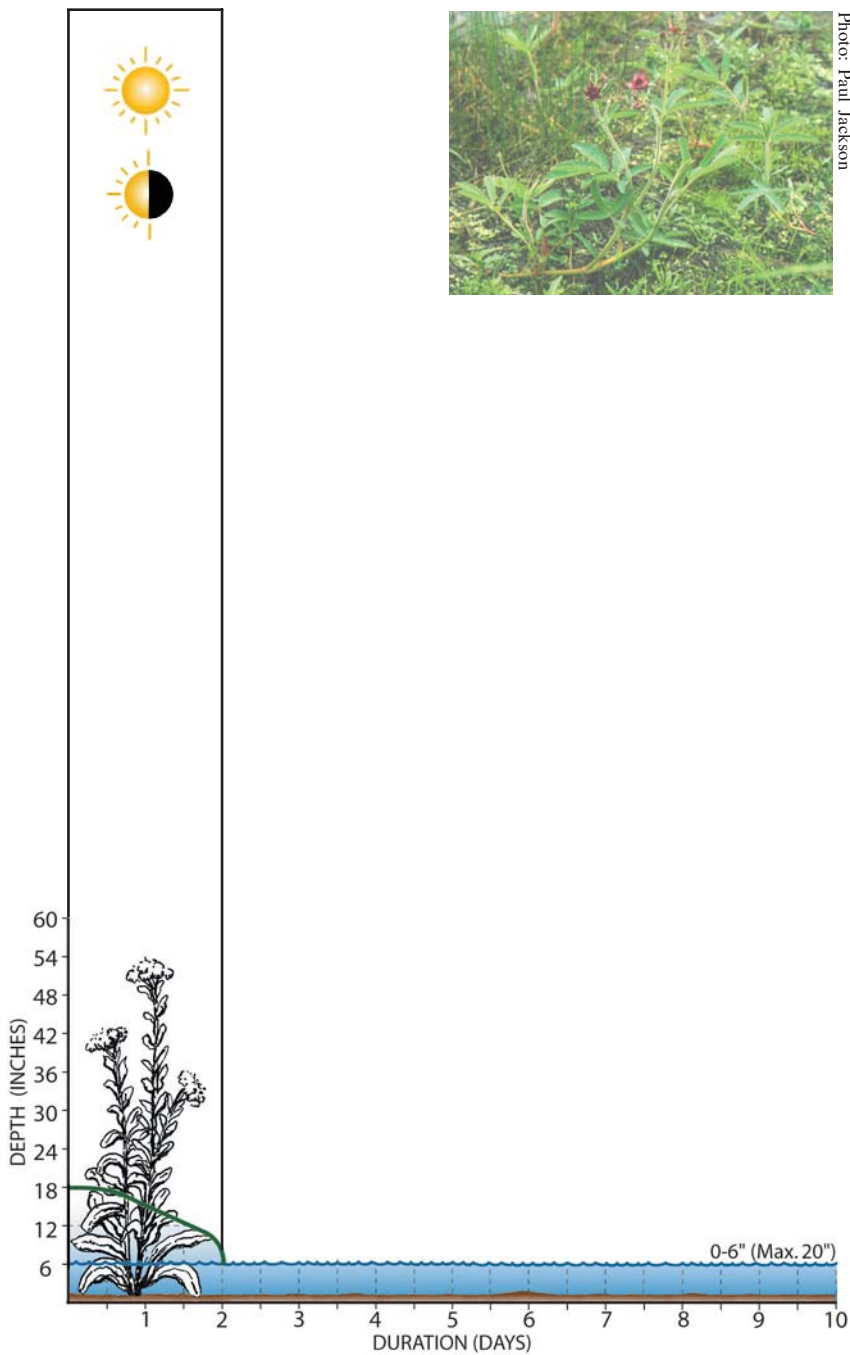
Grouse and woodcock eat the seeds and foliage. [32]

### Nursery/Plant Information

**Available:** Not available.

Indicator Status: OBL

Photo: Paul Jackson







## *Pteridium aquilinum*

### Bracken Fern

#### **Habitat/Plant Community and Geographic Range**

**Habitat Community:** Many habitats, often disturbed areas. **Range:** Minn. (Eco-Region: 1-3, 5-8), Wis., Mich. Widespread at least in the N. Hemisphere. [17, 21]

#### **Description**

**General:** Coarse fern with coriaceous, deciduous leaves mostly 18-60" tall overall.

**Leaf:** Petiole coarse, erect and stem-like, with several vascular bundles that unite distally to form a gutter-shaped bundle. Blade is ternate-pinnately 2-3 times compound, the ultimate segments pinnatifid but otherwise entire. The pinnae are opposite and the pinnules alternate, their segments oblong to linear with revolute margins. Veins "free" but connected by a submarginal vascular strand on which the contiguous and confluent linear sori are borne; these are protected by the recurved, modified leaf margin and a minute hyaline inner indusial flap of tissue. **Root:** Widely creeping rhizomes with septate hair. [17]

#### **Normal Water Level**

This species prefers upland moist to upland dry conditions. [21]

#### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 1 day (decreasing all 12" in 1 day). Bracken fern is somewhat tolerant to flood duration. [1]

#### **Sensitivities or Other Tolerances:**

**Shade:** Full to partial sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Low.

**Insect:** Infrequent. **Other:** This species has a moderate-to-high tolerance to general disturbance and stress. [1]

#### **Design Considerations**

Design considerations are difficult to obtain. **Concerns:** Spreads aggressively.

#### **Wildlife Use**

Ferns are widespread, especially in moist woodlands. Yet, as a wildlife food source, they are used to a minor extent. Their leaves are eaten by several species, including deer, hares and grouse, especially in seasons when other green plants are scarce. Ferns are a good habitat cover plant for small mammals and songbirds. [32]

#### **Nursery/Plant Information**

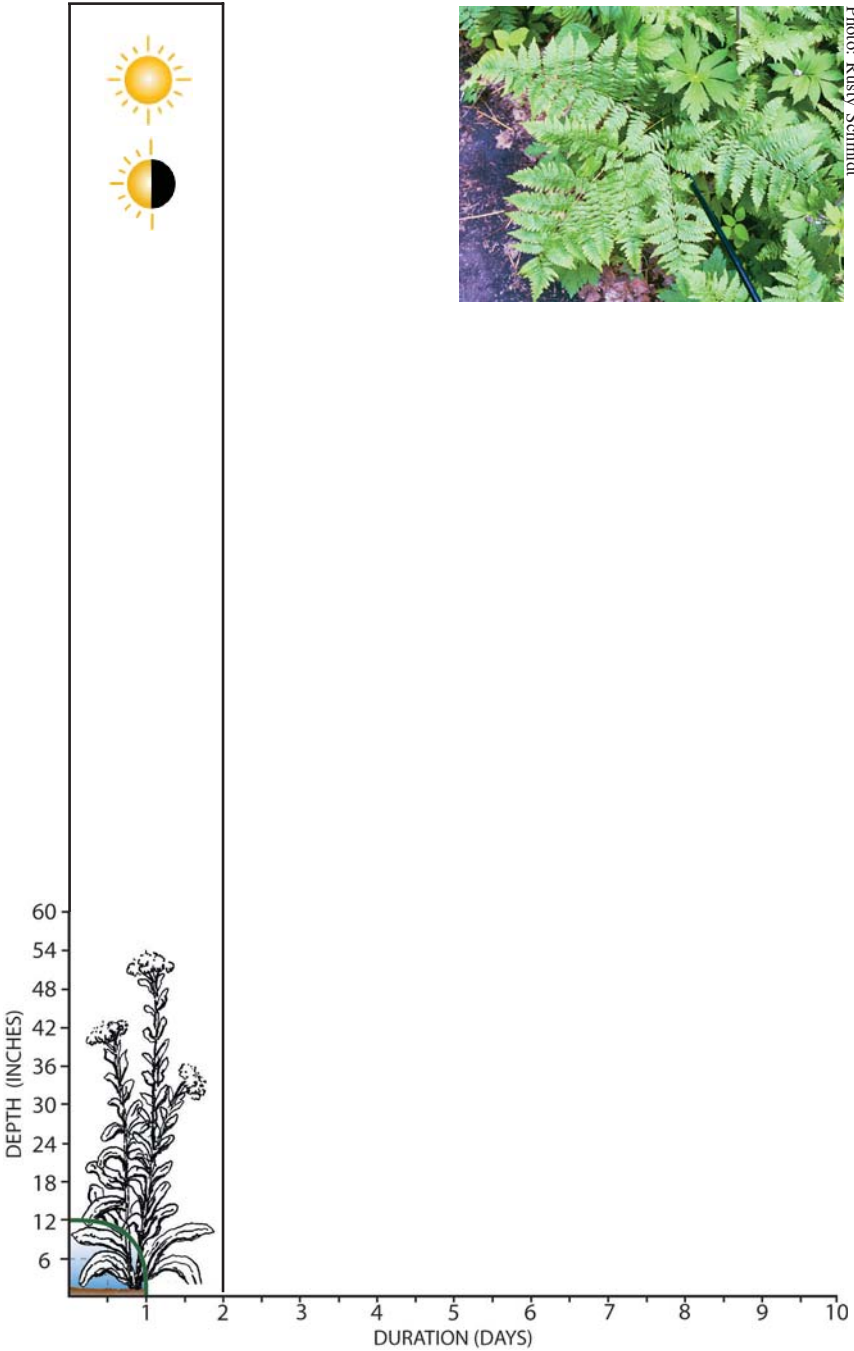
**Available:** Not available.

#### **Planting Techniques**

Difficult to transplant.

Indicator Status: FACU

Photo: Rusty Schmidt





# *Pycnanthemum virginianum*

Mountain Mint - a.k.a. Common or Virginia Mountain Mint

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadows, sedge meadow, marshes, tamarack swamps, calcareous fens and low prairies. Mountain mint may persist when other prairie species are eliminated by grazing. [7, 11, 16, 44] **Range:** Nw., c. and s. Minn. (Eco-Region: 1,3-9), Wisc., c. and s. LP of Mich. Me. to N.D., s. to Ga. and Okla. [7, 21]

## Description

**General:** Strongly scented (minty fragrance), native, perennial herb 20-36" tall with fine, attractive foliage. **Flower:** The small, triangular-shaped calyx lobes are shorter than the calyx tube. The inflorescence contains 4 or more flowers in dense, button-like cymes that terminate the stems and branches. Each white-with-purple-spot flower contains 4 stamens. Blooms from the end of June to the beginning of October. **Leaf:** Opposite, lance-linear-shaped leaves are entire, smooth above and usually average less than ¼" wide. The outermost modified leaves of the inflorescence are leafy and hairless above, without a prominent midvein. **Stem:** Square stems that are hairy along the angles. **Fruit:** 4-parted achene. **Root:** Stoloniferous rhizomes. **Soil:** The pH range is 5.0-7.0. [7, 11, 44]

## Normal Water Level

Although it will tolerate drier conditions, mountain mint prefers upland moist to wet/saturated conditions. [21, 44]

## Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). [44]

## Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Moderate. **Siltation:** Low to moderate. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 44, 47]

## Design Considerations

Due to its stoloniferous growth habit, mountain mint has been used for stabilization of slopes, buffers, vegetated swales and shores. It is a good perennial for gardens and lake shore restorations. It has been used in a number of landscape designs where it is allowed to spread. It is a terrific plant for restorations of calcareous, wet meadows, marshes and low prairie conditions. It provides good cut and dried flowers that are very aromatic. **Concerns:** This species can be aggressive, although this may be a benefit in some situations where invasive species are a concern. [16, 44]

## Wildlife Use

Mountain mint attracts butterflies. [21, 44]

Indicator Status: FACW+

### Nursery/Plant Information

**Available:** Widely.

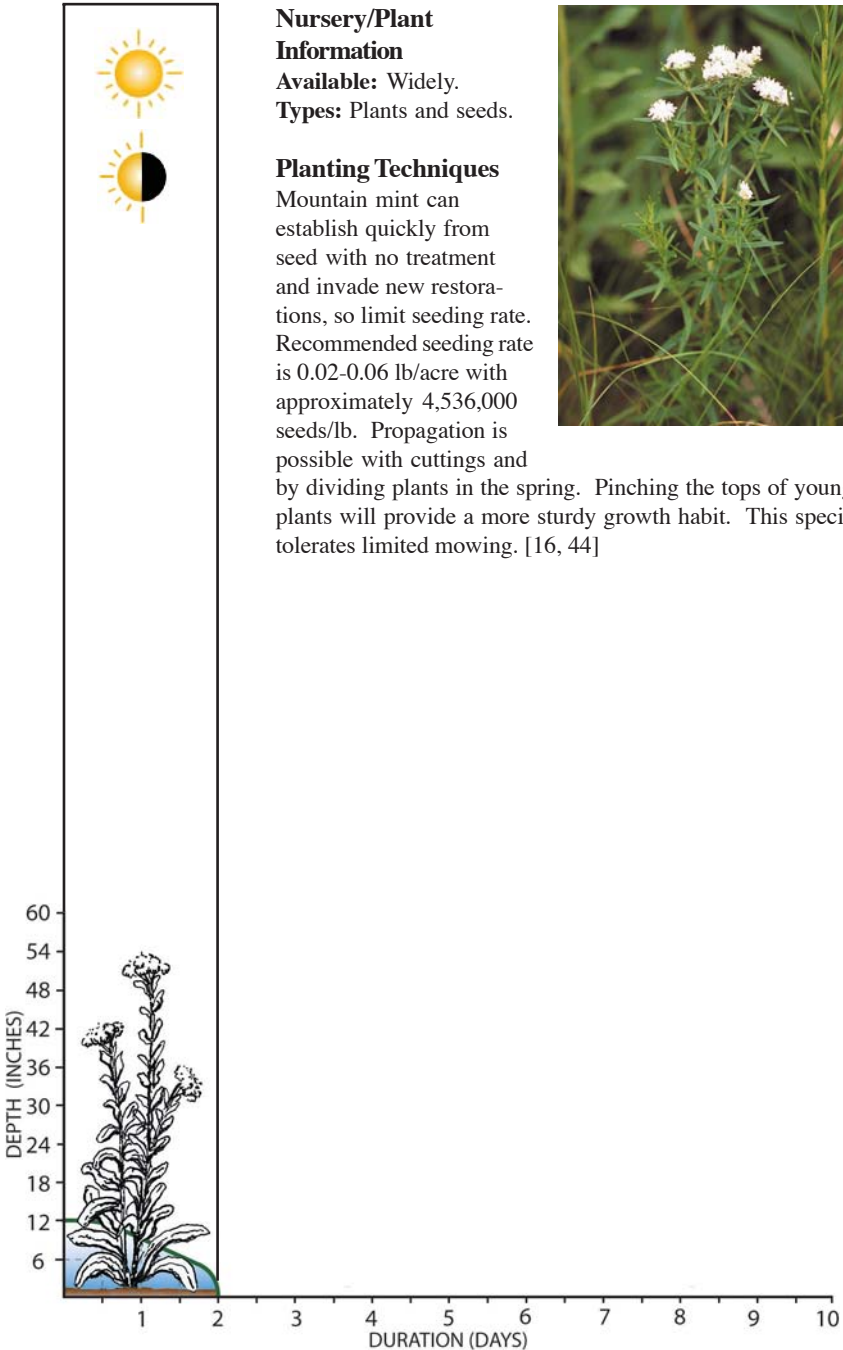
**Types:** Plants and seeds.

### Planting Techniques

Mountain mint can establish quickly from seed with no treatment and invade new restorations, so limit seeding rate. Recommended seeding rate is 0.02-0.06 lb/acre with approximately 4,536,000 seeds/lb. Propagation is possible with cuttings and by dividing plants in the spring. Pinching the tops of young plants will provide a more sturdy growth habit. This species tolerates limited mowing. [16, 44]



Photo: Paul Jackson





## *Quercus bicolor*

### Swamp White Oak

#### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Flood plain forest, terrace species, low areas in moist forests, alluvial flats, borders of small streams, lake margins and swamps. [7, 22, 36, 44]

**Range:** Se. and sc. Minn. (Eco-Region: 7-8), c. and s. Wis., s. LP of Mich. Que. and Me. to c. Minn., s. to N.C., Tenn. and n. Ark. [7, 21]

#### **Description**

**General:** Deciduous tree 50-60' tall and 40-50' wide with a trunk up to 3' wide.

Typically the crown is broad and rounded, often with drooping branches.

**Flower:** Separate, but on same tree, appearing with the leaves. The male flowers are slender, drooping catkins, while the female flowers are in groups of 2 to 4, opening in May. **Leaf:** Obovate, rounded or blunt at the tip that is broadest beyond the middle and gradually narrows to a pointed base 4-7" long and 2-4½" wide. The edges are wavy, with 5-10 shallow, rounded lobes on each side. Leaves are green and slightly shiny above, with soft, whitish hairs beneath that turn brown to red in the fall and persist through winter. **Buds:** Clustered at branch tips, yellow-brown and smooth.

**Bark:** Two-tone, light-gray bark with large, thin scales that become furrowed into plates and exfoliates. **Twigs:** Gray to yellow-brown. **Fruit:** ¾-1¼" long, egg-shaped acorns that are 1/3 or more enclosed by a deep cup of many distinct scales, which becomes light brown. Usually, there are 2 fruits on a long, slender stalk that mature the first year. **Root:** Shallow, fibrous roots. **Soil:** Tolerates most soils, though it prefers alluvial flats and requires acidic soil. [7, 8, 22, 36, 44]

#### **Normal Water Level**

This species prefers upland moist to wet/saturated conditions that dry out toward the end of the growing season. [21, 37, 44]

#### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 60". **Duration:** Long – 15 days (decreasing 12"/day for 4 days and gradually decreasing to 0" at 15 days). Seedlings cannot tolerate more than 9" of inundation over 12 hours. This species will tolerate seasonally and irregular inundation and flooding with a moderate tolerance to duration. It will tolerate depth increases. [1, 8, 22, 37, 44]

#### **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun. **Salt:** High, especially for soil salt and lower for spray. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** Swamp white oak is often susceptible to severe iron chlorosis, and it requires acid soils. It is not damaged often by wind and ice, and it is resistant to drought, heat, soil compaction and mine spoils. It has a moderate-to-low tolerance to general disturbance and stress. [1, 8, 10, 22, 25, 37, 44]

#### **Design Considerations**

This species has recently been used in many urban conditions, including street trees, due to its ability to withstand many stresses. It is also used as a buffer slope and

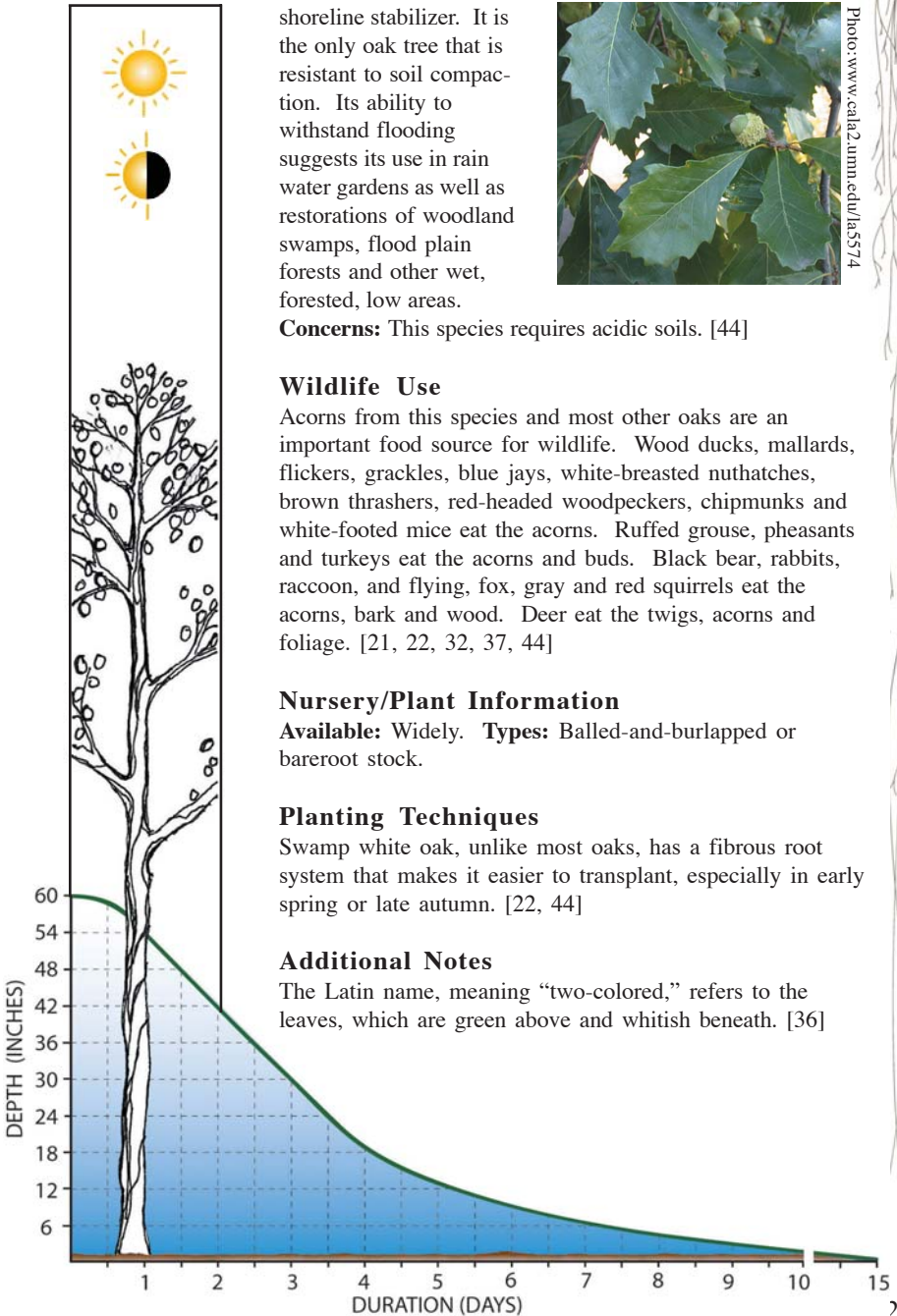
**Indicator Status:** FACW+

shoreline stabilizer. It is the only oak tree that is resistant to soil compaction. Its ability to withstand flooding suggests its use in rain water gardens as well as restorations of woodland swamps, flood plain forests and other wet, forested, low areas.

**Concerns:** This species requires acidic soils. [44]



Photo: www.calra2.unm.edu/ra574



### Wildlife Use

Acorns from this species and most other oaks are an important food source for wildlife. Wood ducks, mallards, flickers, grackles, blue jays, white-breasted nuthatches, brown thrashers, red-headed woodpeckers, chipmunks and white-footed mice eat the acorns. Ruffed grouse, pheasants and turkeys eat the acorns and buds. Black bear, rabbits, raccoon, and flying, fox, gray and red squirrels eat the acorns, bark and wood. Deer eat the twigs, acorns and foliage. [21, 22, 32, 37, 44]

### Nursery/Plant Information

**Available:** Widely. **Types:** Balled-and-burlapped or bareroot stock.

### Planting Techniques

Swamp white oak, unlike most oaks, has a fibrous root system that makes it easier to transplant, especially in early spring or late autumn. [22, 44]

### Additional Notes

The Latin name, meaning "two-colored," refers to the leaves, which are green above and whitish beneath. [36]



## *Ratibida pinnata*

**Yellow Coneflower** - a.k.a. Gray-headed Coneflower

### **Habitat/Plant Community and Geographic Range**

**Habitat Community:** Mesic prairies, mesic savannas, open places, roads, railways and edges of woods, often on limestone. [16, 17, 35, 41, 44] **Range:** Minn. (Eco-Region: 1, 5, 7-9), Wis., Mich. S. Ont. to Minn. and S.D., s. to Tenn., Ga., w. Fla., La. and Okla., and adventive e. to Vt. and Mass. [17, 21]

### **Description**

**General:** Yellow coneflower is a native, perennial herb with tall, thin, hairy stems up to 7' tall that support striking yellow flowers with droopy petals. After pollination, the cone dries to a light gray color and smells strongly of spice when crushed.

**Flower:** The showy flower heads have up to 15 drooping, yellow rays and raised, thimble-shaped, grayish cone disk flowers that are shorter than the rays. Approximately 10-25 very showy flower heads per plant, each on an individual stalk. Blooms from July to October.

**Leaf:** Highly divided leaves with many thin, coarsely-toothed lobes are covered with short, gray hair and up to 7" long. Basal leaves have stalks up to 7" long in contrast to the stalkless, undivided, upper leaves, which become smaller near the top. **Stem:** Erect, covered with short, gray hair. **Fruit:** Smooth achenes.

**Root:** Fibrous-rooted from a stout, woody rhizome or sometimes a short caudex. **Soil:** Tolerates most soils, especially adapted to difficult clay soils and on limestone with a pH range of 6.0 to 7.0. [17, 35, 41, 44]

### **Normal Water Level**

This species prefers upland moist to dry conditions. [21, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 1 day (decreasing 12"/day). [44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Low to moderate. **Siltation:** Low. **Insect:** Unknown. **Other:** [44]

### **Design Considerations**

Yellow coneflower has an extensive fibrous root system from a stout, woody rhizome that provides good soil stabilization of slopes, ditches and other buffer areas. This species is a persistent plant with gray foliage, which makes it a good contrast plant for landscape design and provides cut flowers and dried seed heads. It is a successional plant that is adapted to most soils although it prefers limestone and clays. **Concerns:** This species can be aggressive, though this may be desirable in some situations. [16, 44]

### **Wildlife Use**

Yellow coneflower provides seed for the American goldfinch and other songbirds and gamebirds. It attracts butterflies and other insects. It is palatable to grazing species when it is young. [16, 21, 44]

Indicator Status: UPL

### Nursery/Plant Information

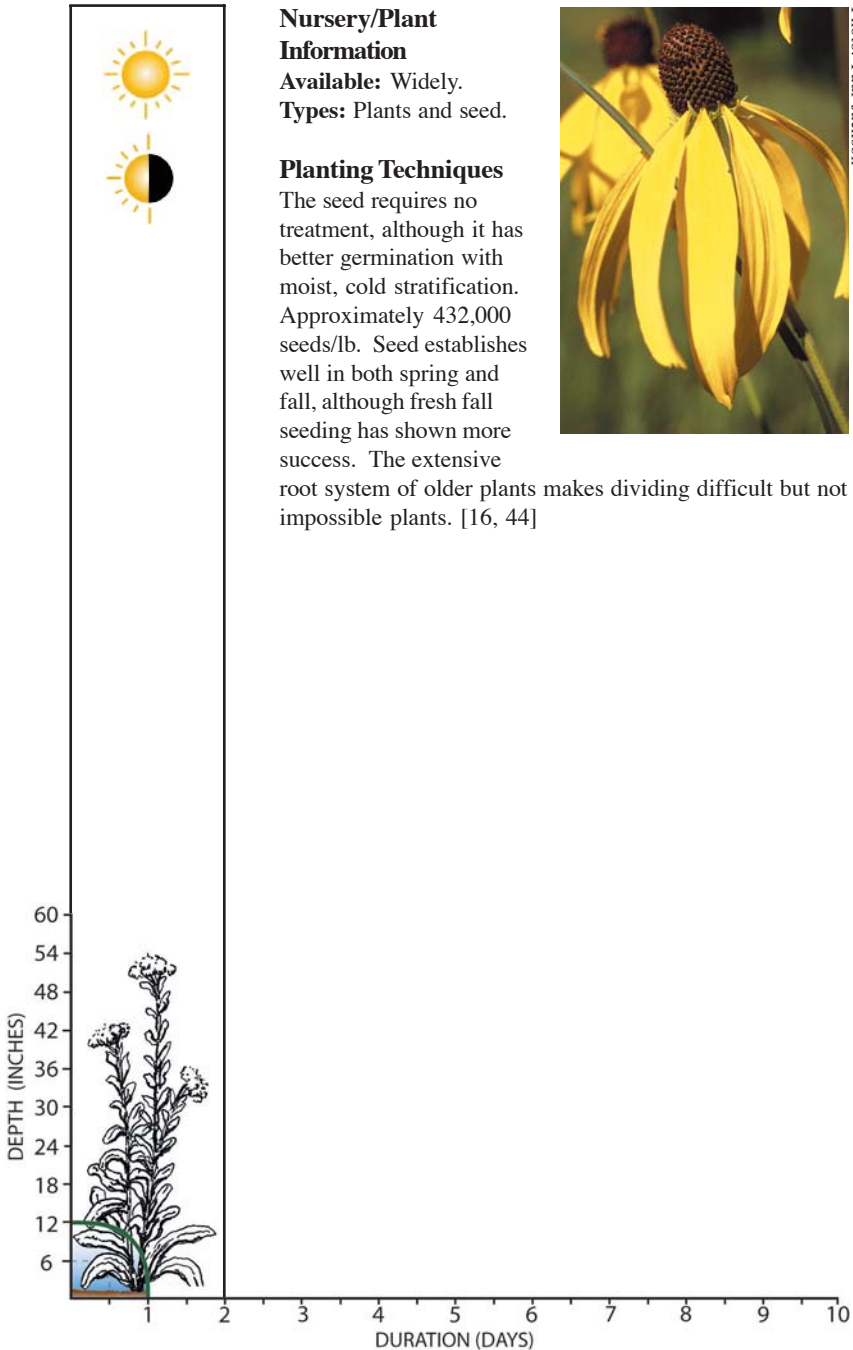
**Available:** Widely.  
**Types:** Plants and seed.

### Planting Techniques

The seed requires no treatment, although it has better germination with moist, cold stratification. Approximately 432,000 seeds/lb. Seed establishes well in both spring and fall, although fresh fall seeding has shown more success. The extensive root system of older plants makes dividing difficult but not impossible plants. [16, 44]



Photo: Paul Jackson







## *Rudbeckia subtomentosa*

**Brown-eyed-Susan** - a.k.a. Sweet Black Eyed Susan, Sweet Coneflower

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Peat or wet sands, stream banks, drainage ditches, prairies, wet open woods and thickets. [16, 17] **Range:** Se. Minn. (Eco-Region: 6-8), sw. Wis., Mich. Mich. to Wis., s. to w. Tenn., La. and Okla. [17]

### **Description**

**General:** Native, perennial herb with very attractive, yellow flower heads in profusion atop deep green, glossy leaves. Typically 24-36" tall and grows in bunches.

**Flower:** Disk flowers are dark purple or brown, 5/16-5/8" wide, with yellow ray flowers numbering 12-21, no more than 1/2" long. Blooms July to September.

**Leaf:** Alternate, entire leaves are firm, densely short-haired, especially beneath, ovate with petioles serrate, generally some of the larger ones deeply trilobed. **Stem:** 24-78" long, densely short-haired above. **Fruit:** Quadrangular achenes that are glabrous and partly enfolded in the bracts. **Root:** Stout rhizomes. **Soil:** Prefers peat or wet sands although it will tolerate heavy soils. [17]

### **Normal Water Level**

This species prefers upland mesic conditions.

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day).

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Unknown. **Nutrient:** Unknown.

**Siltation:** Unknown. **Insect:** Infrequent.

### **Design Considerations**

Brown-eyed-Susans are well suited for many restorations of stream banks, ditches, prairies and other sites with peat, heavy or sandy soil. It is a beautiful plant for landscape designs and rain water gardens. It provides cut and dried flowers. [16]

### **Wildlife Use**

Birds and butterflies use this plant for food and habitat. Provides excellent ground cover.

### **Nursery/Plant Information**

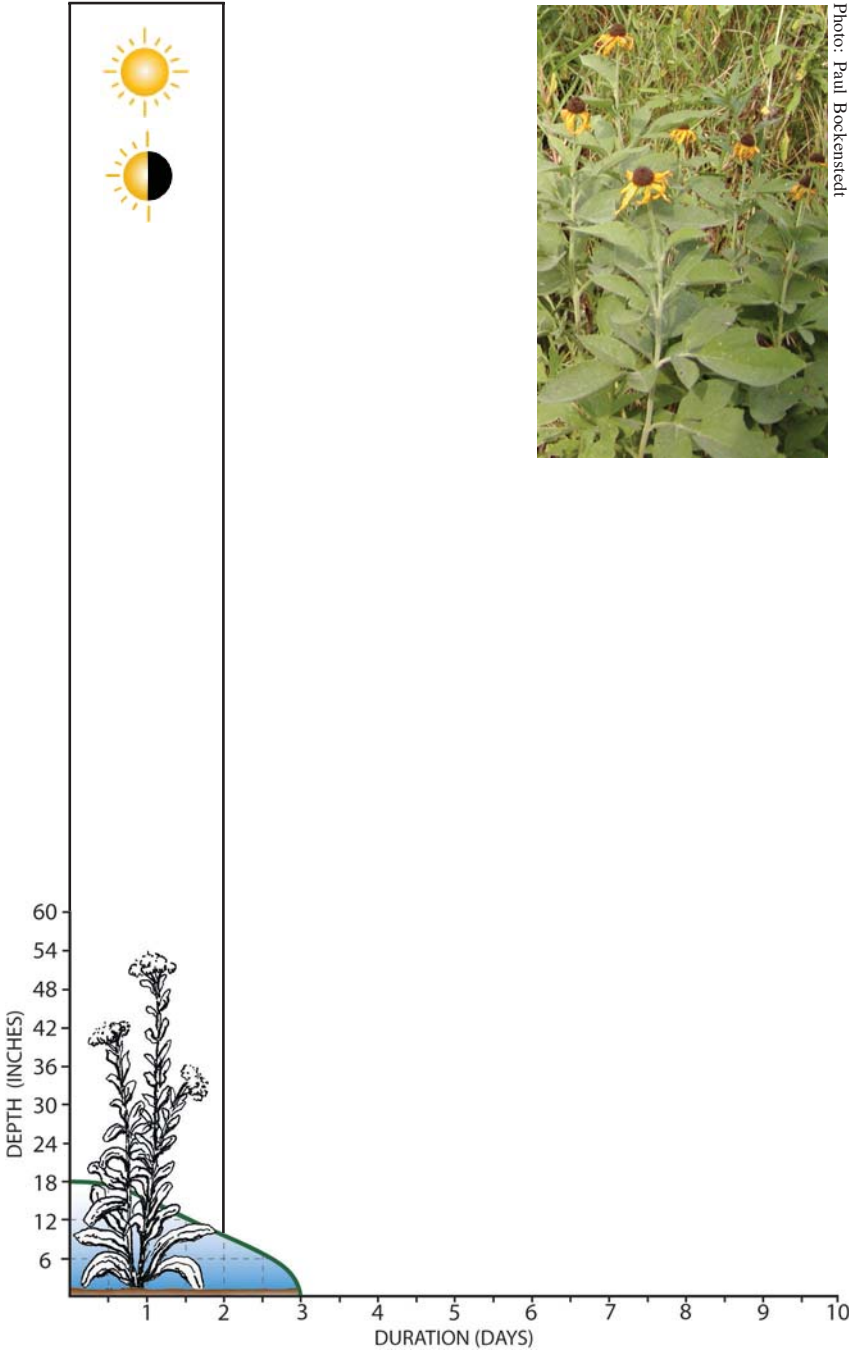
**Available:** Widely. **Types:** Seeds and plants.

### **Planting Techniques**

The seeds benefit from moist, cold stratification. Approximately 736,000 seeds/lb. [16]

**Indicator Status: FACU+**

Photo: Paul Bockenstedt





## *Sagittaria latifolia*

**Broadleaved Arrowhead** - a.k.a. Arrowhead, Broad Arrowhead, Broadleaf Arrowhead or Common Arrowhead; Wapato, Rat Potato or Duck Potato

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Shallow water, slow-moving streams, quiet lake shores, ponds, marshes, shrub swamps, wooded swamps and pools in bogs. [4, 7, 11, 16, 35, 41] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. N.S. and Que. to B.C., s. to S. Amer. [7, 21]

### **Description**

**General:** Native, perennial, emergent herb usually erect, 1-4' tall, that is sometimes nonpersistent. **Flower:** Whorls of 2-15 flowers ½-1" wide, borne on the naked stem with 3 green sepals and 3 white petals, blooming from July to August. The male flowers have many stamens.

**Leaf:** Mostly basal leaves with arrowhead-shaped blades vary greatly in width, which may be a response to varying water depths. **Stem:** Naked stems arise from base of plant. **Fruit:** Flattened achenes are packed into a dense head, where each achene is winged on the margins and has a horizontal beak.

**Root:** Rhizomes and edible, starchy tubers 1" or more in diameter form in the fall. **Soil:** Shallow water and saturated soils of marshes with a pH range of 5.9-8.8. [4, 7, 11, 35, 41, 44]

### **Normal Water Level**

This species prefers shallow water of 24" of inundation or less to wet/saturated conditions. [11, 21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). This species will tolerate regular inundation and withstand periods of drought. It persists in stabilized water levels at depths of less than 20" and few drawdowns. It has a moderate tolerance for flood duration and is unaffected by flood depth increases. [1, 23, 31, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Partial to full sun. **Salt:** Moderate. **Nutrient:** Moderate (high for P).

**Siltation:** Moderate to low and decreases with sedimentation increases, though will tolerate turbid conditions. **Insect:** Unknown. **Other:** Broadleaved arrowhead spreads rapidly. It tolerates and assimilates high levels of nutrients and heavy metals. It has a moderately high tolerance to general disturbance and stress. [1, 6, 31, 37, 44]

### **Design Considerations**

This species has been used in shoreline zones, especially within the bench of retention ponds. It is well suited for wetland restorations within quiet pools, shallow water of lakes and ponds and shrubby conditions. It species persists in the seed bank. **Concerns:** When newly planted, protect this species, especially from Canada geese. [4, 16, 26, 42, 44]

### **Wildlife Use**

Broadleaved arrowhead provides wonderful waterfowl food and habitat. Ducks eat the seeds, but the tubers are the most valuable portions to wildlife. Black, canvasback, mallard, pintail, ring-necked and wood ducks as well as swans eat the seeds and tubers. The seeds are eaten by king rail and the starchy tubers are eaten by muskrat, beaver and porcupine. This species also provides

## Indicator Status: OBL

habitat for insects, reptiles, amphibians and gamefish, especially channel catfish, white bass, shiners and shad. Black terns may also use the leaves for nesting material. [4, 11, 21, 32, 35, 37, 41, 44]

### Nursery/Plant Information

**Available:** Widely. **Types:** Seed, tubers, rootstock and transplants.



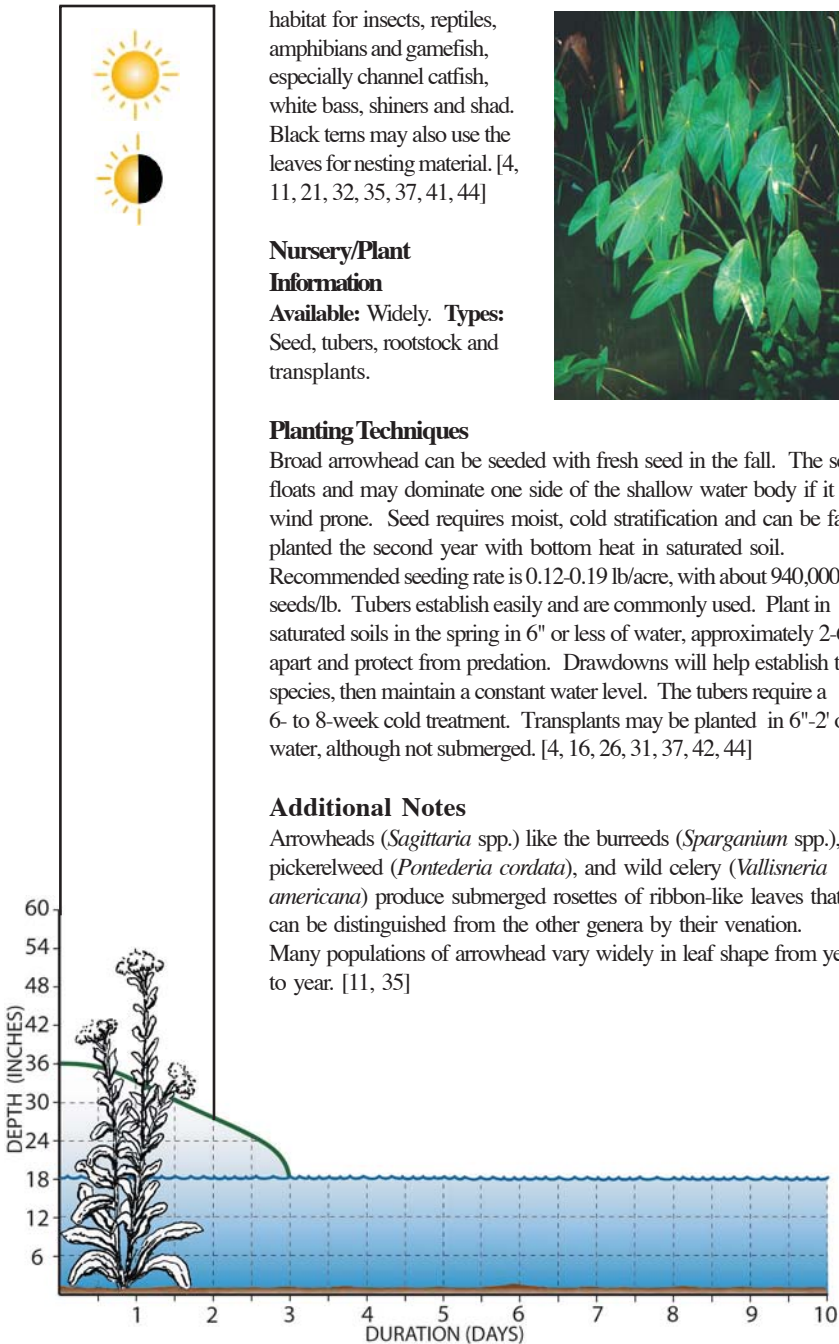
Photo: Dan Shaw

### Planting Techniques

Broad arrowhead can be seeded with fresh seed in the fall. The seed floats and may dominate one side of the shallow water body if it is wind prone. Seed requires moist, cold stratification and can be fall planted the second year with bottom heat in saturated soil. Recommended seeding rate is 0.12-0.19 lb/acre, with about 940,000 seeds/lb. Tubers establish easily and are commonly used. Plant in saturated soils in the spring in 6" or less of water, approximately 2'-6' apart and protect from predation. Drawdowns will help establish this species, then maintain a constant water level. The tubers require a 6- to 8-week cold treatment. Transplants may be planted in 6"-2' of water, although not submerged. [4, 16, 26, 31, 37, 42, 44]

### Additional Notes

Arrowheads (*Sagittaria* spp.) like the burreeds (*Sparganium* spp.), pickerelweed (*Pontederia cordata*), and wild celery (*Vallisneria americana*) produce submerged rosettes of ribbon-like leaves that can be distinguished from the other genera by their venation. Many populations of arrowhead vary widely in leaf shape from year to year. [11, 35]





## *Salix discolor*

### Pussy Willow

#### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Swamps, fens, shrub-carrs, wet meadows, edges of wooded swamps, shores, stream banks, flood plain forests and marsh borders. [7, 11, 36]

**Range:** Common; all but sw. Minn. (Eco-Region: All), Wis., Mich. Nfld. to B.C., s. to Del., n. Ga., Ky., Ill., n. Mo., S.D., Wyo. and Idaho. [7, 21]

#### Description

**General:** Erect, many-stemmed, deciduous shrub usually 20-25' high and 10-15' wide, with an open, rounded crown. It is usually the first willow to flower in spring.

**Flower:** Plants are unisexual. The pistillate, silky, furry catkins are 1-2½" long.

Usually blooms during May and June. **Leaf:** Alternate leaves are generally elliptic, entire to slightly toothed, shiny green above, whitened beneath, and are without hair (may have sparse hair beneath); usually 1½-4¼" long, 3/8-1¼" wide. Large, roundish stipules are present. **Bark:** Gray, fissured and scaly. **Twigs:** Stout, reddish to dark brown, and lacking hair (although new twigs may be hairy).

**Fruit:** A densely hairy narrow capsule that is 5/16-½" long, light brown, developing in early spring before the leaves. **Soil:** Wet to moist sands to loam soils. [7, 11, 36]

#### Normal Water Level

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [21]

#### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 24". **Duration:** Long – 6 days (decreasing 12" the first 2 days, then 6" every 2 days thereafter). Pussy willow is flood tolerant with moderate tolerance to flood duration. [1]

#### Sensitivities or Other Tolerances

**Exposure:** Full sun. **Salt:** Moderate. **Nutrient:** Moderate to low. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** Pussy willow has a moderate-to-high tolerance to general disturbances and stress. [1, 10]

#### Design Considerations

Pussy willow is an attractive willow that is cut for its long-lasting branches. It has been planted in swamps, shores and stream banks to help stabilize the soils as well as for its beauty.

#### Wildlife Use

Willow buds and small, tender portions of the twigs are staples for ruffed and sharp-tailed grouse as well as songbirds, waterfowl and marsh birds. Rabbits, squirrels, porcupines, muskrats, beavers, elk, moose and deer eat the twigs, foliage and bark. [11, 21, 32, 37]

**Indicator Status: FACW**

**Nursery/Plant Information**

**Available:** Limited.  
**Types:** Bareroot stock.

**Planting Techniques**

This species transplants easily in the spring and grows from cuttings.

**Additional Notes**

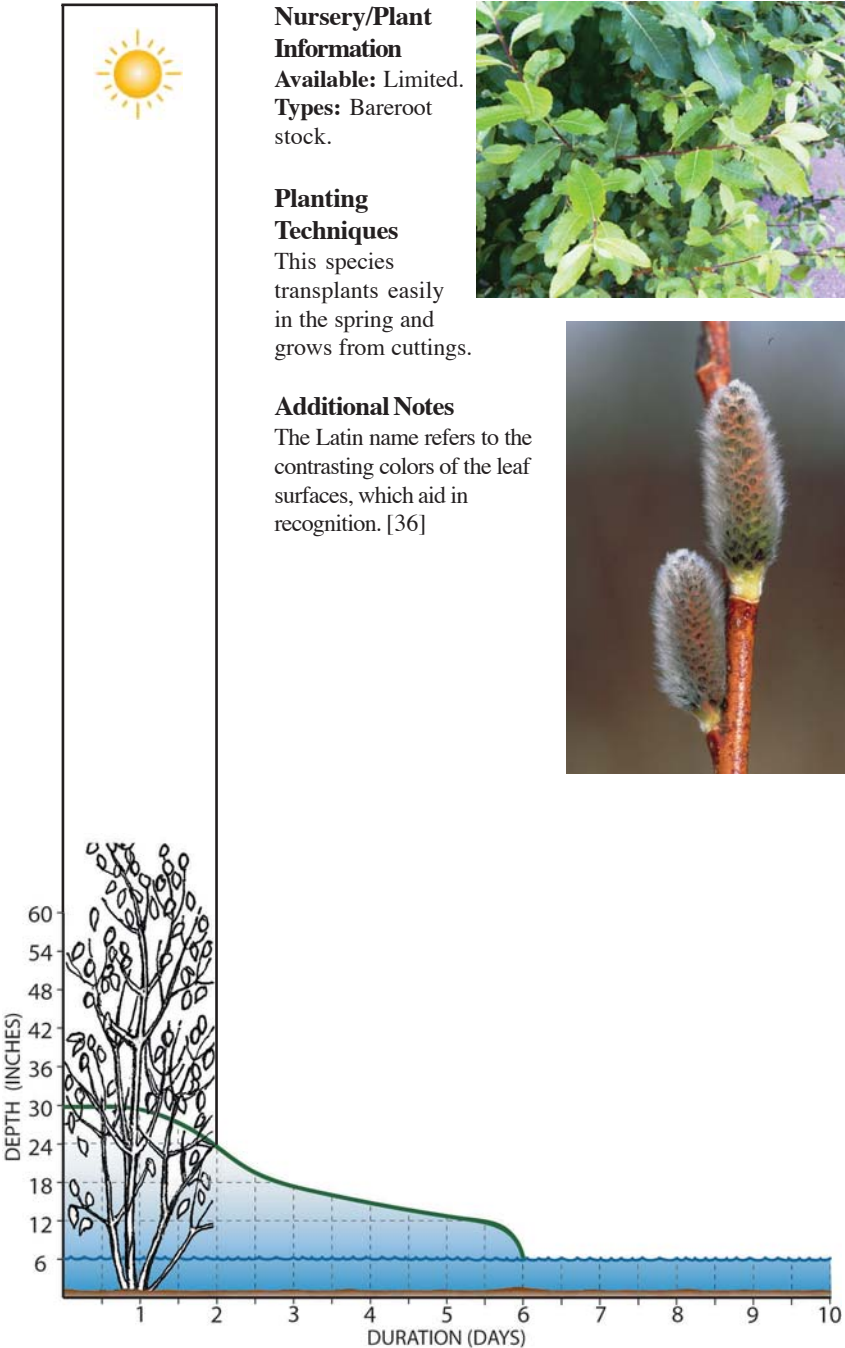
The Latin name refers to the contrasting colors of the leaf surfaces, which aid in recognition. [36]

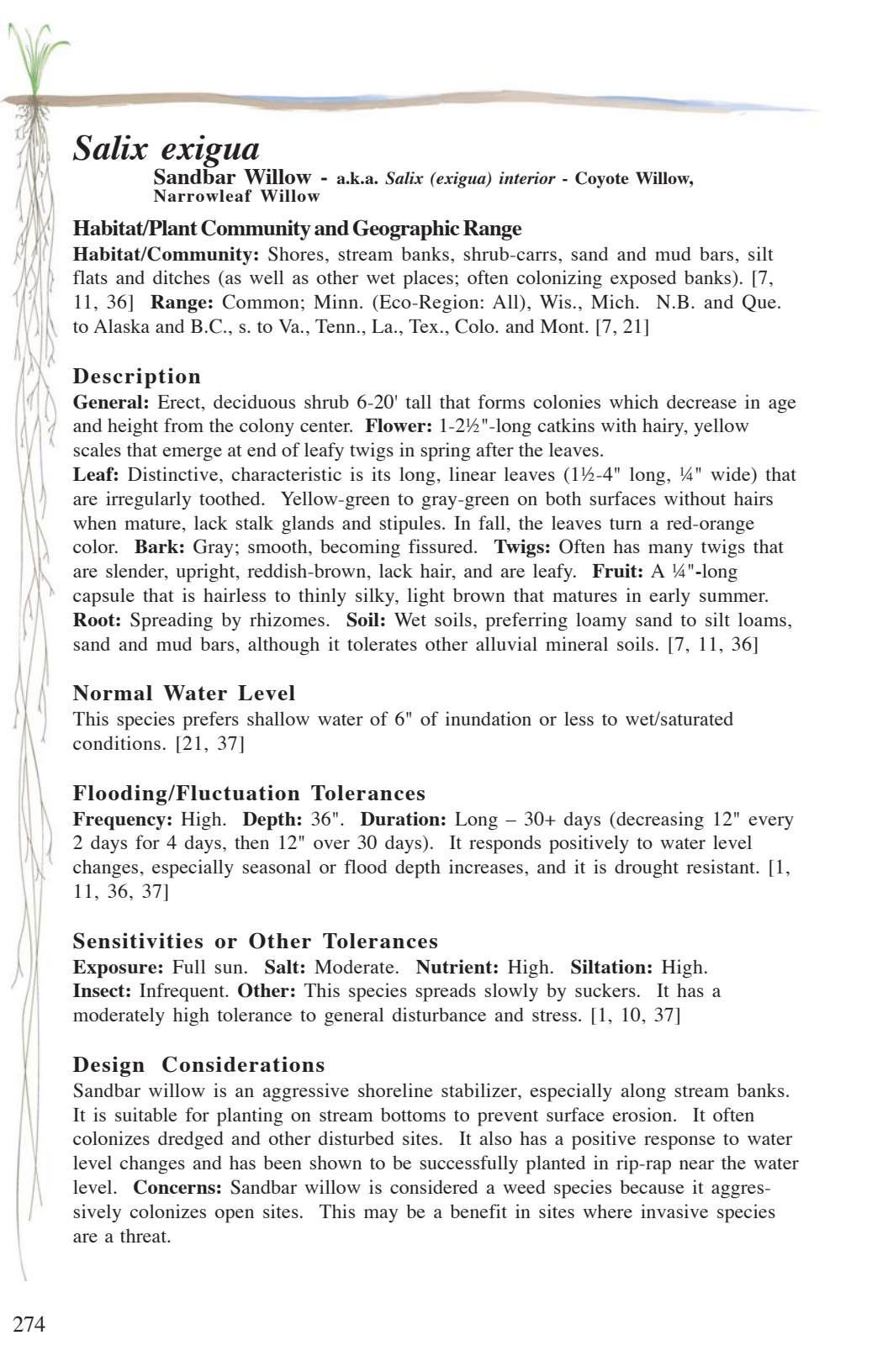


Photo: Rusty Schmidt



Photo: Jeff Shaw





## *Salix exigua*

**Sandbar Willow** - a.k.a. *Salix (exigua) interior* - Coyote Willow, Narrowleaf Willow

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Shores, stream banks, shrub-carrs, sand and mud bars, silt flats and ditches (as well as other wet places; often colonizing exposed banks). [7, 11, 36] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. N.B. and Que. to Alaska and B.C., s. to Va., Tenn., La., Tex., Colo. and Mont. [7, 21]

### **Description**

**General:** Erect, deciduous shrub 6-20' tall that forms colonies which decrease in age and height from the colony center. **Flower:** 1-2½"-long catkins with hairy, yellow scales that emerge at end of leafy twigs in spring after the leaves.

**Leaf:** Distinctive, characteristic is its long, linear leaves (1½-4" long, ¼" wide) that are irregularly toothed. Yellow-green to gray-green on both surfaces without hairs when mature, lack stalk glands and stipules. In fall, the leaves turn a red-orange color. **Bark:** Gray; smooth, becoming fissured. **Twigs:** Often has many twigs that are slender, upright, reddish-brown, lack hair, and are leafy. **Fruit:** A ¼"-long capsule that is hairless to thinly silky, light brown that matures in early summer.

**Root:** Spreading by rhizomes. **Soil:** Wet soils, preferring loamy sand to silt loams, sand and mud bars, although it tolerates other alluvial mineral soils. [7, 11, 36]

### **Normal Water Level**

This species prefers shallow water of 6" of inundation or less to wet/saturated conditions. [21, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 36". **Duration:** Long – 30+ days (decreasing 12" every 2 days for 4 days, then 12" over 30 days). It responds positively to water level changes, especially seasonal or flood depth increases, and it is drought resistant. [1, 11, 36, 37]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun. **Salt:** Moderate. **Nutrient:** High. **Siltation:** High. **Insect:** Infrequent. **Other:** This species spreads slowly by suckers. It has a moderately high tolerance to general disturbance and stress. [1, 10, 37]

### **Design Considerations**

Sandbar willow is an aggressive shoreline stabilizer, especially along stream banks. It is suitable for planting on stream bottoms to prevent surface erosion. It often colonizes dredged and other disturbed sites. It also has a positive response to water level changes and has been shown to be successfully planted in rip-rap near the water level. **Concerns:** Sandbar willow is considered a weed species because it aggressively colonizes open sites. This may be a benefit in sites where invasive species are a threat.

**Indicator Status: OBL**

### Wildlife Use

Willows buds and small, tender portions of the twigs are staples for ruffed and sharp-tailed grouse as well as songbirds, waterfowl and marsh birds.

Rabbits, squirrels, porcupine, muskrats, beaver, elk, moose and deer eat the twigs, foliage and bark. [21, 32, 37]



Photo: Rusty Schmidt

### Nursery/Plant Information

**Available:** Widely.

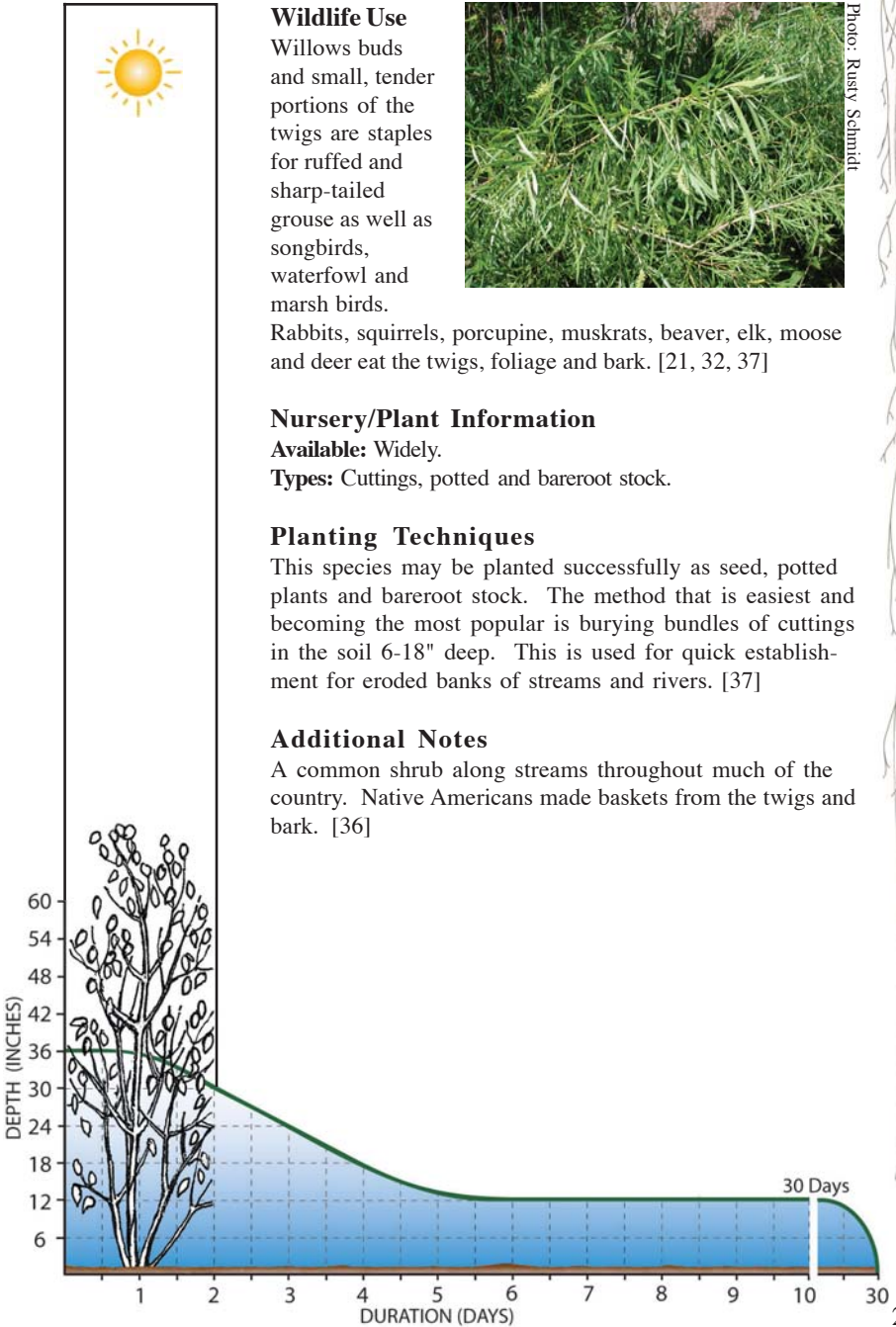
**Types:** Cuttings, potted and bareroot stock.

### Planting Techniques

This species may be planted successfully as seed, potted plants and bareroot stock. The method that is easiest and becoming the most popular is burying bundles of cuttings in the soil 6-18" deep. This is used for quick establishment for eroded banks of streams and rivers. [37]

### Additional Notes

A common shrub along streams throughout much of the country. Native Americans made baskets from the twigs and bark. [36]







## *Salix nigra*

**Black Willow** - a.k.a. Swamp Willow, Gooding Willow

### **Habitat/Plant Community and Geographic Range**

**Habitat Community:** Stream banks, lake shores, flood-plain forests, swamps, sloughs, swales, ditches and wet depressions in forests. [7, 11, 22, 36, 44]

**Range:** Ec. and s. Minn. (Eco-Region: 2, 5-9), all but far n. Wisc., s L.P. of Mich. N.B. to Minn., s to Fla., Tex., Calif. and into Mex. [7, 21]

### **Description**

**General:** Deciduous tree 35-50' tall and 20-35' wide, with a single trunk or several trunks and a rounded, open crown. Trunks are often leaning or horizontal to the water or ground surface. **Flower:** Yellow-green catkins 1-3" long with hairy scales are borne among new leaves from April to May. **Leaf:** Alternate, narrow, lance-shaped leaves are 3-5" long and 3/8-3/4" wide. Often they are slightly curved to one side with long, pointed and finely saw-toothed and hairless leaves. The upper side of the leaf is darker green than the lower. **Bark:** Dark brown or blackish, deeply furrowed or ridged into scaly, forking ridges. **Twigs:** Very slender, easily detached at the base, brownish. **Fruit:** Capsules 3/16" long that are reddish-brown, hairless and mature in late spring. **Root:** Shallow roots divide into a multitude of rootlets. **Soil:** Tolerates most soils with a pH range of 6.0-8.0. [7, 11, 22, 36, 44]

### **Normal Water Level**

This species prefers wet/saturated conditions. [21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 60" in spring and 24" in summer. **Duration:** Long for spring, medium long for the summer - 10 and 4 days, respectively (decreasing 6"/day in the spring and 12" over 2 days in the summer). This species tolerates spring seasonal inundation better than irregular summer inundation. However, it is still very tolerant to flood duration and depth increases. It will decrease in abundance with flood depth decreases. [1, 22, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun; not tolerant of shade. **Salt:** Moderate to high. **Nutrient:** Moderate to high. **Siltation:** Moderate. **Insect:** Infrequent – willow sawfly occasionally defoliates trees. **Other:** Black willow has a slow rate of spread even though it does spread by suckers and has a rapid rate of growth. It is frequently susceptible to fungus scab, and black canker causes leaf and shoot destruction. Wind and ice frequently damage it, especially breaking off large limbs. It is sensitive to SO<sub>2</sub> and O<sub>3</sub>, though resistant to HFI, drought, heat, soil compaction and mine spoils. It is moderately tolerant to alkaline soils. It has a moderate-to-high tolerance to general disturbance. [1, 2, 22, 25, 37, 44]

### **Design Considerations**

This species is a good stream bank stabilizer due to its rapid rate of growth and its ability to sucker if damaged. It has been used in both stream bank and shoreline stabilization. Due to its ability to withstand flooding, it is well suited for flood plain

**Indicator Status:** OBL

restorations, stream bank improvements and ditches. [6, 37, 44]

### **Wildlife Use**

Willow buds and small, tender portions of the twigs are staples for ruffed and sharp-tailed grouse as well as songbirds, waterfowl and marsh birds.

Rabbits, squirrels, porcupine, muskrats, beaver, elk, moose and deer eat the twigs, foliage and bark. It is also a food source for the mourning cloak butterfly. Cavities are used by racoons and woodducks. [6, 21, 22, 32, 37, 44]



Photo: www.calra2.umh.edu/15574

### **Nursery/Plant Information**

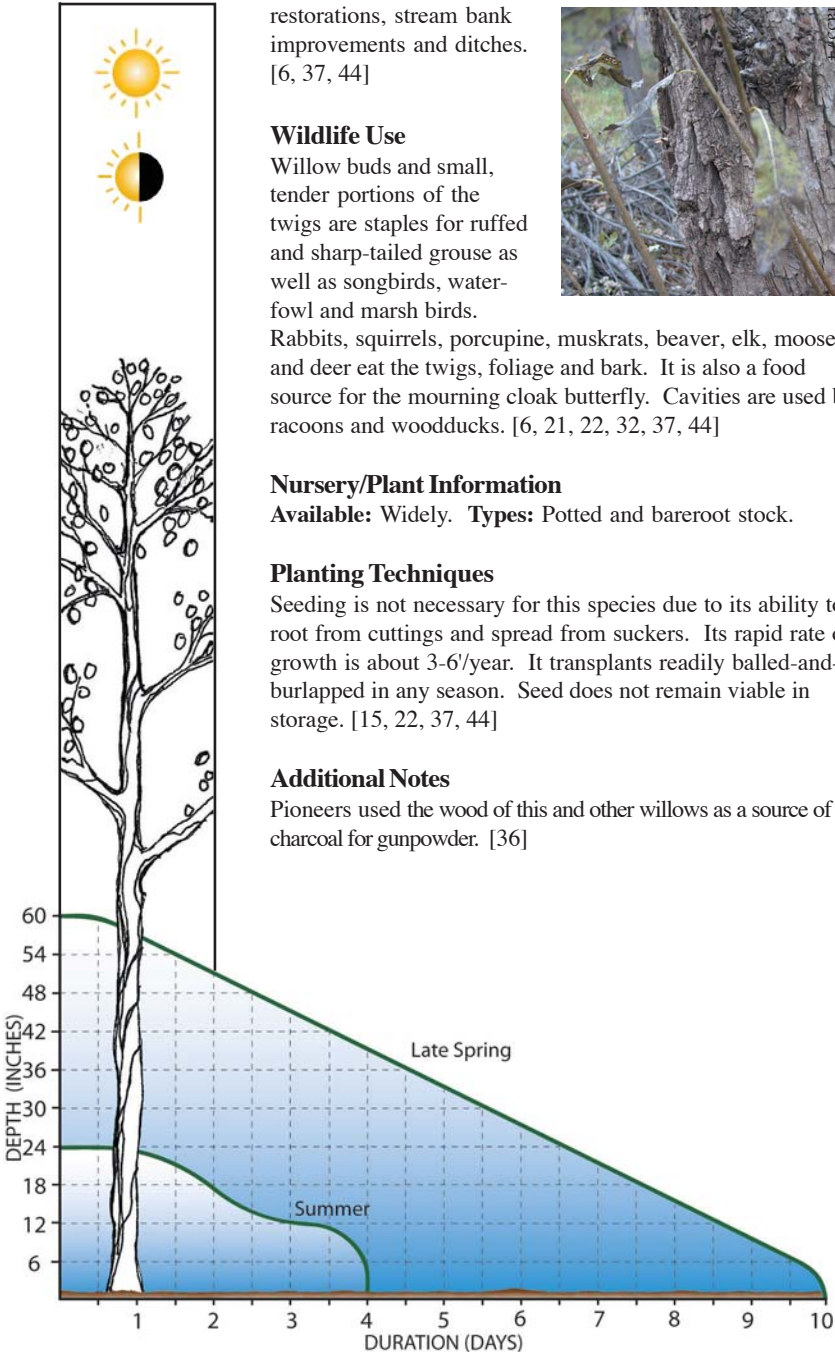
**Available:** Widely. **Types:** Potted and bareroot stock.

### **Planting Techniques**

Seeding is not necessary for this species due to its ability to root from cuttings and spread from suckers. Its rapid rate of growth is about 3-6'/year. It transplants readily balled-and-burlapped in any season. Seed does not remain viable in storage. [15, 22, 37, 44]

### **Additional Notes**

Pioneers used the wood of this and other willows as a source of charcoal for gunpowder. [36]





# *Sambucus pubens*

Red-berried Elder - a.k.a. *Sambucus racemosa* – Scarlet Elder, Red Elderberry

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Occasionally in swamps and thickets, but more common in moist, deciduous forests; deep, rich woods, lining quick-flowing creeks, moist rock crevices, sheltered coves, ravines, roadsides and fence rows in deep shade. [7, 22]

**Range:** Minn. (Eco-Region: 1, 2, 5-9), Wis., Mich. Circumboreal, Nfld. to B.C., s. to Pa., N.C., Ind., Ill. and Minn. **This species is threatened in Ill.** [7, 21]

## Description

**General:** Native, deciduous shrub 6-12' tall and 10-15' wide. **Flower:** Flowers opening with developing leaves in white, conical flower spikes. Individual flowers are small, 5-parted elongate, pyramidal clusters at the ends of the stem. Clusters are 2-5" long and usually longer than wide. **Leaf:** Large, opposite, pinnately divided, compound leaf with usually 5 leaflets. The leaflets are lance-shaped, tapered to a long, sharp tip and smooth or hairy on underside, with small margins of sharp, forward-pointing teeth. **Bark:** Matures to warty, gray-brown bark. **Twigs:** Yellow-brown and hairy with inner red-brown pith. **Fruit:** Round, red, berry-like drupe that ripens in June. **Root:** Fibrous, deep lateral roots. **Soil:** Prefers loam soils and moist, rich woods, although it will tolerate rocky and many other soil types. [7, 11, 22]

## Normal Water Level

This species prefers upland moist conditions. [21]

## Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). This species is actually flood intolerant and somewhat tolerant to flood duration. [1, 22]

## Sensitivities or Other Tolerances

**Exposure:** Full sun to shade, and deep shade tolerant. **Salt:** Low. **Nutrient:** Moderate to low. **Siltation:** N/A. **Insect:** Infrequent-borers; rarely serious. **Other:** This species is frequently damaged by wind and ice and is easily broken. It is sensitive to 2,4-D, O<sub>3</sub>, drought and heat. It resists HFl and SO<sub>2</sub> and can be damaged by soil compaction occasionally. [1, 2, 22, 47]

## Design Considerations

Red-berried elder is a fast grower and even though it is intolerant to flooding, it is found near fast-moving streams, road sides and fence rows. This means it must be able to endure flooding for short periods. It will tolerate deep shade and is excellent in mass plantings.

## Wildlife Use

Red-berried elder is an important food source for many kinds of songbirds and gamebirds in the summer, including robins, catbirds, pheasants, bluebirds, rose-breasted grosbeaks, ruffed grouse, starlings, brown thrashers, olive-backed thrushes and veery. Rabbits eat the fruit and the bark. The fruit is poisonous to humans. [11, 21, 22, 32]

**Indicator Status:** FACU+

**Nursery/Plant Information**

**Available:** Widely.  
**Types:** Bareroot and potted stock.

**Planting Techniques**

This species transplants with difficulty. [22]



Photo: Dan Shaw





# *Schizachyrium scoparium*

Little Bluestem - a.k.a. *Andropogon scoparius*

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Dry to mesic prairies, savannas, old fields, open woodlands and other sandy to mesic habitats. [17, 44] **Range:** Minn. (Eco Region: 3-10), Wis., Mich. N.B. and Que. to Alta., s. to Fla. and Mex. [3, 17, 21]

## Description

**General:** Little bluestem is a native, perennial, clump-forming grass that can be used as an ornamental grass. It grows 2-3' tall. **Flower:** Long, reddish-brown racemes bearing 5-20 sets of spikelets on a straight, white-ciliate rachis from July to September. **Leaf:** Blades 1/8-1/4" wide, amber foliage that maintains its color through the winter. **Stem:** 2-3' tall, amber. **Fruit:** Showy spikelets along the entire stem, each seed with a fluffy beard and a needle-like awn. **Root:** Numerous, branching, vertical roots that may extend to 6' in depth. **Soil:** Many types, although it prefers dry to mesic sandy habitats with a wide pH range. [3, 17, 44]

## Normal Water Level

This species prefers dry to upland mesic conditions. [21, 44]

## Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 1 day (decreasing all 12" in 1 day). This species does not tolerate inundation and is somewhat tolerant to flood duration. [1, 44]

## Sensitivities or Other Tolerances

**Exposure:** Full sun to part shade. **Salt:** Moderate. **Nutrient:** Moderate to low; it is unaffected by P decreases. **Siltation:** Low. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 44]

## Design Considerations

Little bluestem is an excellent winter cover species in open places, with excellent fall and winter color. It has been used in slope stabilization areas and buffers and will hold soil against erosion once established. The roots are numerous and deep. It has been used successfully in the upper edge of rain water gardens where it is not being inundated, as a buffer or filter. **Concerns:** Many cultivars are being developed. Also, this plant is starting to be overused; you will find it in most ornamental landscape designs. [44]

## Wildlife Use

This species is a principal wildlife food for songbirds (field and tree sparrows) and deer in open and prairie areas. It is palatable and nutritious to many grazing species. [32, 44]

## Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and plants.

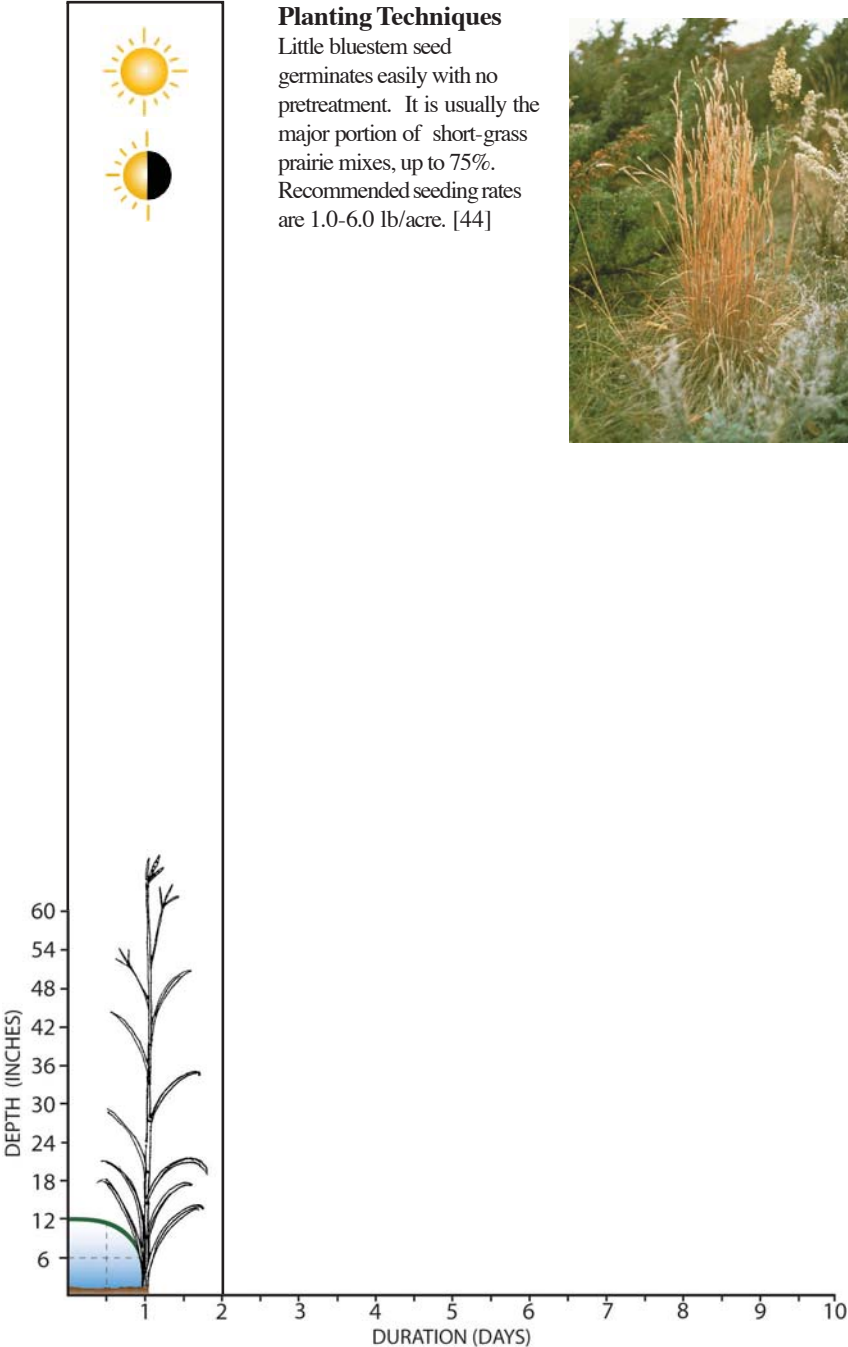
Indicator Status: FACU-

**Planting Techniques**

Little bluestem seed germinates easily with no pretreatment. It is usually the major portion of short-grass prairie mixes, up to 75%. Recommended seeding rates are 1.0-6.0 lb/acre. [44]



Photo: Paul Jackson





## *Scirpus acutus*

**Hardstem Bulrush** - a.k.a. **Hard-stemmed Bulrush or Common Tule**

### **Habitat/Plant Community and Geographic Range:**

**Habitat/Community:** Marshes, calcareous fens, minerotrophic waters, ditches, ponds, streams, lakes and occasionally bog lakes (usually emergent in shallow-to-deep water, sometime where brackish). [4, 7, 11, 16, 24, 44] **Range:** Common; Minn. (Eco-Region: All), n. and e. Wis., Mich. N.S. to B.C., s. to N.C., Tex. and Calif. [7, 21]

### **Description**

**General:** Persistent, native, perennial, emergent herb 3½-9' tall. Often forms large colonies. Hardstem bulrush can form colonial stands or by intermixing with other emergents. Hybrids between hardstem and softstem bulrush (*Scirpus validus*) can occur. **Flower:** A spikelet that is reddish brown; blooms from May to September. The spikelets are oval to cylindrical and are exceeded by a specialized leaf that appears to be a continuation of the stem. **Leaf:** A few sheathing vestigial leaves at the base. **Stem:** 3½-9' tall, cylindrical and dark olive green. The stems are small chambered, so that they are stiff and not easily crushed between the thumb and index finger. **Fruit:** Achenes are not quite 1/8" long, have 6 basal bristles and are covered by whitish-brown scales. The scales have marginal hairs and red dots on the back. **Root:** Stout rhizomes. **Soil:** It prefers sandy to marly substrates with good water circulation in the root zone and a pH range of 6.7-9.1. [4, 7, 11, 24, 44]

### **Normal Water Level**

This species prefers deep-to-shallow water, generally in depths to 5', but it has been found in much deeper depths and can be found in wet/saturated conditions. [11, 21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Medium long – 4 days (decreasing 12" every 2 days). This species can tolerate regular inundation and high flood durations. It resists wave action and water level changes. [1, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full sun. **Salt:** Moderate to high. **Nutrient:** Low to moderate. **Siltation:** Low to moderate. **Insect:** N/A. **Other:** It has a higher tolerance of mixosaline and minerotrophic conditions than softstem bulrush (*S. validus*). It has moderate tolerance to general disturbances and stress. [1, 6, 11, 24, 37, 44]

### **Design Considerations**

Hardstem bulrush has been used in many conditions, from lake revegetation to shoreline and vegetated swales due to its ability to resist wave action and water level changes. It is an excellent buffer plant, protects dams, eroding shores, silt movement and creates excellent wildlife habitat. It is used in many wetland restorations and landscape designs. It should be planted to help limit the invasive qualities of cattail. **Concerns:** Protect new plantings from depredation by geese. [6, 16, 44]

### **Wildlife Use**

Bulrush is a wonderful wildlife habitat for waterfowl and other species. Coots, black, canvasback, mallard, pintail, redhead, ring-necked, scaup and teal ducks eat the seeds. Stems

**Indicator Status:** OBL

are utilized when young by Canada and snow geese. Sora and Virginia rails eat the seeds and rootstock. Muskrats eat the rootstock and stems. Especially in central Minn., bulrush provides the primary nesting sites for grebes, black terns and other waterfowl and marsh birds. It provides spawning and nursery habitat for northern pike, bluegills and other fish. [4, 6, 11, 16, 24, 32, 37, 44]

**Nursery/Plant Information**

**Available:** Widely.

**Types:** Achenes, rootstocks, rhizomes and transplants.

**Planting Techniques**

The achenes require moist, cold stratification for 90 days, then warm temperature and light. Fresh achenes may be planted in the fall with drawdowns in the spring. Plant in saturated soils. A recommended seeding rate of 0.06-0.25 lb/acre with approximately 292,800 seeds/lb. Rhizomes planting has had more success, so long as rhizomes are planted 2-5" deep in 4-6" of water and 3' apart. Clustered arrangements are proving more successful due to the slow rate of spread. Transplants can be planted in 6"-2' of water up to 1,000 plants/acre. This species is favored by drawdowns. [16, 24, 42, 44]

**Additional Notes**

Stems of hardstem bulrush are difficult to flatten between the fingers, unlike softstem bulrush (*S. validus*), whose stems are easily compressed. [7]

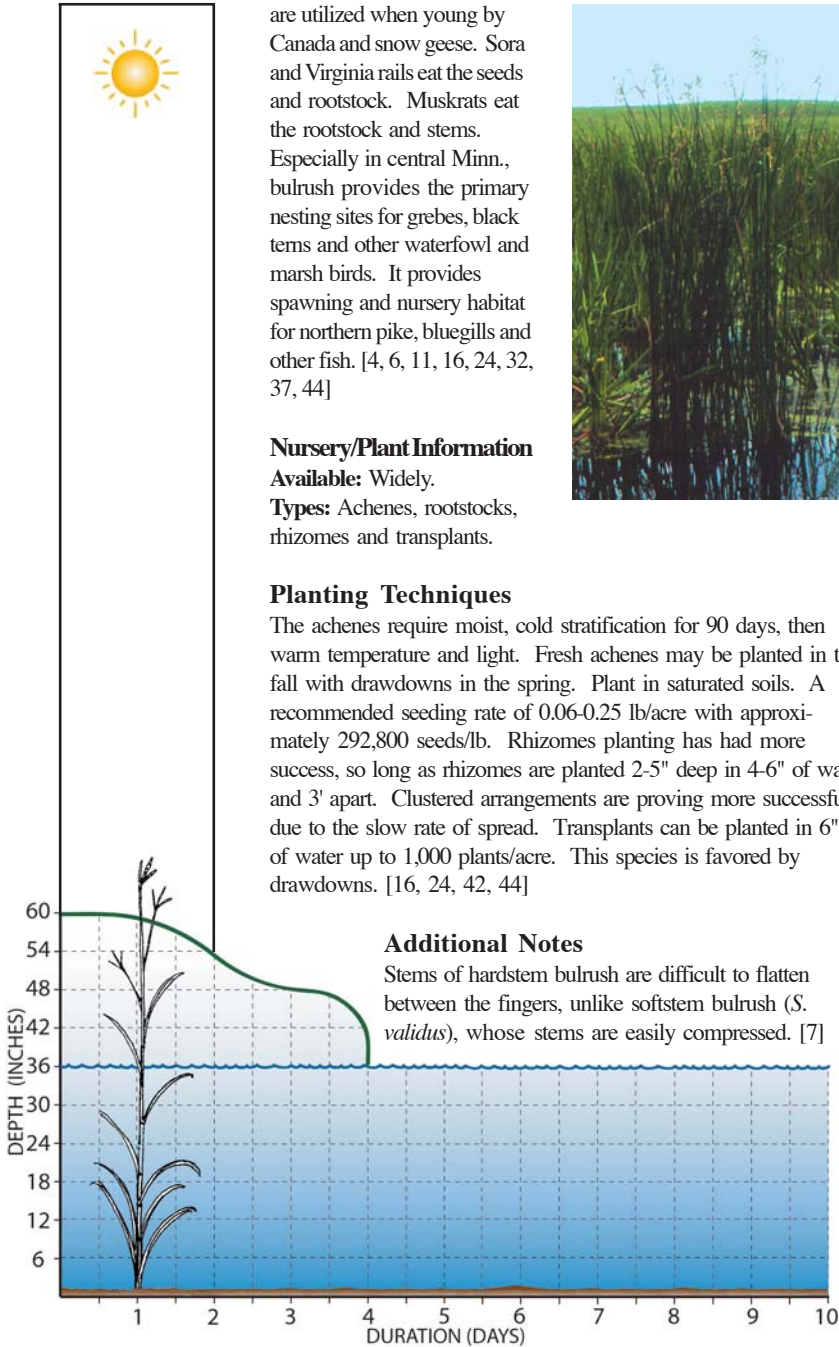


Photo: Jason Husveth





# *Scirpus atrovirens*

**Green Bulrush - a.k.a. Black Bulrush, Dark Green Rush**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Moist woods, shores, ditches, stream banks, swamps, shrub-carrs, alder thickets, sedge meadows, springs and other wet places. It seems to increase with disturbance to peat/muck soils and often invades dredged material sites. [7, 11, 16]

**Range:** Common; Minn. (Eco-Range: All), Wis., Mich. Ont. to Alta. and Wash., s. to Mo., Tex., N.M. and Ariz. [7, 21]

## **Description**

**General:** Green bulrush is a common, short-lived, pioneer, emergent, native perennial with course clump form and nice clusters of small, brown heads that may reach a height of 5'. **Flower:** 2 or more conspicuous, spreading, modified leaves subtend the terminal inflorescence with flat blades. Numerous spikelets on the inflorescence are crowded into a dense, nearly spherical head on rays that angle out in different directions and bloom from June to July. **Leaf:** M-shaped, mint-green leaves are broad (up to  $\frac{3}{4}$ " wide), with sheaths that are brownish or green and not tinged with red. **Stem:** Sturdy, roundly triangular stems, with up to 10 stem leaves growing to 4.5' tall. **Fruit:** Achenes that are tan to nearly white, compressed 3-angled, with a short beak. **Root:** Short rhizomes with strong, fibrous roots. **Soil:** Prefers peat to muck soils and often invades dredged material sites or other poor, saturated soils and seems to increase with disturbance. [7, 11]

## **Normal Water Level**

This species prefers shallow water of 30" of inundation or less to wet/saturated conditions, although it will tolerate periods of drought. [21]

## **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 30". **Duration:** Medium short— 3 days (decreasing 12"/day for 2 days then 6" the last day). This plant has moderately low tolerance to flood duration. [1]

## **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Low to moderate.

**Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species has a moderately high tolerance to general disturbance and stress. [1]

## **Design Considerations**

Green bulrush is well suited to controlling erosion along shorelines, ditches, stream banks, meadows and thickets. It is a good pioneer species that will vegetate a site quickly with a decorative bunching form. It is a frequent pioneering colonizer of wetland mitigation sites and disturbed areas. **Concerns:** This species can be aggressive and is short lived. This may be desirable to compete with non-native or invasive species. [16]

## **Wildlife Use**

Bulrush provides wildlife habitat for waterfowl and other species. Coots, black, canvas-back, mallard, pintail, redhead, ring-necked, scaup, and teal ducks eat the seeds. Stems are utilized when young by Canada and snow geese. Sora and Virginia rails eat the seeds

**Indicator Status: OBL**

and rootstock. Muskrats eat the rootstock and stems. Bulrush provides spawning and nursery habitat for northern pike, bluegills and other fish. [32, 37]



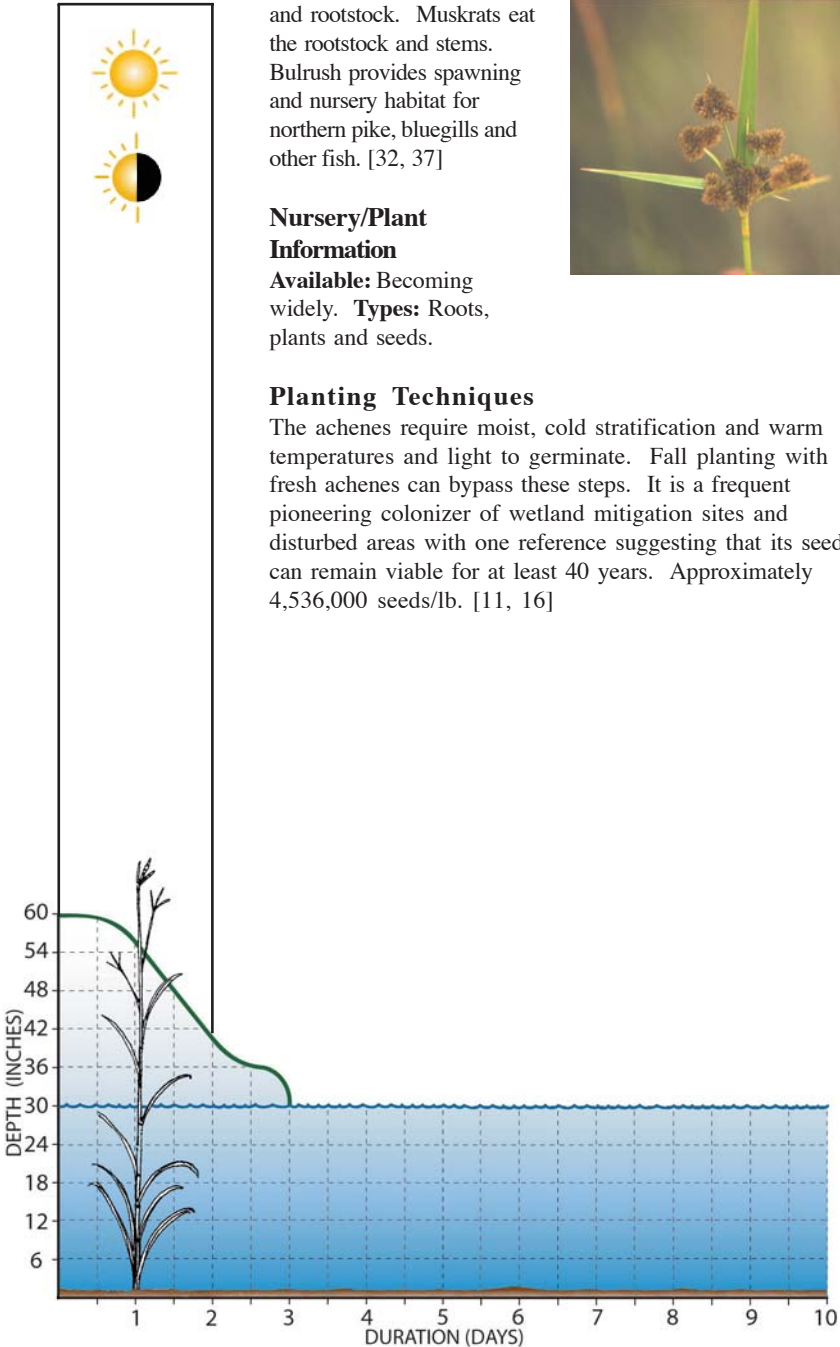
Photo: Jason Husveith

**Nursery/Plant Information**

**Available:** Becoming widely. **Types:** Roots, plants and seeds.

**Planting Techniques**

The achenes require moist, cold stratification and warm temperatures and light to germinate. Fall planting with fresh achenes can bypass these steps. It is a frequent pioneering colonizer of wetland mitigation sites and disturbed areas with one reference suggesting that its seeds can remain viable for at least 40 years. Approximately 4,536,000 seeds/lb. [11, 16]





# *Scirpus cyperinus*

Woolgrass - a.k.a. Wool Grass Sedge

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadows, marshes, swamps, ditches, bog margins, lake edges and alder thickets (where wet or in very shallow water). [7, 11, 16]

**Range:** Common to abundant; Minn. (Eco-Region: All), Wis., Mich. Nfld. to s. B.C., s. to Fla., e. Tex. and S.D. [7, 21]

## Description

**General:** Woolgrass is not a true grass; it is actually a member of the sedge family. A coarse, densely clumped, native, perennial herb that stands 36-48" tall. **Flower:** Two or more unequally spreading, modified leaves subtending the terminal inflorescence. Many tiny spikelets in small, compact clusters at the apex of the stem ascend from a fountain-like base of several to many rays on the inflorescence from June to July.

**Leaf:** Woolgrass has a fountain of large, slender, basal leaves and about 10 stem leaves with brownish or green and not-tinged-with-red sheaths. **Stem:** Smooth and more or less round, sturdy stems with about 10 stem leaves that extend above the basal leaves. **Fruit:** Nutlets covered with many brown, woolly bristles that give the cluster of spikelets a fuzzy appearance. **Root:** Short rhizomes. **Soil:** Saturated or boggy soils of many types, though prefers peat. [7, 11]

## Normal Water Level:

This species prefers shallow water of 3" of inundation or less to wet/saturated conditions, although it will tolerate a drought. [6, 21, 37]

## Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 18". **Duration:** Long – 5 days (decreasing 6" in the first day then 6" every 2 days thereafter). Woolgrass can tolerate seasonal and irregular inundation periods and is moderately tolerant to flood duration. It will increase with a decrease of flood depth. [1, 37]

## Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Moderate.

**Sitation:** Moderate. **Insect:** Infrequent. **Other:** This species has a moderate rate of spread and will tolerate acidic soils. It has a moderate-to-high tolerance of general disturbance and stress. [1, 6, 37]

## Design Considerations

Woolgrass has been used in restorations of wet meadows, sedge meadows, wet woodland reconstruction and peaty fens. It is an attractive plant for landscape design, mitigation and restoration sites. The short rhizomes help stabilize the soil. This is an early successional species. **Concerns:** Protect this species from depredation while it is becoming established. This species can be short lived. [16, 27, 42]

## Wildlife Use

Bulrush provides habitat for not only waterfowl, but for other species as well. Coots, black, canvasback, mallard, pintail, redhead, ring-necked, scaup and teal ducks eat the

**Indicator Status:** OBL

seeds. Stems are utilized when young by Canada and snow geese. Sora and Virginia rails eat the seeds and rootstock. Muskrats eat the rootstock and stems. Bulrush provides spawning and nursery habitat for fish and nesting habitats for waterfowl and marsh birds. [32, 37]

**Nursery/Plant Information**

**Available:** Widely.

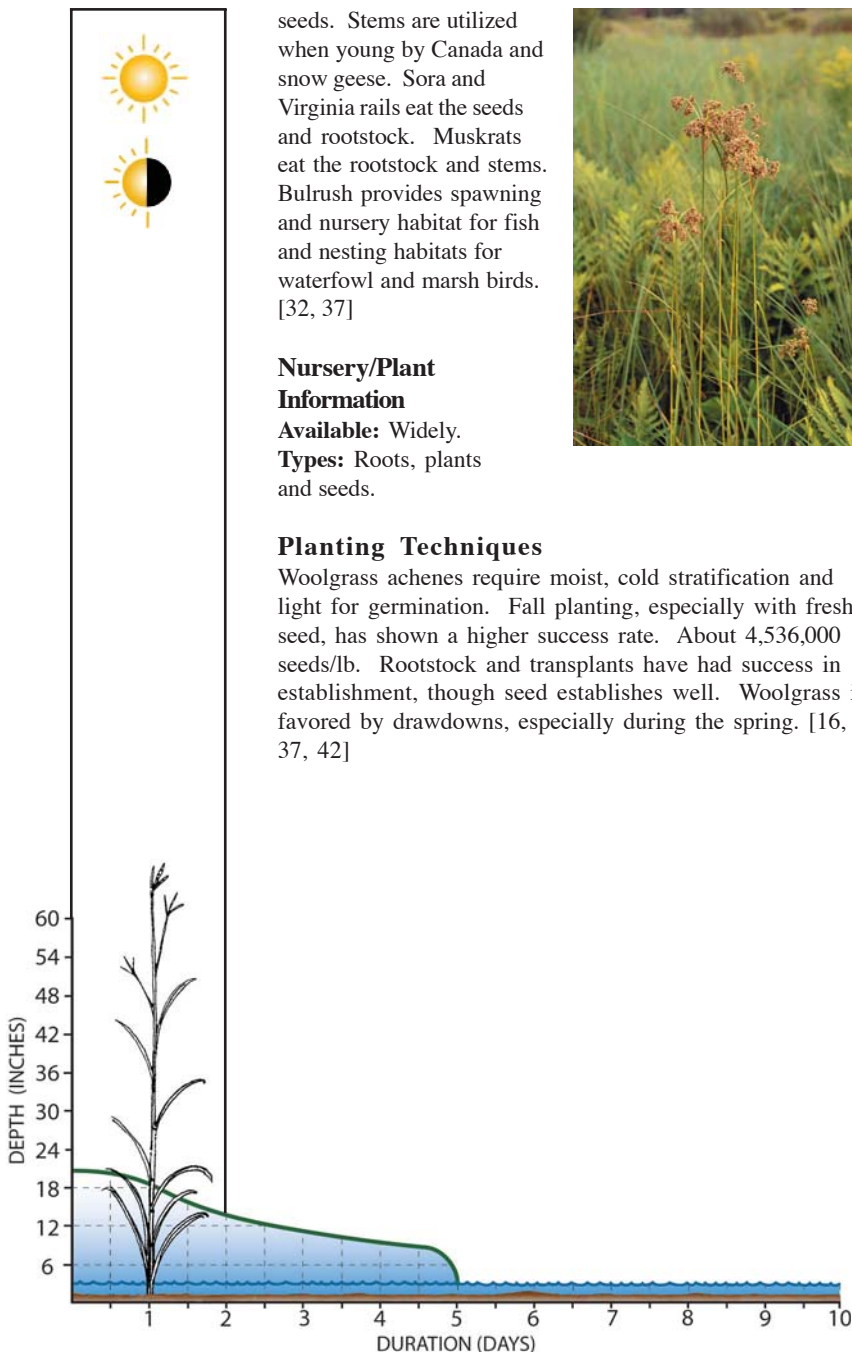
**Types:** Roots, plants and seeds.

**Planting Techniques**

Woolgrass achenes require moist, cold stratification and light for germination. Fall planting, especially with fresh seed, has shown a higher success rate. About 4,536,000 seeds/lb. Rootstock and transplants have had success in establishment, though seed establishes well. Woolgrass is favored by drawdowns, especially during the spring. [16, 37, 42]



Photo: Paul Jackson





# *Scirpus fluviatilis*

**River Bulrush - a.k.a. River Rush, Three-square Rush**

## **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Streams, ditches, deep and shallow marshes, lakes, ponds and in fresh and mixosline waters (usually in shallow water, though sometimes brackish). [4, 7, 11, 16] **Range:** Occasional; Minn. (Eco-Region: All), all but nc. Wis., local in UP and mostly c. and s. LP of Mich. Que. to Wash., s. to Va., Mo., Kan. and Calif. It is a common dominant in Miss. River backwaters. [7, 21]

## **Description**

**General:** Stout, native, perennial, emergent herb often 5-7' tall and forming large colonies. **Flower:** Spikelets are brown, 3/8-1" long, and sessile on 4"-long stalks from July to September. **Leaf:** Leaf blades are smooth, 1/4-1/2" wide and strongly M-shaped in cross section. **Stem:** Sharply, triangular stems with flat sides are mint-green and leafy, growing to a height of 6'. **Fruit:** Distinctly, 3-angled achenes that are a dull, tan-to-gray green with a beak and 6 barbed bristles at the base. **Root:** Thick rhizome with tuber-like enlargements that are red to gray-black in color, covered with hair-like roots. **Soil:** Tolerates a wide variety of conditions although it prefers silty soils with a pH range of 7.0-9.1. [4, 7, 11, 44]

## **Normal Water Level**

This species prefers shallow water of 30" of inundation or less to wet/saturated conditions. [21, 37, 44]

## **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 30". **Duration:** Medium short – 3 days (decreasing 12"/day for 2 days and then 6" the last day). River bulrush tolerates regular flooding and inundation; it is moderately tolerant to flood duration and will increase with flood depth increases and decrease with depth decreases. [1, 37, 44]

## **Sensitivities or Other Tolerances**

**Exposure:** Full to partial to sun. **Salt:** Moderate. **Nutrient:** Moderate to high. **Siltation:** High. **Insect:** Infrequent. **Other:** This species has a moderate rate of spread and a moderate tolerance to general disturbance and stress. [1, 37, 44]

## **Design Considerations**

River bulrush has been used in soil stabilization and erosion control in shorelines, vegetated swales and riverbanks, especially in 6" or less of standing water. It is recommended for wetland restorations, mitigation sites and shoreline improvements of streams, ponds and lakes. It provides good wildlife habitat. **Concerns:** This species is very aggressive and can form monocultures, which may be desirable to compete with invasive species. It also may be uprooted by wave action. [16, 44]

## **Wildlife Use**

Bulrush provides habitat for waterfowl and other species. Coots, black, canvasback, mallard, pintail, redhead, ring-necked, scaup and teal ducks eat the seeds. Young stems are utilized by Canada and snow geese. Sora and Virginia rails eat the seeds and

## Indicator Status: OBL



rootstock. Muskrats eat the rootstock and stems. Bulrush provides spawning and nursery habitat for bass, bluegills and other fish. It also provides nesting habitat for waterfowl and marshbirds. [4, 32, 37, 44]



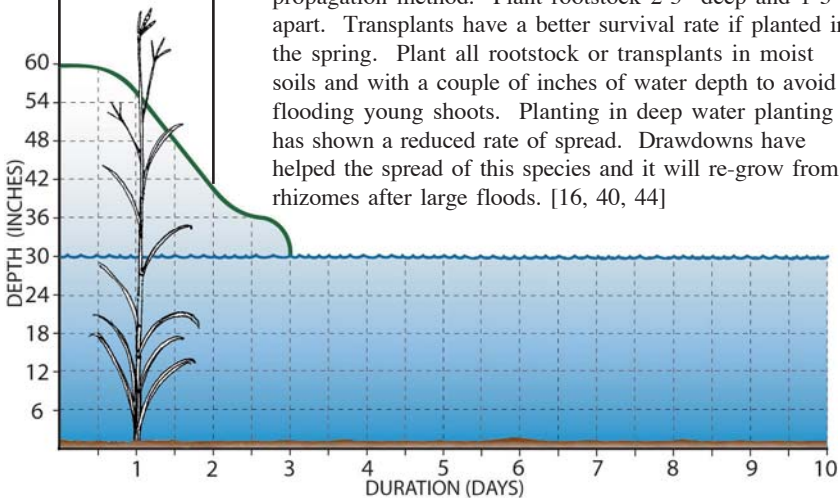
### Nursery/Plant Information

**Available:** Becoming widely. **Types:** Rhizomes, rootstocks, tubers and transplants.



### Planting Techniques

River bulrush achenes require moist, cold stratification for at least 90 days, then good light for germination. Seed production is erratic. Fresh seed planted in the fall has the highest germination rate. Recommended seeding rate is 0.06-0.125 lb/acre with about 54,000 seeds/lb. This species divides well, and rhizomes, tubers and transplants are the preferred propagation method. Plant rootstock 2-5" deep and 1-3' apart. Transplants have a better survival rate if planted in the spring. Plant all rootstock or transplants in moist soils and with a couple of inches of water depth to avoid flooding young shoots. Planting in deep water planting has shown a reduced rate of spread. Drawdowns have helped the spread of this species and it will re-grow from rhizomes after large floods. [16, 40, 44]





## *Scirpus pungens*

**Three-square Bulrush** - a.k.a. *Scirpus americanus*, *Scirpus (americanus) pungens* - Common Threesquare, True Three-square Bulrush, Chairmaker's Rush, Swordgrass

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Shallow water, wet sandy, gravelly or mucky shores, streambanks, deep and shallow marshes, calcareous fens, wet meadows, ditches, seeps and other wet places. It is frequently found in mixosaline waters. [4, 7, 11, 16, 24]

**Range:** Fairly common; Minn. (Eco-Region: All), nw. and e. Wis., LP and occasional in UP of Mich. S. Can., s. to S. Amer.; Europe, Australia and New Zealand. [7, 21]

### **Description**

**General:** A persistent, perennial, emergent herb that grows 3-5' tall and forms colonies.

**Flower:** 1 to 8 oblong spikelets  $\frac{1}{4}$ - $\frac{3}{4}$ " long, sessile and crowded. Blooms from July to September. A specialized leaf appears to be a continuation of the stem beyond the spikelets.

**Leaf:** One to three leaves that are narrowly linear and are less than half the height of the stems form basal sheaths.

**Stem:** Sharply triangular stems with 2 or 3 concave sides, growing to a height of 5'. **Fruit:** Achenes with bristles. **Root:** Long, slender rhizomes. **Soil:** Likes shallow water in wet sandy, gravelly or mucky shorelines as well as calcareous conditions. [4, 7, 11, 24]

### **Normal Water Level:**

This species prefers shallow water of 30" of inundation or less to wet/saturated conditions and will tolerate slightly salty water. [11, 21, 37]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 18". **Duration:** Medium long – 4 days (decreasing 12" in 2 days, then 6" over the next 2 days). This species will tolerate regular or seasonal inundation and flood duration. It will increase and is tolerant to flood depth increases. [1, 37]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to partial sun. **Salt:** Low to high. **Nutrient:** Low to moderate.

**Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species has a rapid rate of spread. It will remove metals quickly. It has a moderate tolerance to general disturbance. [1, 6, 24, 37]

### **Design Considerations**

Three-square bulrush is a good soil stabilizer for shores, stream banks and vegetated swales. It provides good wildlife habitat and has a rapid rate of spread for mitigation and restoration sites. **Concerns:** This species can become aggressive, although that may be desired in some instances. [16, 37]

### **Wildlife Use**

Bulrush provides wildlife habitat not only for waterfowl, but for other species as well. Coots, black, canvasback, mallard, pintail, redhead, ring-necked, scaup and teal ducks eat the seeds. Stems are utilized when young by Canada and snow geese. Sora and

**Indicator Status: OBL**



Virginia rails eat the seeds and rootstock. Muskrats eat the rootstock and stems. Bulrush provides spawning and nursery habitat for bass, bluegills and other fish. It also provides nesting cover for waterfowl and marsh birds. [4, 6, 11, 24, 32, 37]

### **Nursery/Plant Information**

**Available:** Becoming widely. **Types:** Root, plants and seeds.

### **Planting Techniques**

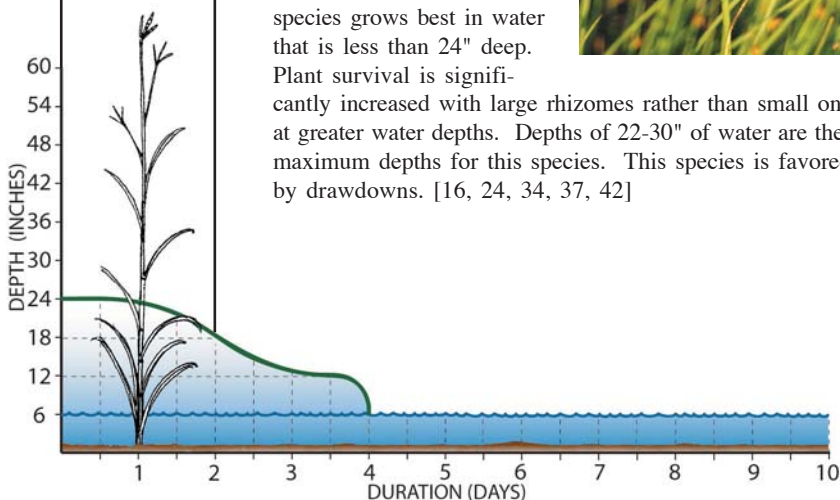
Three-square bulrush requires moist, cold stratification for at least 90 days and then light for germination. Fresh seed planted in the fall can bypass the stratification process. Approximately 220,000 seeds/lb. Transplants can be planted in saturated soil to a depth of 12" of inundation. This species grows best in water that is less than 24" deep. Plant survival is significantly increased with large rhizomes rather than small ones at greater water depths. Depths of 22-30" of water are the maximum depths for this species. This species is favored by drawdowns. [16, 24, 34, 37, 42]



Photo: Rusty Schmidt



Photo: Rusty Schmidt







## *Scirpus validus*

**Soft-stem Bulrush** - a.k.a. *Scirpus tabernaemontani* – Great Bulrush,  
American Great Bulrush

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Lakes, ponds, deep and shallow marshes, streams, ditches and occasionally bogs (shallow water and shores). [4, 7, 11, 16] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Nfld. to s. Alaska, s. to S. Amer. [7, 21]

### **Description**

**General:** A persistent, emergent, perennial herb that is 3-9' tall, sometimes forming large colonies that may be intermixed with other emergent species. **Flower:** Several to many brown, oval spikelets on a specialized leaf that appears to be a continuation of the stem and exceeds the spikelets; blooms from June to September. **Leaf:** A few sheathing vestigial leaves at the base. **Stem:** Cylindrical, light-green stems 3-9' tall may be a little over ½" thick and are large-chambered so they can be crushed easily between the thumb and index finger. **Fruit:** Achenes with 6 basal bristles about equal in length to the achenes and shiny, orange-to-brown scales are often with a conspicuous green midrib. The scales are slightly longer than the achene. **Root:** Spreads by slender rhizomes. **Soil:** Soft-stem bulrush usually prefers mucky substrates with more stagnant conditions than those preferred by hardstem bulrush and a pH range of 6.5-8.5. [4, 7, 11, 44]

### **Normal Water Level**

This species prefers shallow water of 12-48" of inundation although it will tolerate wet/saturated conditions. [21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 24". **Duration:** Long – 42+ days (decreasing 12" every 21 days). This species will tolerate flooding for long periods regularly to seasonally. It is unaffected by flood depth increases, and it increases with depth decreases. [1, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Low to moderate. **Nutrient:** Low to moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species is sensitive to oxygen depletion, though it will remove pollution quickly. It has a rapid rate of spread and a moderate-to-low tolerance to general disturbance and stress. [1, 6, 37, 44]

### **Design Considerations**

Because it dissipates wave energy, soft-stem bulrush is an excellent soil stabilizer for shores, stream banks and vegetated swales. It is preferred to cattails and provides good habitat reconstruction. It is recommended for lake, pond, stream and wetland restorations and mitigation sites. Seed can be found in the seed bank. **Concerns:** This species is sensitive to oxygen depletion. It is also susceptible to depredation when young or if Canada geese populations are too high. It is an aggressive plant, which may be desirable in certain situations. [16, 19, 26, 44]

### **Wildlife Use**

Bulrush provides wonderful wildlife habitat not only for waterfowl, but for other species as well. Coots, black, canvasback, mallard, pintail, redhead, ring-necked, scaup and teal ducks eat the seeds. Stems are utilized when young by Canada and snow geese. Sora and Virginia rails eat

**Indicator Status: OBL**

the seeds and rootstock. Muskrats eat the rootstock and stems. Especially in central Minnesota, bulrushes provide the primary nesting sites for grebes, black terns and other waterfowl and marsh birds. Bulrush provides spawning and nursery habitat for northern pike, bluegills and other fish. [4, 6, 11, 32, 37, 44]



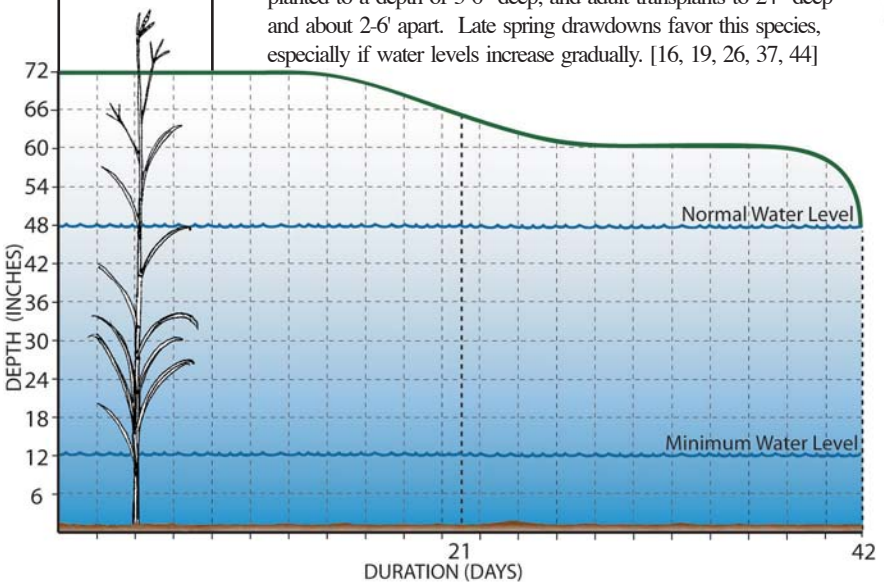
Photo: Dan Shaw

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Achenes, rhizomes, rootstocks and container plants.

### **Planting Techniques**

Soft-stem bulrush seeds require moist, cold stratification and high light levels to germinate. The achenes should be stored under water in darkness at 30-38 degrees F. Seed in the fall with fresh seed. Sow on wet mudflats and cover with 1-2" of water during the winter, then follow with a drawdown. Submerged young seedlings do not establish. Recommended seeding rate is 0.06-0.25 lb/acre with about 604,800 seeds/lb. Rootstock and transplants are more successful than seeding. Rootstocks and seedlings should be planted to a depth of 5-6" deep, and adult transplants to 24" deep and about 2-6' apart. Late spring drawdowns favor this species, especially if water levels increase gradually. [16, 19, 26, 37, 44]





## *Scutterlaria lateriflora*

Mad-dog Skullcap - a.k.a. Blue Skullcap

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Shores, stream banks, sedge and wet meadows, marshes, swamps and shaded wet areas, usually found among sedges. [7, 21, 35] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. Nfld. to B.C., s. to Ga., Tex. and Calif. [7, 21]

### Description

**General:** Slender, native, perennial herb, usually 1-2' tall. **Flower:** Two-lipped, smaller blue petals and sepals in loose clusters from elongate racemes in the axil leaves. **Leaf:** Opposite, ovate to lance-shaped, smooth leaves are 1-3" long and ½-2" wide. The margins are coarsely toothed with petioles no longer than ¾" long. **Stem:** Solitary, square stems 8-24" long and smooth. **Fruit:** An achene. **Root:** Slender rhizomes. [7, 35]

### Normal Water Level

This species prefers wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 24". **Duration:** Medium short – 3.5 days (decreasing 6" the first half day, then 6"/day thereafter). This species has a moderately low tolerance to flood duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Full sun to shade. **Salt:** Moderate. **Nutrient:** Moderate. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate-to-high tolerance to general disturbance and stress. [1]

### Design Considerations

Mad-dog skullcap is used in many mitigation and restoration sites of shores, stream banks and wet meadows within the seed mix for diversity. It self-sows well. It is a beautiful, small landscape plant that could do well in rain water gardens.

### Wildlife Use

No information available.

### Nursery/Plant Information

**Available:** Limited. **Types:** Seed only.

### Planting Techniques

This species self sows easily. [21]

Indicator Status: OBL

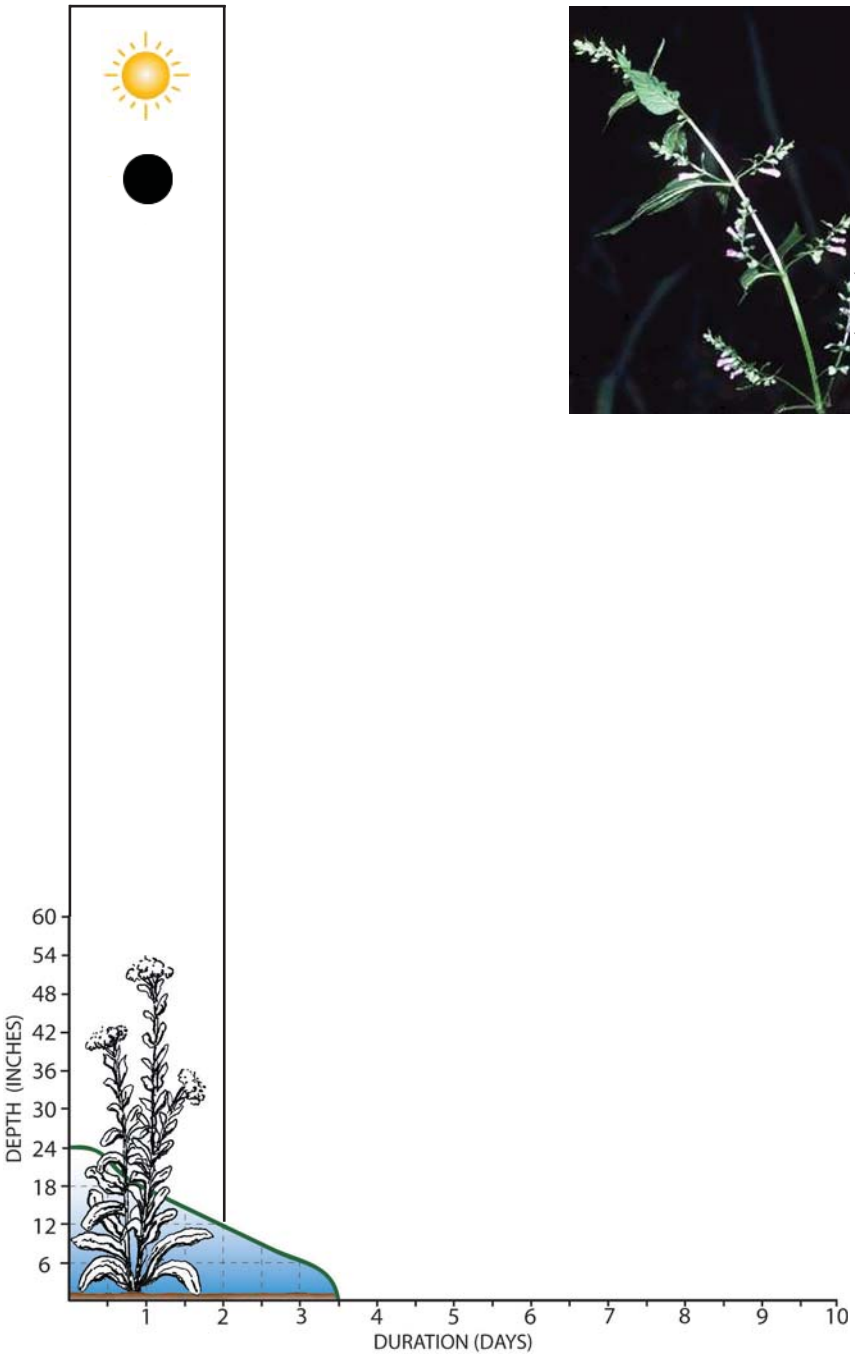


Photo: Robert Mohlenbrock/USDA, NRCS, 1997 - Northeast



# *Silphium laciniatum*

## Compass Plant

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Mesic prairies and railroads, though sometimes seen in natural sedge meadows and wet prairies. [17, 44] **Range:** Minn. (Eco-Region: All), Wis., Mich. Oregon to Minn. and S.D., s. to Ala. and Tex. Locally introduced along railroads e. to N.Y. [17]

### Description

**General:** Coarse, perennial, native herb to a mature height of up to 10'.

**Flower:** Large, yellow, disk-type heads in a narrow line up the stalk similar to a raceme, blooming from July to September. The flower's ovate bracts exceeding the disk of rays, 17-25 per head and  $\frac{3}{4}$ -2" long. **Leaf:** Alternate, deeply cut-to-lobed lower leaves, which are up to 20" long and then progressively reduced upwards, with the uppermost entire and well under 4" long. The basal leaves tend to align themselves in a north-south direction. **Stem:** Small hairs along the stem. **Fruit:** A winged achene. **Root:** Coarse, taprooted, rough-hairy to 3-6'. **Soil:** Most rich prairie soils with a pH range of 4.5-7.5. [17, 44]

### Normal Water Level

This species prefers upland mesic conditions, though it will tolerate some wet/saturated conditions. [44]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 1 day (decreasing entire 12" in 1 day). This species will not tolerate artificial inundation situations, though has been found in sedge meadows and wet prairies occasionally. [44]

### Sensitivities or Other Tolerances

**Exposure:** Full sun. **Salt:** Low. **Nutrient:** Low. **Siltation:** Low. **Insect:** Infrequent. [44, 47]

### Design Considerations

This species has been used in buffer and slope stabilization. It has also had success in the restorations of mesic-to-wet prairies and the edges of rainwater gardens. [44]

### Wildlife Use

Compass plant provides seed for songbirds, meadow mice and sharp-tailed grouse. It attracts butterflies and is a food source for the silphium weevil. Deer have been known to graze on the plant. [44]

### Nursery/Plant Information

**Available:** Limited. **Types:** Plants and seeds.

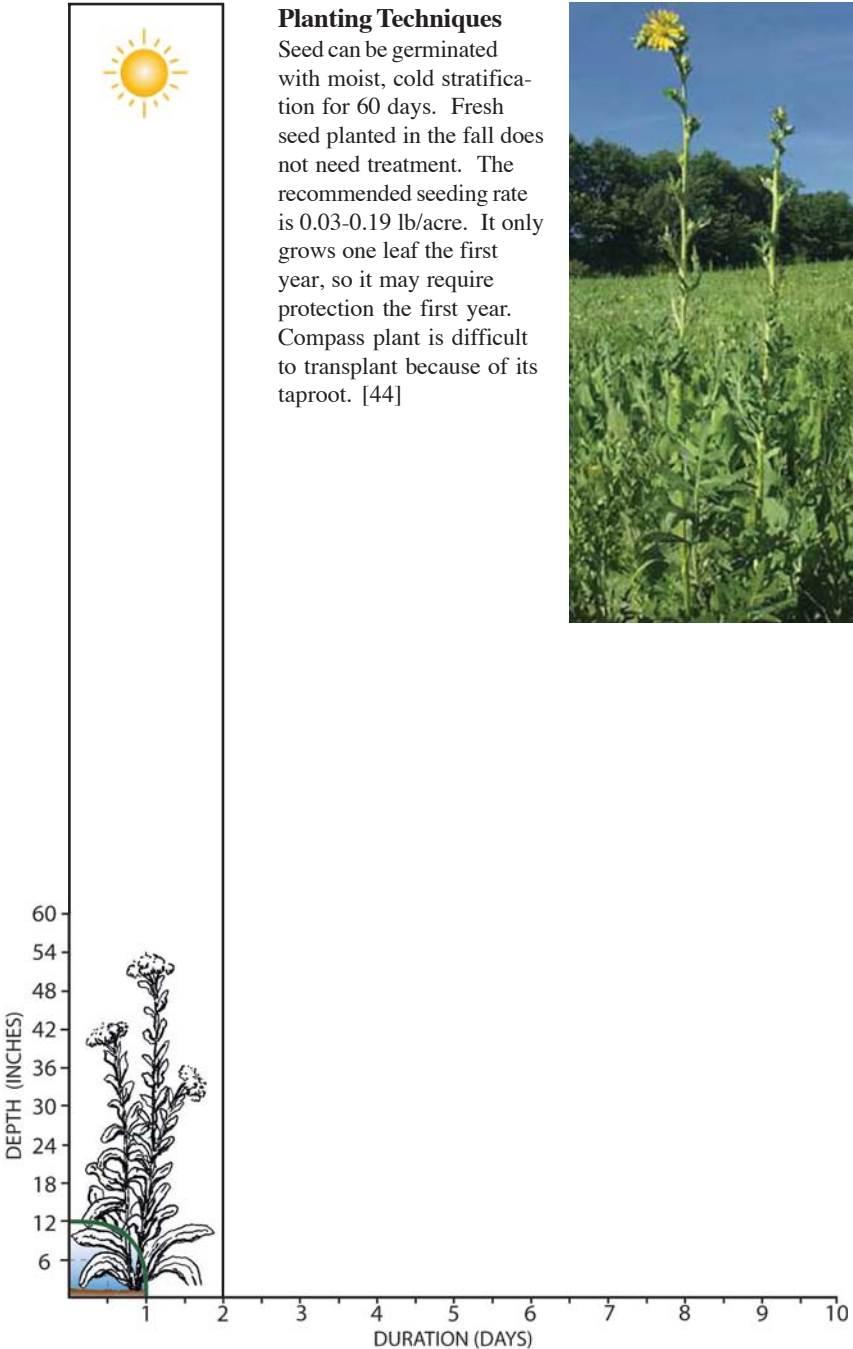
Indicator Status: UPL

### Planting Techniques

Seed can be germinated with moist, cold stratification for 60 days. Fresh seed planted in the fall does not need treatment. The recommended seeding rate is 0.03-0.19 lb/acre. It only grows one leaf the first year, so it may require protection the first year. Compass plant is difficult to transplant because of its taproot. [44]



Photo: Paul Drobot & Wisconsin State Herbarium





## *Silphium perfoliatum*

Cup Plant - a.k.a. Indian-cup

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Flood plain forests, stream banks, wet prairies and savannas, wet meadows, along wetlands and springs. [7, 16, 35, 41] **Range:** S. and ec. Minn. (Eco-Region: 6-9), s. Wis., s. LP of Mich. S. Ont. to N.D., s. to Ga. and La. [7, 21] **This is a threatened species in the s. LP of Mich.**

### Description

**General:** A robust, native, perennial herb, usually 4-6' tall, with sunflower-like heads up to 4" across and unique united leaves that form a "cup" that holds rainwater, hence its common name. **Flower:** A multibranching flower stalk with 10-30 heads arranged in a spreading cluster. Each head has 20-30 yellow rays that are 3-4" wide, with a light green-to-yellow, sterile disk flower center that blooms from July to September. **Leaf:** Bristly, lance-shaped, opposite leaves that are 6-10" long and united at the base to form a "cup." **Stem:** Often reddish in color, wide, square and smooth to the touch. **Fruit:** Only the ray flowers produce seeds. **Root:** Spreads by rhizomes. **Soil:** Moist, fertile soils, especially in river valleys. [7, 35, 41]

### Normal Water Level

This species prefers upland moist to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day).

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species is sensitive to herbicide drift. It has a moderate tolerance to general disturbance and stress. [1, 16, 47]

### Design Considerations

Cup plant has wonderful wildlife use and is used in wetland and prairie restorations. It has also been used for shoreline, buffer and vegetated swale soil stabilization. It is also an ideal plant for the background of rain water gardens. **Concerns:** This species is sensitive to herbicide drift. It can be aggressive, which may be desirable in some situations. [16]

### Wildlife Use

The seeds of cup plant are eaten by meadow mice, goldfinches and sharp-tailed grouse. Cup plant is also a good butterfly and hummingbird plant. Yet, it is used mostly as a source of water after rain events. Birds use the "cups" as baths, and tree frogs will sit in them. [21, 32, 41]

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and plants.

Indicator Status: FACW-

### Planting Techniques

Cup plant propagates from seed well and produces about 22,400 seeds/lb. [16]

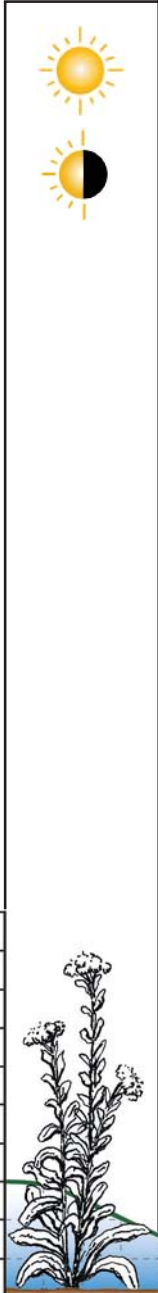


Photo: Dan Shaw



Photo: Dan Shaw



DURATION (DAYS)





## *Smilacina racemosa*

**False Solomon's Seal** - a.k.a. *Polygonatum Biflorum*, *Smilacina trifolia* - False Spikenard, Feathery False Solomon's Seal, Feathery Solomon's Plume, Solomon's Plume

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Open bogs, conifer swamps, deciduous woods, mesic and dry savannas, and thickets. [7, 16, 35, 41] **Range:** N. and ec. Minn. (Eco-Range: 1, 2, 4-9), n. and c. Wis., Mich. Nfld. to Nw. Terr. and B.C., s. to N.J., Ohio, s. Wis. and Minn.; n. Asia. **Rare in se. Wis.** [7, 21]

### **Description**

**General:** Native, perennial, woodland herb that grows 1-3' high. **Flower:** Stem ends in a dense cluster (3-5" long) of many small, star-shaped, white flowers 1/8" wide. Each flower has 3 petals and 3 sepals, giving the appearance of 6 petals, blooming in spring. **Leaf:** Alternate, elliptical-to-oval, stalkless leaves 3-6" long; hairy underneath with heavy, parallel veining. **Stem:** Unbranched stems, often arching, usually 1-2' long. **Fruit:** A cluster of waxy red berries, which may be conspicuous in the fall. **Root:** Elongate rhizome rootstalks that have scars on them, marking the attachment position of former aerial stems that are similar to the seal of King Solomon. **Soil:** Rich, mesic-to-dry forests. [7, 35, 41]

### **Normal Water Level**

This species prefers upland moist conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 1 day (decreasing 12" in 1 day). This species has an intolerance to flood duration of 3 days or more. [1]

### **Sensitivities or Other Tolerances**

**Exposure:** Partial sun to full shade. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Low. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1]

### **Design Considerations**

False Solomon's seal has been used in woodland restoration as well as in some slope soil stabilization. It has beautiful dried seed heads, and is well suited to shady conditions. **Concerns:** It may become aggressive, though it does create a good woodland ground cover. [16]

### **Wildlife Use**

This species is used to a limited extent by ruffed grouse, gray-cheeked thrush, olive-backed thrush, veery and white-footed mouse. Its waxy red berries are not edible to humans. [21, 32, 41]

Indicator Status: FACU

### Nursery/Plant Information

**Available:** Widely.

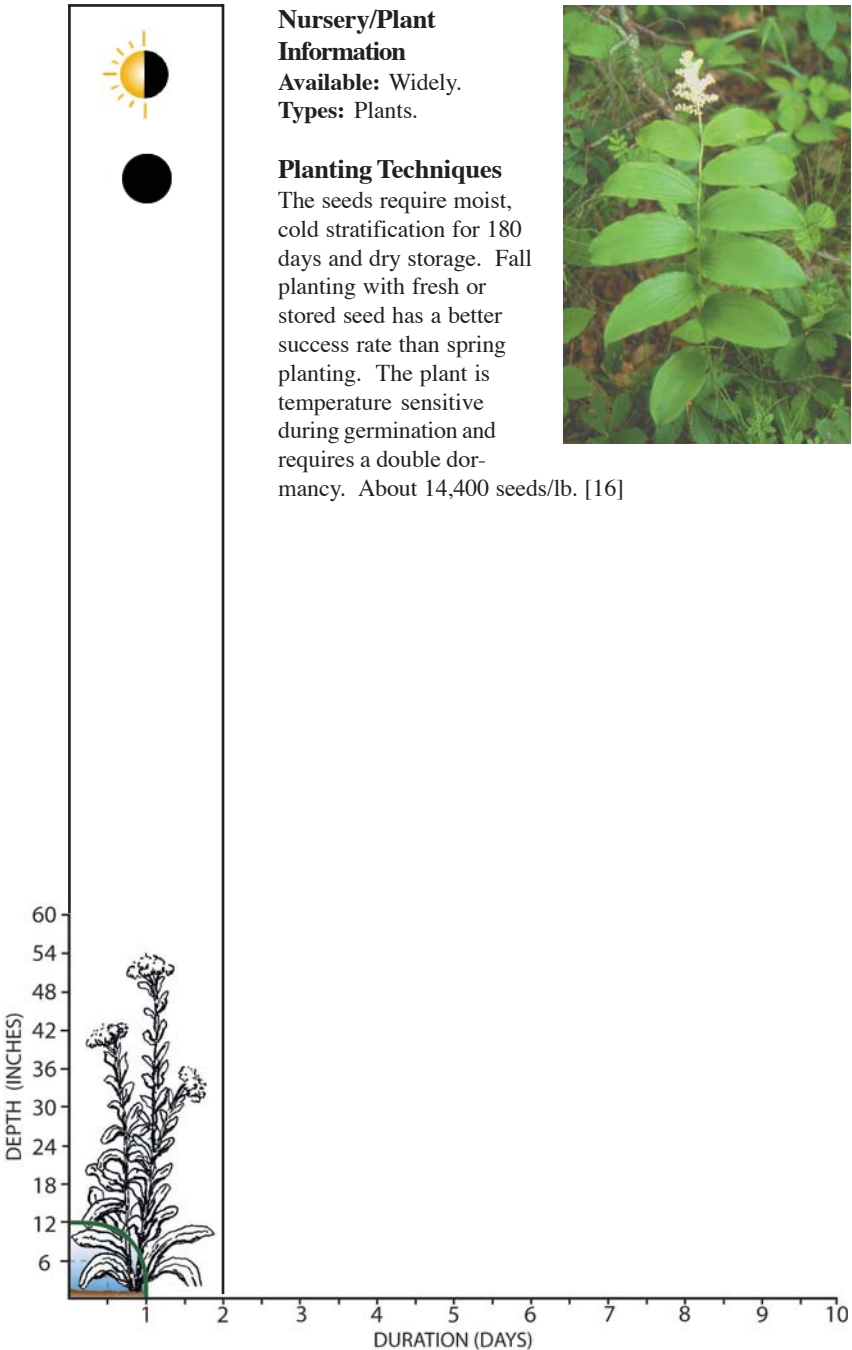
**Types:** Plants.

### Planting Techniques

The seeds require moist, cold stratification for 180 days and dry storage. Fall planting with fresh or stored seed has a better success rate than spring planting. The plant is temperature sensitive during germination and requires a double dormancy. About 14,400 seeds/lb. [16]



Photo: Paul Jackson





## *Solidago flexicaulis*

Zig-zag Goldenrod - a.k.a. Broad-leaved Goldenrod, Woodland Goldenrod

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Clearings, woods and woodland edges, especially in hardwood forest areas. The only goldenrod to grow in the forest. [16, 17, 35, 44] **Range:** Minn. (Eco-Region: 1, 4-9), Wis., Mich. N.S. and N.B. to N.D., s. to Va., Ky. and Ark., and in the mountains to Ga. [17, 21]

### Description

**General:** Native, woodland, perennial herb that reaches a height of 1-3'. **Flower:** Several round clusters, 1-2" wide, often stalked at the axis of the upper leaf joints. Individual flowers are ¼" wide and have only 3-4 petals. Blooms from August to September. One of the few goldenrods with flower clusters located at each leaf joint rather than spikes near the top of the plant. **Leaf:** Pointed, oval leaves that are coarsely toothed and 1-3" long. The dark green leaves alternate along the stem with short leafstalks. **Stem:** 1 to 3 erect stems that bend back and forth between each leaf attachment, hence the common name, "zig-zag," which is most obvious between the upper leaves. **Fruit:** Short-haired achenes. **Root:** Long rhizomes. **Soil:** Moist, rich woodlands, though it will tolerate dry conditions and calcareous situations. [17, 35, 41]

### Normal Water Level

This species prefers upland moist to dry conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 1 day (decreasing 12" in 1 day). This species is somewhat tolerant to flood duration. [1]

### Sensitivities or Other Tolerances

**Exposure:** Part sun to full shade. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Low to moderate. **Insect:** Infrequent. **Other:** This species is moderately tolerant to general disturbance and stress. [1]

### Design Considerations

Zig-zag goldenrod is a good woodland plant for restorations, shady flower gardens, calcareous soils, shady slopes and buffers. It has been used successfully in well-drained, shady rain water gardens. **Concerns:** This plant can be aggressive, and it prefers woodland situations. [16, 41]

### Wildlife Use

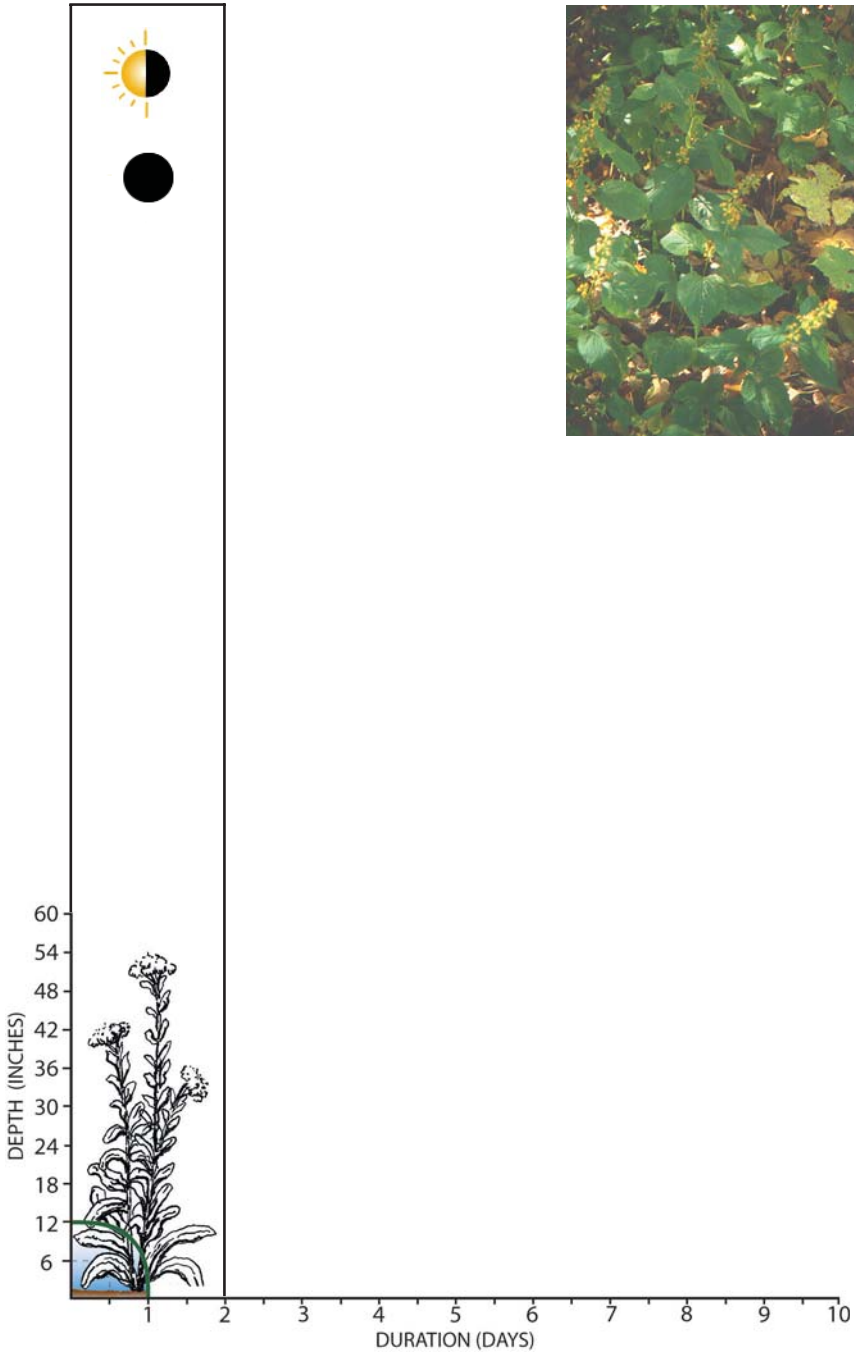
Goldenrod leaves are eaten to a limited extent by ruffed, sharp-tailed and spruce grouse. Goldfinches, juncos, and swamp and tree sparrows eat the seeds. Rabbits eat the foliage and plants. Mice eat the seed heads and foliage. [21, 32]

### Nursery/Plant Information

**Available:** Widely. **Types:** Plants and seeds.

Indicator Status: FACU

Photo: Dan Shaw





## *Solidago riddellii*

### Riddell's Goldenrod

#### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Wet meadows, calcareous fens, low prairies, lake shores and stream banks. It prefers to be supported by groundwater seepages. [7, 11, 16]

**Range:** W. and s. Minn. (Eco-Range: 4, 7-9), c. and s. Wis., c. and s. LP of Mich. Ont. to e. N.D. and S.D., s. to Ohio and Mo. [7, 21]

#### **Description**

**General:** Perennial, native herb 2-3' in height. **Flower:** The inflorescence is a flat-topped, hairy head with many and crowded – rarely less than 50 – often several hundred yellow ray flowers with 7-9 rays, each blooming from September to early November. **Leaf:** The lower basal leaves are better developed and usually persistent. The leaves are many along the stalk; sickle-shaped, folded, triple-nerved and not dotted with glands. They persist up to flowering time. **Stem:** Generally stout, smooth except for some hairs in the inflorescence. **Fruit:** Smooth achenes with 5-7 nerves. **Root:** A crown, sometimes with rhizomes. **Soil:** Many mesic-to-saturated soils, including calcareous. [7, 11]

#### **Normal Water Level**

This species prefers upland moist to wet/saturated conditions. [21]

#### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day).

#### **Sensitivities or Other Tolerances**

**Exposure:** Full sun. **Salt:** Moderate. **Nutrient:** Moderate. **Siltation:** Moderate.

**Insect:** Infrequent. **Other:** This species is moderately tolerant to general disturbance and stress. [1]

#### **Design Considerations**

Riddell's goldenrod is well suited for wetland and calcareous restoration or mitigation sites. It provides a nice landscape plant and cutflowers. It also provides good bird and butterfly habitat. [16]

#### **Wildlife Use**

Goldenrod leaves are eaten to a limited extent by ruffed, sharp-tailed and spruce grouse. Goldfinches, juncos, and swamp and tree sparrows eat the seeds. Rabbits eat the foliage and plants. Mice eat the seed heads and foliage. This species is a butterfly favorite also. [21, 32]

#### **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants and seeds.

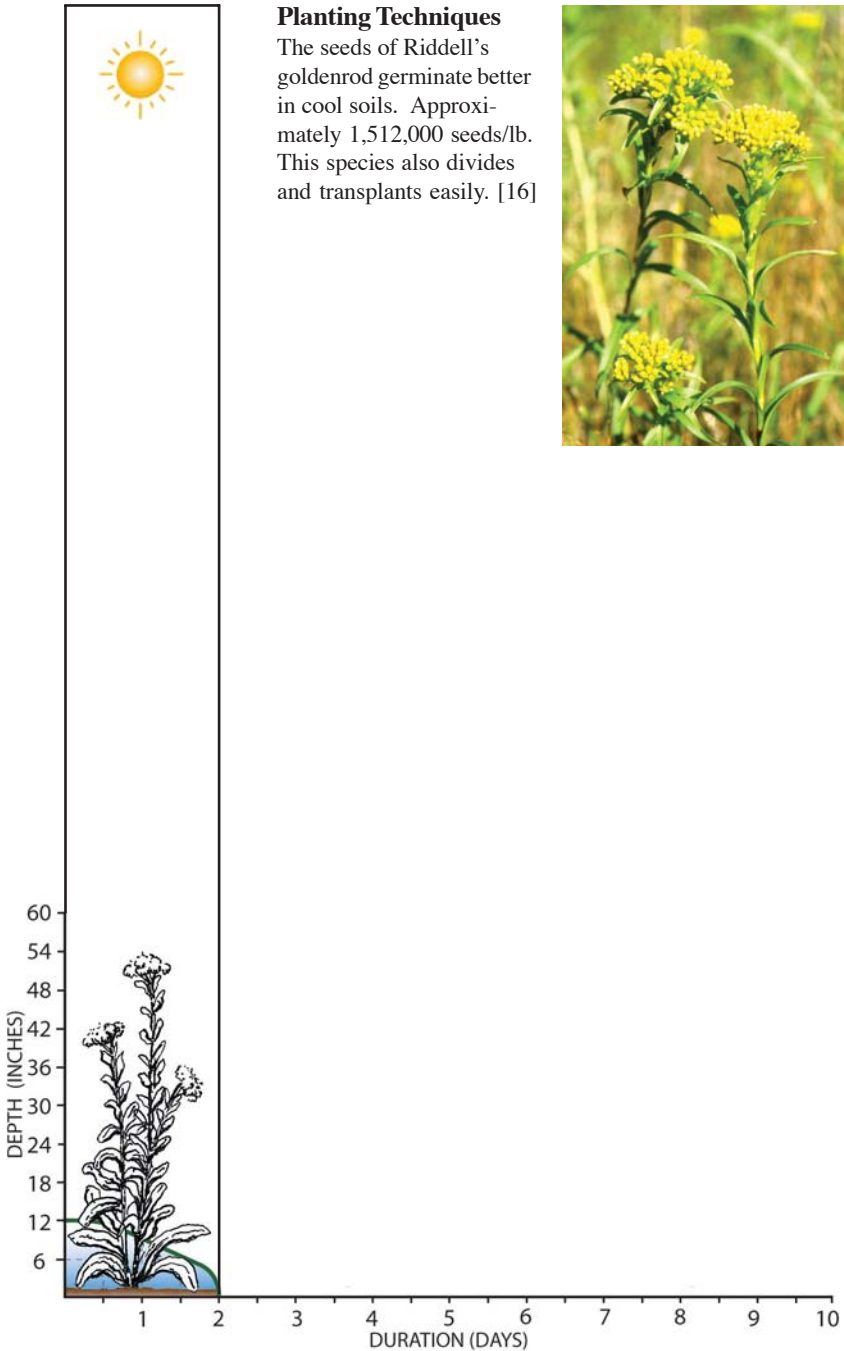
Indicator Status: OBL

### Planting Techniques

The seeds of Riddell's goldenrod germinate better in cool soils. Approximately 1,512,000 seeds/lb. This species also divides and transplants easily. [16]



Photo: Paul Jackson





## *Solidago rigida*

**Stiff Goldenrod** - a.k.a. **Stiff or Hard-leaved Goldenrod**

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Mesic-to-dry open spaces, fields, prairies, savannas and along roadsides, especially in sandy soils. [16, 17, 35, 41] **Range:** Minn. (Eco-Region: All), Wis., Mich. R.I., Conn., w. Mass. and N.Y. to Ga., w. to Alta. and N.M., more common westward. [17, 21]

### **Description**

**General:** Native, perennial herb that stands up to 5' tall and is worthy of growing for its very attractive foliage topped with a broad, flat cluster of yellow flower heads.

**Flower:** Yellow flower heads are in a wide, flat bloom from August. to September. Each flower head has 7-10 ray flowers and 20-30 center disk flowers. **Leaf:** Alternate stem leaves that are oval to oblong. The stalked basal leaves stand erect (hence, the common name) and are rough with short, stiff hairs. The plant's round, fleshy leaves makes it easy to identify. **Stem:** Stiff, hairy, often clumped in 2s and 3s, that branch into flower heads near the top of the plant; 2-4' tall. **Fruit:** 10-20 nerved achenes that are angular. **Root:** Stout, branched caudex. **Soil:** Mesic-to-dry soils, especially sandy. [17, 35, 41, 44]

### **Normal Water Level**

This species prefers upland moist/mesic to dry conditions. [21, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Low to moderate. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species has a minimal flooding tolerance. [44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Low to moderate. **Siltation:** Low to moderate. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 44, 47]

### **Design Considerations**

Stiff goldenrod is used in upland buffers and slope stabilization. It does well in well-drained rain water gardens. It provides cutflowers and nectar for butterflies. It self-sows easily. **Concerns:** Because this species self-sows, it can be aggressive. [16, 44]

### **Wildlife Use**

Goldenrod leaves are eaten to a limited extent by ruffed, sharp-tailed and spruce grouse. Goldfinches, juncos, and swamp and tree sparrows eat the seeds. Rabbits eat the foliage and plants. Mice eat the seed heads and foliage. This species also is an excellent source for nectar for butterflies, bees, flower flies and beetles. [21, 32, 41, 44]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Seed.

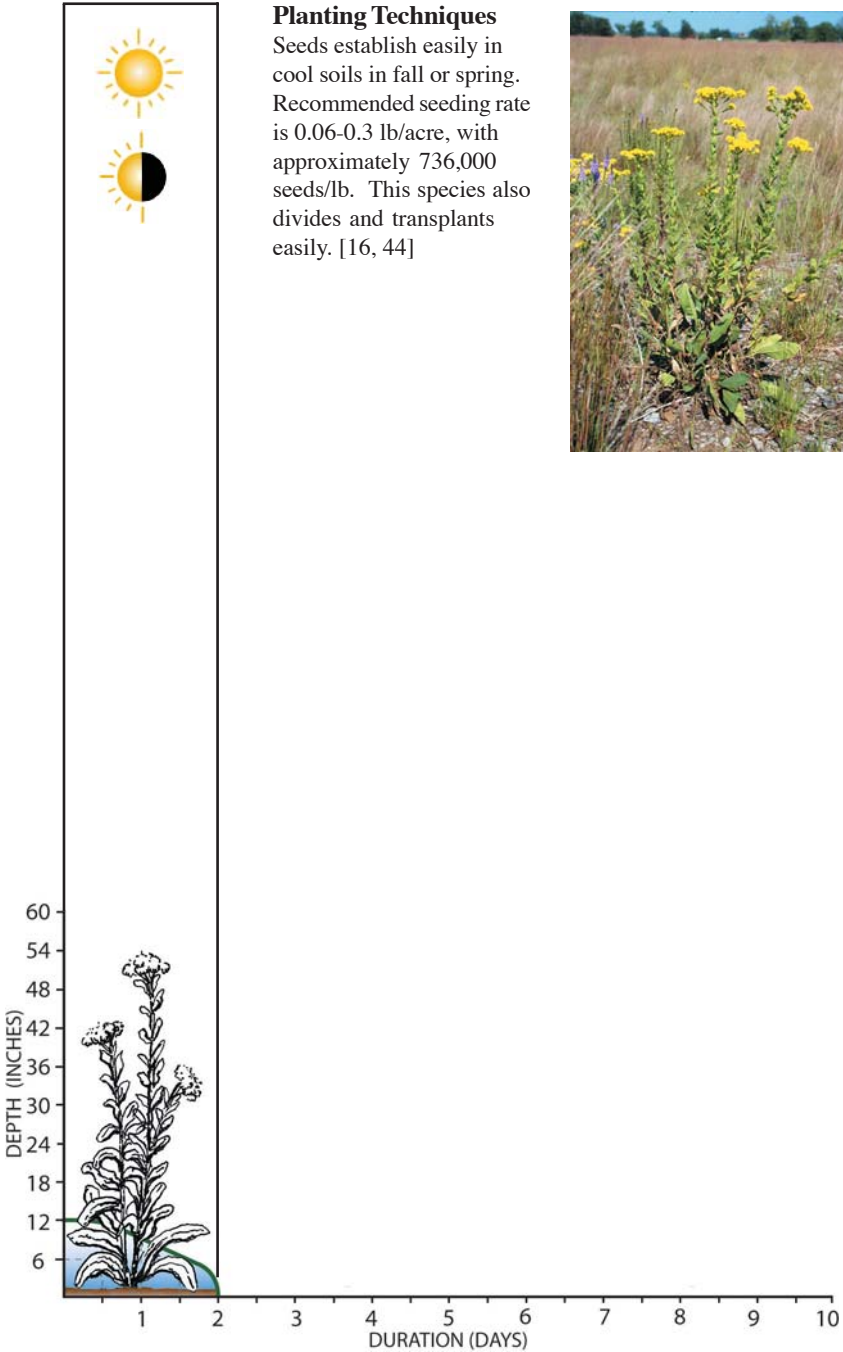
**Indicator Status: FACU-**

**Planting Techniques**

Seeds establish easily in cool soils in fall or spring. Recommended seeding rate is 0.06-0.3 lb/acre, with approximately 736,000 seeds/lb. This species also divides and transplants easily. [16, 44]



Photo: Paul Jackson







# *Sorghastrum nutans*

## Indian Grass

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Mesic or dry prairies, open woods, fields, and an important constituent of tall-grass prairies. [16, 17, 44] **Range:** Minn. (Eco-Region: All), Wis., Mich. S. to the Gulf of Mex., w. to Utah and Ariz. [17, 21]

### Description

**General:** Warm-season, native, perennial grass that forms loose clumps and reaches 4-8'. **Flower:** Plume-like, golden brown panicles from August to September. Panicles are 4-12" long, narrow, freely branched, with the nodes and smaller branches having long, soft, bent hairs. Spikelets are lance-shaped and the awn is twisted below, bent at about a third of its length. **Leaf:** Leaves are 1/8-3/8" long with smooth sheaths and well-developed ligules that are firm and continuous with the auricles. **Root:** Short rhizomes, smooth except for the sericeous nodes. Fibrous roots reach 4' deep. **Soil:** Mesic-to-dry loam or sandy soils with a wide pH range and in most moist, grassy habitats. [17, 44]

### Normal Water Level

This species prefers upland moist to wet/saturated conditions, although it will tolerate drier conditions. [21, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Short – 1 day (decreasing 12" in 1 day). This species is somewhat tolerant to flood duration. [1, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** High and will increase with nutrients. **Siltation:** Low to moderate. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stress. [1, 44]

### Design Considerations

An excellent plant for stabilizing soils of slopes, buffers and vegetated swales. A wonderful contrast or border plant for landscapes for a wide range of habitats. It is also wonderfully suited for many restorations of meadows, prairies and buffers. It has been used in shallow, well-drained rainwater gardens. The plumes may be cut and dried. **Concerns:** Be cautious of non-local seed and hybrids. [16, 44]

### Wildlife Use

Indian grass is a robust perennial that provides good winter cover as well as seeds for game and songbirds. It is a butterfly attractant. But most importantly, it is a palatable and nutritious forage for grazing species. [16, 44]

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and plants.

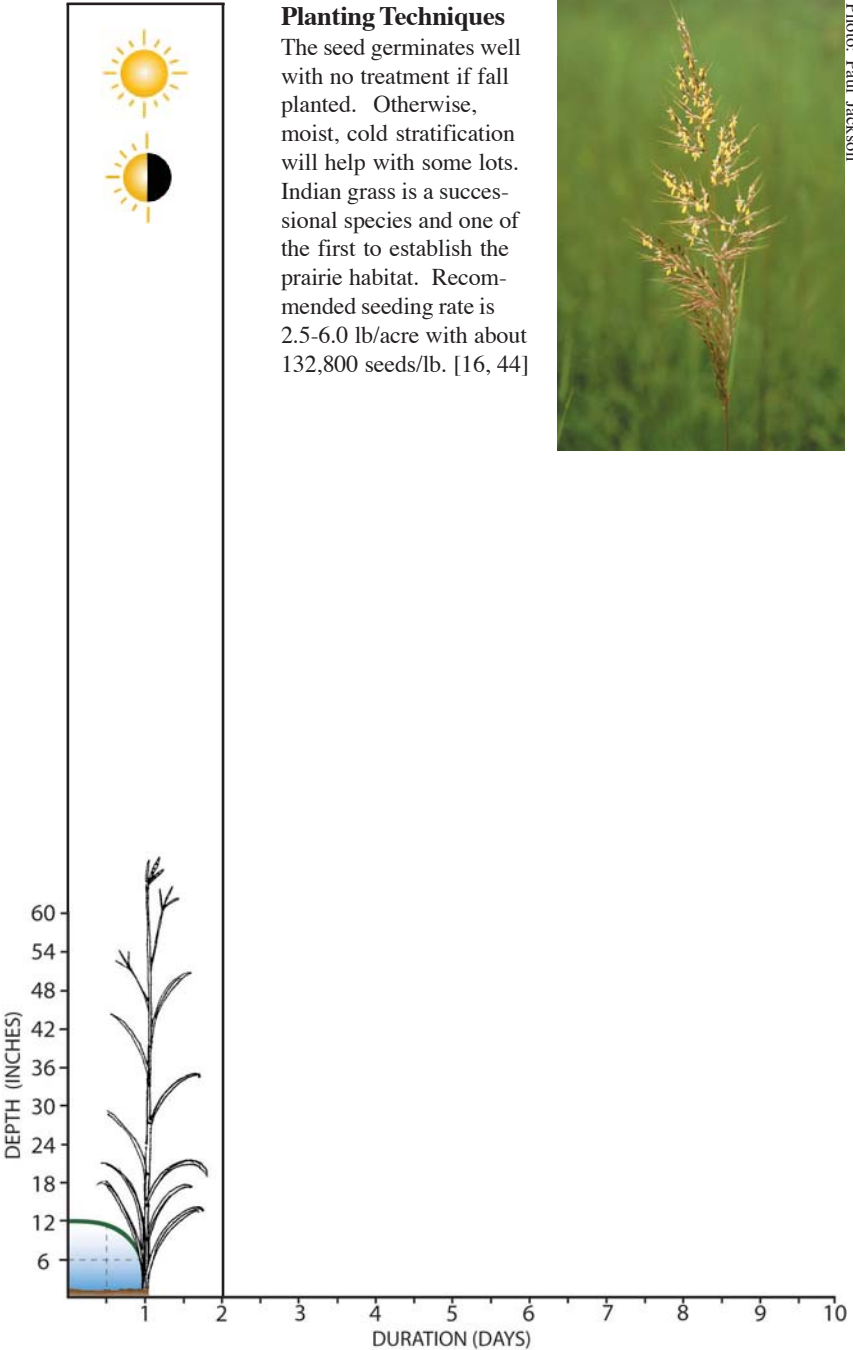
Indicator Status: FACU+

### Planting Techniques

The seed germinates well with no treatment if fall planted. Otherwise, moist, cold stratification will help with some lots. Indian grass is a successional species and one of the first to establish the prairie habitat. Recommended seeding rate is 2.5-6.0 lb/acre with about 132,800 seeds/lb. [16, 44]



Photo: Paul Jackson





# *Sparganium eurycarpum*

Giant Burreed - a.k.a. Common Burreed, Broad-fruited Common Bur-reed

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Marshes, streams, ditches, bogs, ponds and lakes (usually in shallow water; often with cattails). [4, 7, 11, 16, 44] **Range:** Minn. (Eco-Region: All), Wis., Mich. Nfld. to B.C., s. to N.J., Ohio, Ind., Mo., Okla., Ariz. and Calif. [7, 21]

## Description

**General:** A stout, persistent, perennial emergent herb that is up to 4.5' tall.

**Flower:** Unisexual inflorescence that has zigzag branches and are white from June to August. The lower heads consist of the flowers with pistils and are bur-like at maturity, whereas the upper heads consist of flowers with 2 stamens. It can be distinguished from all other burreeds because it has 2 stigmas while other burreeds have just 1.

**Leaf:** Long sword-like, usually erect leaves are ¼-½" wide, and strongly keeled so that they appear to be a flattened-triangular cross section. However, ribbon-like floating and submerged leaves can also be produced. **Stem:** Stout, branched and 15-40" long.

**Fruit:** The mature fruit is about ¼" long and square-topped with a sharp break, where other burreeds are tapered to the base and apex. **Root:** Rhizomes. **Soil:** Shallow water and on wet substrates with a pH range of 6.7-8.8. [4, 7, 11, 44]

## Normal Water Level

This species prefers shallow water of 18" of inundation or less to wet/saturated conditions. Giant burreed is characteristic of silty, fertile waters, especially south of the vegetation tension zone. [21, 11, 37, 44]

## Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/ day).

This species tolerates regular inundation, is moderately tolerant to flood duration, and will decrease with flood depth increases. [1, 37]

## Sensitivities or Other Tolerances

**Exposure:** Full to partial sun. **Salt:** Low to moderate. **Nutrient:** Moderate to high and will increase with both N and P level increases. **Siltation:** Moderate to high.

**Insect:** Unknown. **Other:** This species has a rapid rate of spread. It will remove metal quickly. It has a moderate tolerance to general disturbance and stress. [1, 6, 37, 44]

## Design Considerations

Giant burreed has been used in shorelines of streams, lakes and ponds to provide erosion control. It also provides a wonderful wave buffer. It is used in wetland restorations where cattails would be, hopefully outcompeting the *Typha* spp. It provides good wildlife habitat. **Concerns:** At first glance, giant burreed may resemble cattail (*Typha* spp.) when not in flower; however, the strongly keeled leaves (flattened-triangular in cross section) of giant burreed will distinguish it from the flattened leaves (D-shaped in cross section) of cattail. This species is a competitor of cattail and aggressive enough to plant instead. [11, 16, 44]

Indicator Status: OBL



### Wildlife Use

Waterfowl, especially black, mallard, ring-necked, scaup and wood ducks eat the achenes of this species. Muskrats eat the stems and foliage. The plant also provides cover for nesting ducks and marsh birds. [4, 11, 21, 32, 37, 44]

### Nursery/Plant Information

**Available:** Widely.

**Types:** Corms, rhizomes, rootstock, seedlings and transplants.

### Planting Techniques

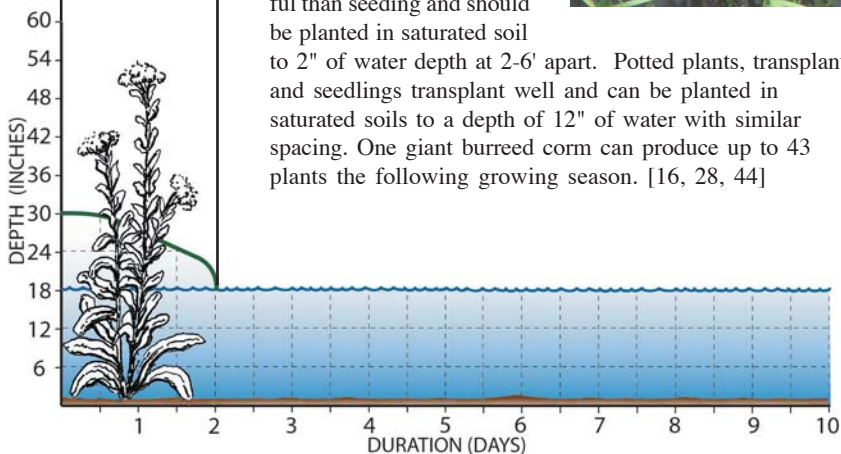
Soak the seeds in a bucket of water outside all winter to allow them to freeze, then sow in saturated soils. The seeds will float, so the wind may spread the plants to other locations. Recommended seeding rate is 0.2-0.375 lb/acre with about 9,488 seeds/lb. Corms and rhizomes are more successful than seeding and should be planted in saturated soil to 2" of water depth at 2-6' apart. Potted plants, transplants and seedlings transplant well and can be planted in saturated soils to a depth of 12" of water with similar spacing. One giant burreed corm can produce up to 43 plants the following growing season. [16, 28, 44]




Photo: Jason Hunsveith



Photo: Paul Jackson





# *Spartina pectinata*

Prairie Cord Grass - a.k.a. Cord Grass

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Shallow-water marshes, wet meadows, sandy and gravelly shores, ditches and low prairies. [7, 11, 16, 44] **Range:** Minn. (Eco-Range: All), especially s. and w. Wis., LP and c. UP of Mich. Nfld. and Que. to Alta., Wash. and Ore., s. to N.C., Ark., Tex. and N.M. [7, 21]

## Description

**General:** Hardy, coarse, densely colonial, native, perennial grass 5-7' tall.

**Flower:** Greenish yellow panicle with many, distinct one-sided spikes from July to August. The spikelets are longer than broad, overlay, and may be ascending or lie flat, resembling a comb. Unequal-size glumes are articulated below the glumes.

**Leaf:** Main blades are shiny, long and flat, 1/8-3/8" wide and up to 3' long with strongly roughened margins. When dry, the leaves may be inrolled. Gracefully arching leaves turn red to light straw yellow in fall. **Stem:** Stout, smooth, erect stems with short ligules that may be monotypic clones up to 30' away. **Root:** A dense mass of stout, scaly rhizomes. **Soil:** Tolerates most moist-to-saturated soils, although it prefers poor, sandy and gravelly soils with a pH range of 4.7-7.8. [7, 11, 44]

## Normal Water Level

This species prefers shallow water of 3" of inundation or less and wet/saturated to moist upland conditions. [21, 37, 44]

## Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 18". **Duration:** Medium long – 4 days (decreasing 6"/day). This species will tolerate seasonal and regular inundation periods, is moderately tolerant to flood duration, and population decreases with flood depth increases. [1, 37, 44]

## Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low to moderate. **Nutrient:** Moderate to high. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species has a moderate rate of spread. It is moderately tolerant to general disturbance and stress. [1, 37, 44]

## Design Considerations

Prairie cord grass is an excellent soil stabilizer of shores, stream banks, slopes, buffers and vegetated swales due to the large rhizomatous mass it creates. It is well suited to restore wetlands, marshes, wet meadows and wet prairies as well as shorelines.

**Concerns:** It is an aggressive plant that can create clones up to 30' away. This may be desirable to compete with non-native and invasive species or to revegetate a site quickly to prevent erosion. [16, 44]

## Wildlife Use

Although prairie cord grass seeds are eaten by several kinds of ducks, they are an important food source for only the black duck. Marsh birds such as the clapper, and

**Indicator Status:** FACW+



sora and Virginia rails also eat the seeds. Early growth provides forage for rodents, deer and Canada geese. It also provides habitat for marsh wrens and muskrats. [32, 37, 44]

**Nursery/Plant Information**

**Available:** Widely.  
**Types:** Plants and seeds.

**Planting Techniques**

The seeds need no treatment other than to be planted in saturated soils. Recommended seeding rate is 0.5-2.0 lb/acre with approximately 2,520,000 seeds/lb. Seed viability can be low, so rhizomes and young plants are used more often. Rhizomes should be planted in spring 5" below the surface and 1-3' apart. The soil should be kept saturated but not flooded during establishment and the stand should be burned annually to stimulate seed production. [16, 44]



Photo: Paul Jackson





## *Spiraea alba*

Meadowsweet - a.k.a White or Narrowleaf Meadowsweet, or Meadowsweet Spirea

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet meadows, stream banks, wet thickets, shrub-carrs, bogs, pond and lake shores, savannas, springs, dunes, old fields, meadows and conifer swamps (soils often sandy). It may form relatively tall, dense thickets on disturbed sites, and it tends to increase with declining water levels. [7, 11, 16, 22]

**Range:** Minn. (Eco-Region: All), Wis., Mich. Nfld. and n. Que. to Alta., s. to Va., N.C., Ind., n. Mo. and S.D. [7, 21]

### Description

**General:** Low, deciduous, woody shrub with many branches, often forming colonies. 3-6' in height. **Flower:** A terminal, finely hairy, elongate panicle that has small, white, 5-petaled flowers in bloom from June to August. **Leaf:** Alternate, simple, unlobed, finely serrate leaves without hairs and 1-2½" long that turns yellow-red in the fall. **Bark:** Red-brown and smooth. **Twigs:** Slender, ascending, and generally dull brown and smooth. **Fruit:** A follicle. **Root:** Dense, fibrous, shallow lateral spreading, freely suckering roots. **Soil:** Soils ranging from sand, silt loams, peat and mucks that are saturated to moderately dry. [7, 11, 21]

### Normal Water Level

This species prefers shallow water of 3" of inundation or less to wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Long – 80 days in spring, 5 days in summer (decreasing 6" the first day then 6"/2 days for the next 4 days). It is very tolerant of flooding. [22]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Unknown. **Siltation:** Low to medium. **Insect:** Occasional – spirea spid, oblique-banded leaf roller, scales.

**Other:** Ice and wind infrequently damage meadowsweet, which is resistant to drought, heat and soil compaction. This species is not tolerant to general disturbance and stress. [1, 22]

### Design Considerations

Meadowsweet is a nice landscape shrub, although it can be aggressive. It is a fast grower for habitat restorations and suitable for naturalistic landscapes. It will create large, dense thickets and it tends to increase with declining water levels or with disturbed sites. **Concerns:** This species can be aggressive, though that may be desirable in some situations. [16]

### Wildlife Use

Meadowsweet is valuable to deer, songbirds and gamebirds. The fruit is not edible for humans. It attracts butterflies, moths and other insects. [21, 22, 32]

Indicator Status: FACW+



Photo: Paul Jackson

Photo: Paul Jackson

### Nursery/Plant Information

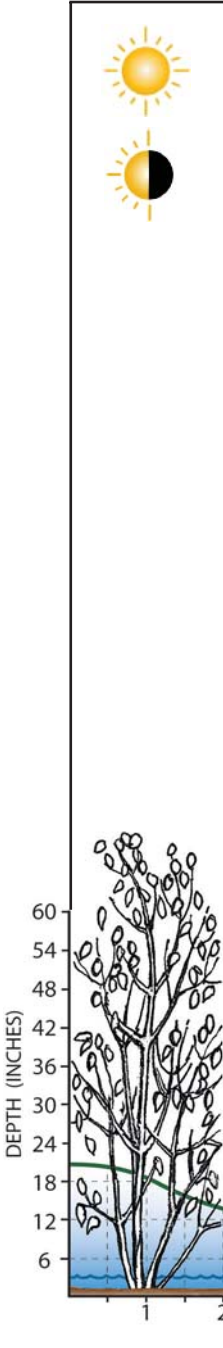
#### Available:

Widely.

**Types:** Bareroot and potted plants.

### Planting Techniques

The seeds require dry storage at 70 degrees F. for 180 days, and moist, cold stratification for 90 days. Fall planting gives somewhat better results. Scarifying the seed may also help. Approximately 238,736 seeds/lb. Taking cuttings and division are the easiest ways to propagate this species. Meadowsweet transplants well. [16, 22]







# *Symplocarpus foetidus*

## Skunk Cabbage

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Flood plain forests, swamps, stream banks, calcareous fens, shrub swamps, seepages, and moist, wooded slopes. [7, 11, 35, 41] **Range:** E. especially ec. and se. Minn. (Eco-Region: 1, 6-8), Wis., common in LP, local in UP (but common on Isle Royale) of Mich. N.S. to Minn., s. to N.C. and Iowa. [7, 21]

### General Description

**General:** A native, coarse, perennial herb, which has a skunky odor and grows to 2' tall.

**Flower:** This, our earliest-flowering native plant, has a pointed, brown or purplish spathe, 4-6" high. The spathe encloses a spherical or football-shaped stem, the spadix, on which tiny flowers bloom from March to May. **Leaf:** Exceptionally large basal leaves are 12-24", ovate and heart-shaped at the base, emerging after the flowers. The leaves are bright green and deeply veined, on very short stalks that are often unseen, rising from the base of the flower that also smells of dead flesh when crushed. **Fruit:** Much like a small-stalked and roughened potato. The fruit develops beneath large basal leaves and contains large, acrid seeds in a bland pulp.

**Root:** Thick rhizome. **Soil:** [7, 11, 35, 41]

### Normal Water Level

This species prefers wet/saturated conditions. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 12". **Duration:** Medium short – 3 days (decreasing 6" the first day and 3"/day thereafter). It can tolerate seasonal and regular inundation and is moderately tolerant to flood duration. [1, 37]

### Sensitivities or Other Tolerances

**Exposure:** Full shade. **Salt:** Low. **Nutrient:** Low to moderate. **Siltation:** Moderate.

**Insect:** Infrequent. **Other:** This species has a slow rate of spread. It is moderately tolerant to general disturbance and stress. [1, 37]

### Design Considerations

This species is well suited for restorations in shaded areas that are wooded, calcareous and ground-water-fed, or where springs and seeps occur. It is a unique plant that plays an important role for insects early in the growing season.

### Wildlife Use

Skunk cabbage provides seeds for pheasants, wood ducks, ruffed grouse and bobwhite quail. Beaver, muskrats and frogs have also been known to use this plant as habitat or food. The strong odor attracts early flying insects that pollinate the flower. [21, 32, 37, 41]

### Nursery/Plant Information

**Available:** Limited. **Types:** Seeds and plants.

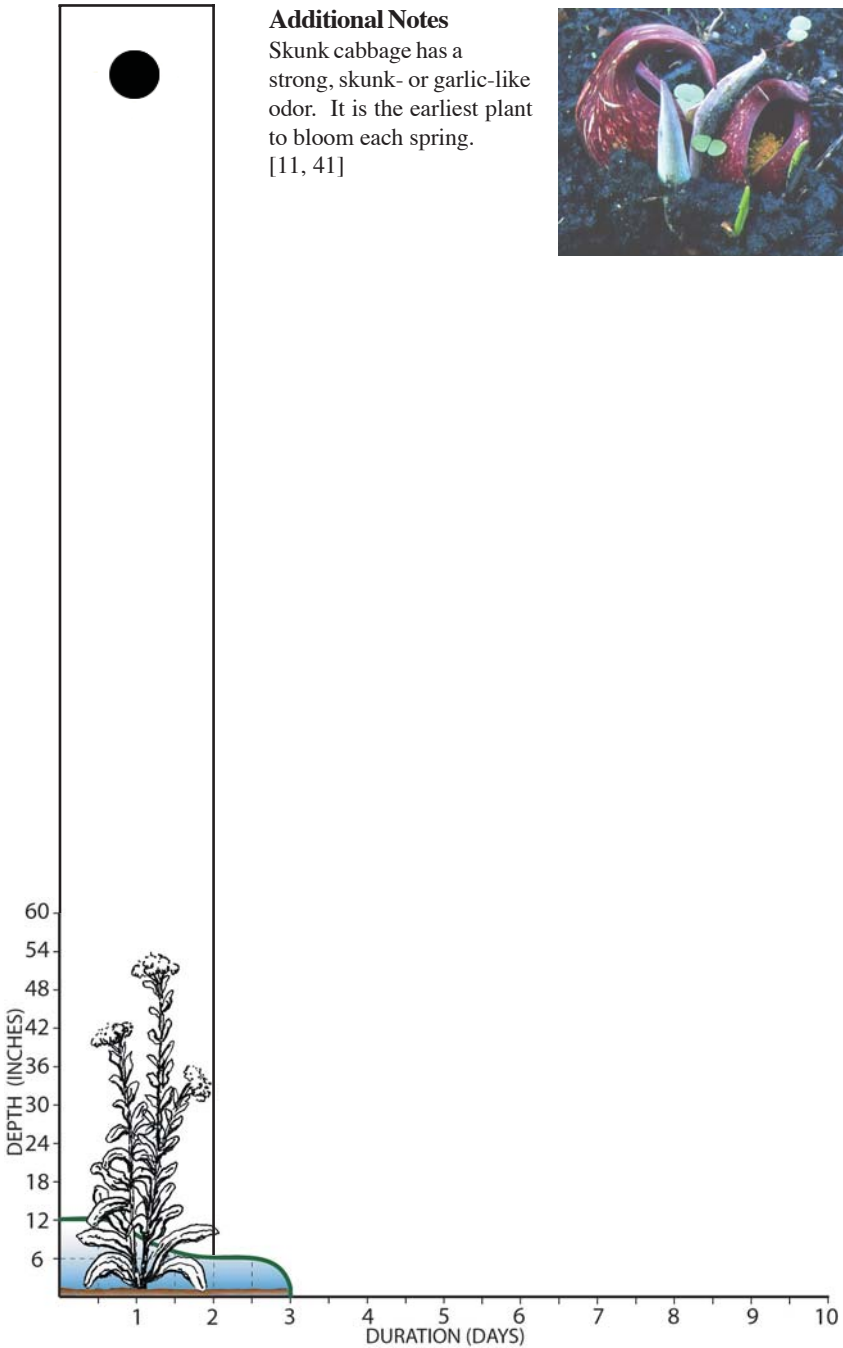
**Indicator Status: OBL**

**Additional Notes**

Skunk cabbage has a strong, skunk- or garlic-like odor. It is the earliest plant to bloom each spring. [11, 41]



Photo: Dan Shaw





# *Thalictrum dasycarpum*

Tall Meadowrue - a.k.a. Purple Meadow Rue

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Wet-to-moist meadows, low prairies, swamps, thickets and stream banks. [7, 16, 35, 41] **Range:** Minn. (Eco-Region: All), Wis., Mich. S. Ont. to Alta. and Wash., s. to Ohio, Ill., Mo., Okla. and Ariz. [7, 21]

## Description

**General:** A wind-pollinated, native, perennial herb often 2-8' tall. **Flower:** Round plumes of small, whitish green flowers that dangle. Lacks petals and instead has many showy yellow stamens (on male plants) or purplish clusters of pistils (on female plants) that bloom June to July. **Leaf:** Up to 25 bluish green leaflets on compound leaves that are longer than wide and end in 3 pointed lobes and are highly divided. **Stem:** Purple-tinted, 3-6'-long, branched stems. **Fruit:** 1/8- to ¼"-long achene with ribs and in a round cluster. **Root:** Short rootstock. **Soil:** Wet-to-moist soils of many types, usually rich-to-heavy or peaty. [7, 35, 41]

## Normal Water Level

This species prefers very moist/mesic to wet/saturated conditions. [21]

## Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium long – 30 days in spring; medium short – 3 days (decreasing 6"/day) in summer.

## Sensitivities or Other Tolerances

**Exposure:** All but fully shaded areas. **Salt:** Low. **Nutrient:** Unknown. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species is moderately tolerant to general disturbances and stresses. [1, 47]

## Design Considerations

Tall meadowrue is a beautiful, dark-green plant with highly divided leaves and clusters of white-to-pale-purple flowers, that enhances any garden or landscape design. It is well suited for partially shaded or brighter areas of restoration, mitigation, calcareous or buffer sites. [16]

## Wildlife Use

This species is wind pollinated, although it is visited by bees, butterflies and other insects. [21, 41]

## Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and plants.

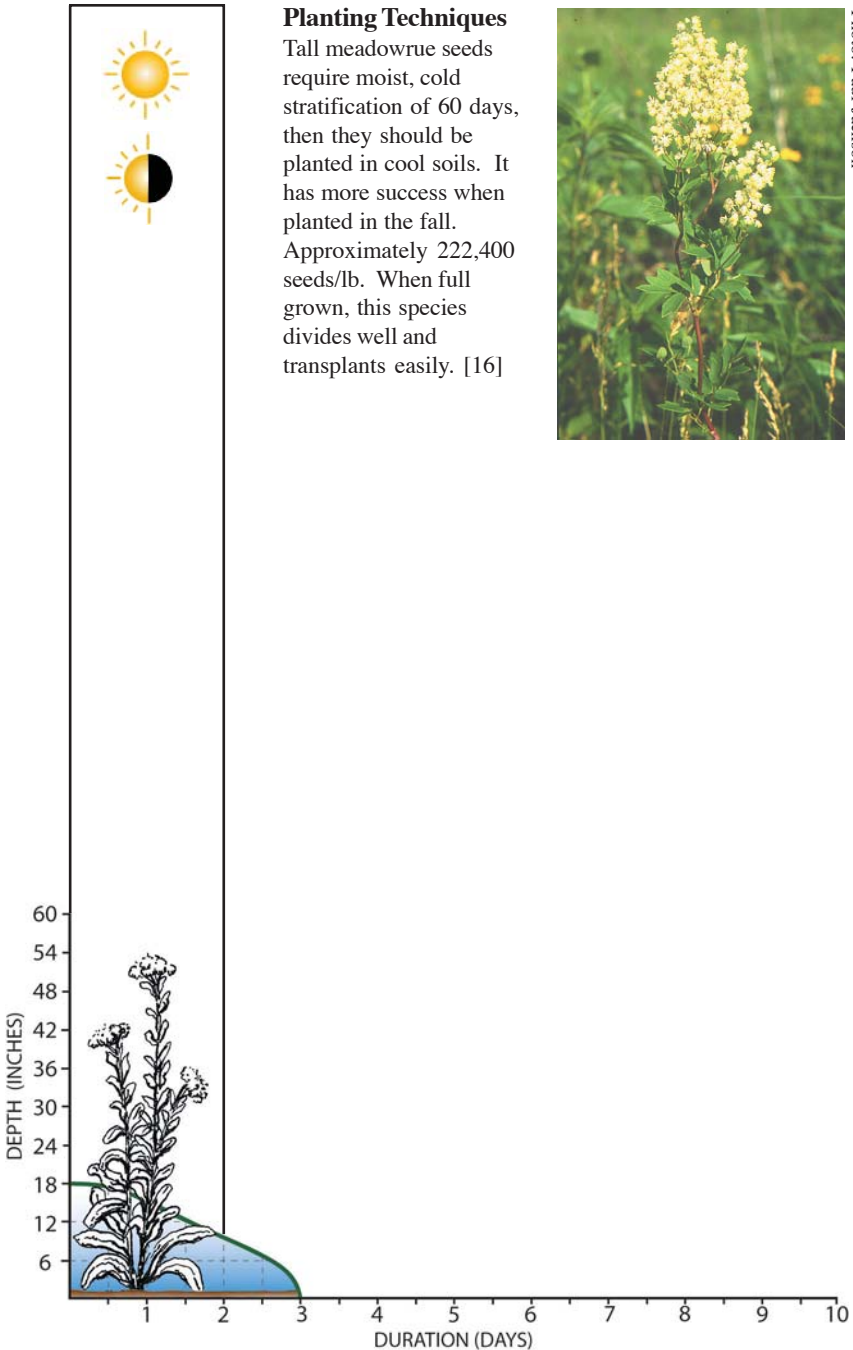
Indicator Status: FACW-

### Planting Techniques

Tall meadowrue seeds require moist, cold stratification of 60 days, then they should be planted in cool soils. It has more success when planted in the fall. Approximately 222,400 seeds/lb. When full grown, this species divides well and transplants easily. [16]



Photo: Paul Jackson





## *Tradescantia ohioensis*

Ohio Spiderwort - a.k.a. Smooth or Common Spiderwort

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Dry-to-mesic prairies, savannas, meadows, thickets and woodlands, also common along roadsides. [16, 17, 44] **Range:** Minn. (Eco-Region: All), Wis., Mich. Mass. to Minn., s. to Fla. and Tex., most common in the Midwest. [17]

### Description

**General:** Grows and expands to form an attractive, native, perennial clump herb that is 1-3' tall. **Flower:** Nice display of solitary 1" flowers in heads that terminate the stem and branches along 2 long leaf bracts. Flowers open only in the morning. Sepals often red-margined, smooth throughout, whereas the petioles are blue. **Leaf:** Narrowly linear, flat, firm, smooth usually less than 3/8" wide. Leaves are in an angular arrangement, which conspicuously dilate into a sheath. **Stem:** Slender, straight, often branched, 15-40" long and smooth. **Fruit:** The ovary seed-cavity opens at maturity along the midrib. [17, 44]

### Normal Water Level

This species prefers upland dry to moist/mesic-to-wet/saturated conditions. [16, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** Low. **Depth:** 12". **Duration:** Short – 2 days (decreasing 6"/day). This species has more flooding tolerance in the spring and is drought tolerant. [44]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Moderate. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance and stresses. [1, 44, 47]

### Design Considerations

Ohio spiderwort is a wonderful plant for many soil conditions and moisture tolerances. It is used mainly as a buffer and slope soil stabilizer. It is also well suited for landscape and garden design, including rain water gardens. Woodland, prairie and savanna restorations are sites that have this plant within the palette. It provides cutflowers and food for butterflies. [44]

### Wildlife Use

This species attracts butterflies, bees and other insects. [16]

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds or plants.

### Planting Techniques

Ohio spiderwort establishes well from seed if planted fresh in the fall. If the seed is stored, it requires moist, cold stratification for 120 days. It prefers to be planted in

**Indicator Status:** FACU

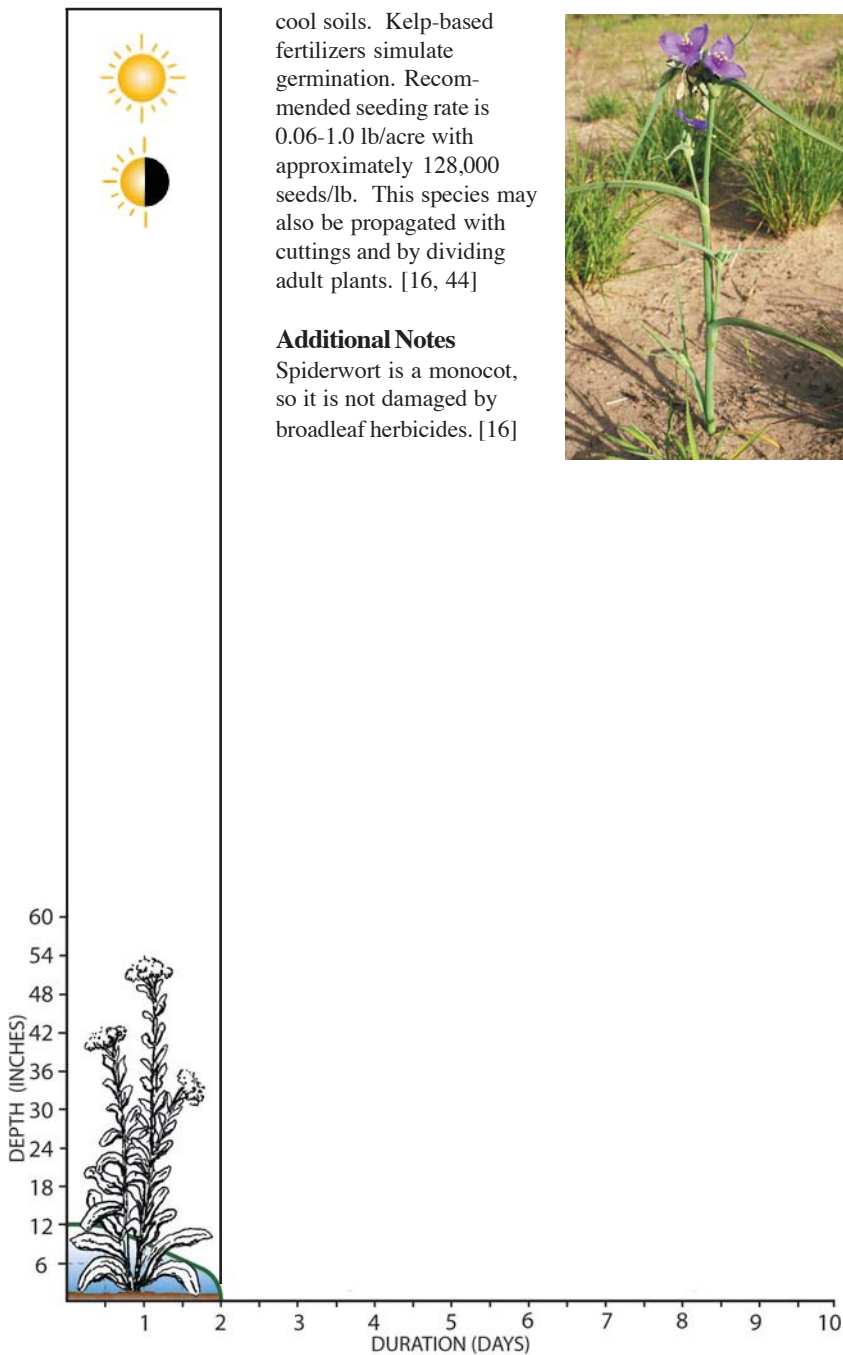
cool soils. Kelp-based fertilizers simulate germination. Recommended seeding rate is 0.06-1.0 lb/acre with approximately 128,000 seeds/lb. This species may also be propagated with cuttings and by dividing adult plants. [16, 44]

**Additional Notes**

Spiderwort is a monocot, so it is not damaged by broadleaf herbicides. [16]



Photo: Paul Jackson





# *Typha latifolia*

Broad-leaved Cattail - a.k.a. Common Cattail

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Marshes, open bogs, lake shores, stream banks, ditches and pond margins (usually in shallow water and less tolerant of brackish conditions than narrow-leaved cattail (*T. angustifolia*) and can form floating mats. [4, 7, 11, 35]

**Range:** Common; Minn. (Eco-Region: All), Wis., Mich. S. Can. to c. Alaska, throughout USA and into Mex.; Eurasia and n. Africa. [7, 21]

## Description

**General:** An erect, persistent, perennial, emergent herb found in almost all our wetland plant communities standing 3-9' high. **Flower:** Dense, cylindrical spike packed with flowers with no gap between the staminate (upper portion) and pistillate (lower portion) parts of the spike. Blooms May to June. **Leaf:** Pale green, 3/8- to 1/4"-wide leaves that are D-shaped in cross section and typically do not extend above the spike and sheaths the base. **Stem:** Long, erect, smooth stem, 3-7 1/2' long.

**Fruit:** Tiny, tufted nutlet. **Root:** Spreads extensively by rhizomes; only a few plants can spread over an acre. **Soil:** Wet substrates of many types and often in 1-2' or more of standing water. [4, 7, 11, 35]

## Normal Water Level

This species prefers deep to shallow water of 18" of inundation or less to wet/saturated conditions, although it can be deeper, and they can form floating mats. Broad-leaved cattail disappears from continuously flooded areas in 4-5 years. Hybrid cattail survived in 24" of water through 5 years of flooding. Generally, *T. angustifolia* will grow in water up to 3' deep; *T. latifolia*, up to 1' deep; and *T. glauca*, up to 2' deep. [11, 19, 21, 33, 37]

## Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 24". **Duration:** Long – 42 days (decreasing 12"/21 days). This species can tolerate regular, irregular or seasonal inundation. With constant inundation, this species can tolerate increased flood depth with high frequency and moderate-to-long durations. Light is essential for young plants and germination. [1, 37]

## Sensitivities or Other Tolerances

**Exposure:** No shade. **Salt:** Low to moderate. **Nutrient:** Moderate, with a population increase of N and P and a decrease with a decrease in nutrients.

**Siltation:** Moderate to high. **Insect:** Infrequent. **Other:** This species spreads rapidly. It is moderately tolerant to general disturbance and stress. [1, 6, 37, 47]

## Design Considerations

Broad-leaved cattail is a cool-season soil stabilizer that has been used in many erosion-control situations. It colonizes an open wet area quickly if it is in the area naturally, to revegetate a mitigation site or another wet site. It provides wildlife habitat and has a decorative use. **Concerns:** In some cases, cattails can form extensive dense, monotypic colonies. They are considered pest species in many states because

Indicator Status: OBL

Photo: Paul Jackson

these stands lack diversity. [11, 16, 37]

### Wildlife Use

Broad-leaved cattail rootstock is more valuable as food than are the seeds. The starchy underground stems are eaten by geese and muskrats. Cattail stands also provide nesting for marsh wrens, and redwing and yellow-headed blackbirds. [4, 11, 32, 37]



### Nursery/Plant Information

**Available:** Limited.

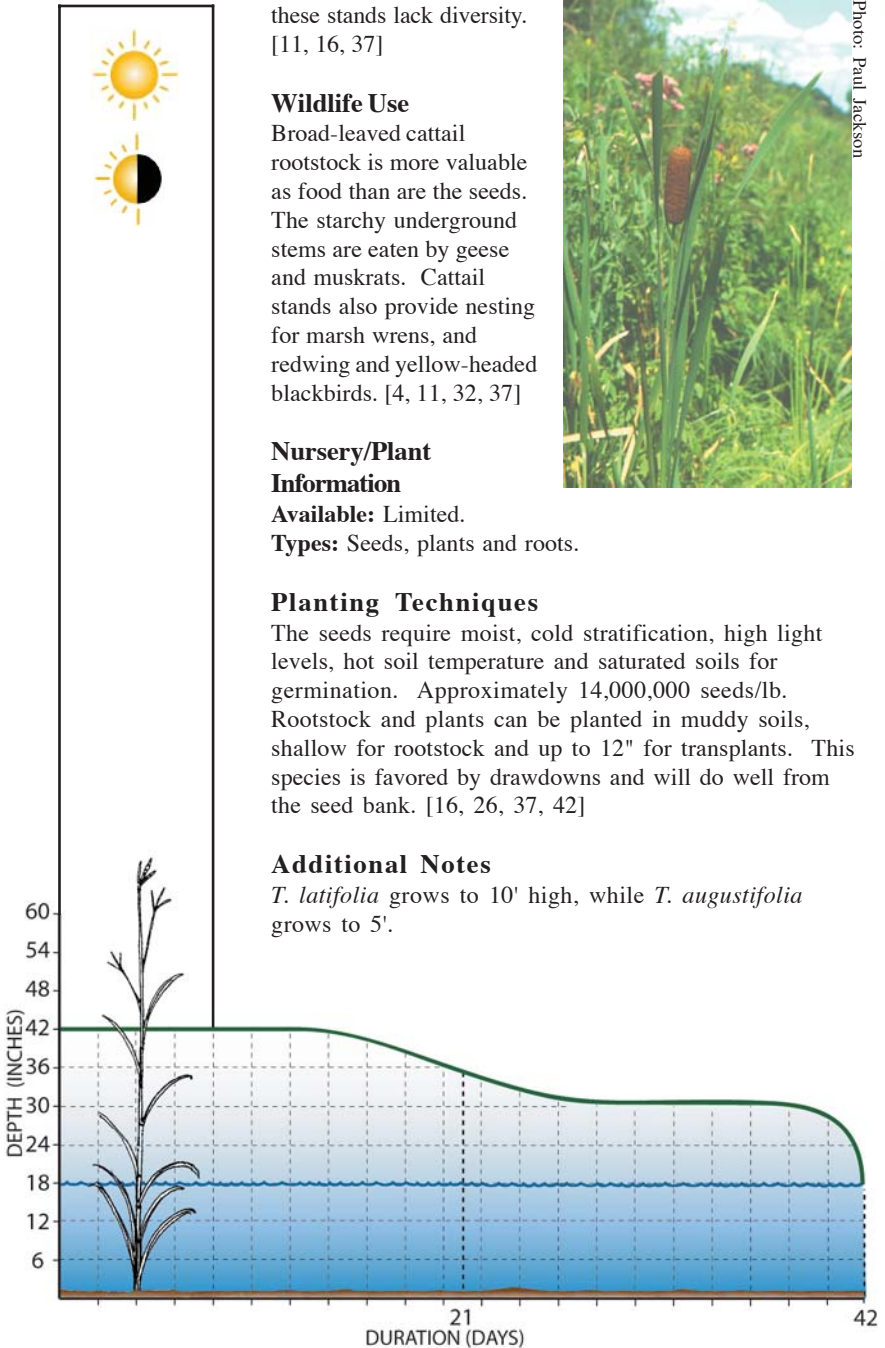
**Types:** Seeds, plants and roots.

### Planting Techniques

The seeds require moist, cold stratification, high light levels, hot soil temperature and saturated soils for germination. Approximately 14,000,000 seeds/lb. Rootstock and plants can be planted in muddy soils, shallow for rootstock and up to 12" for transplants. This species is favored by drawdowns and will do well from the seed bank. [16, 26, 37, 42]

### Additional Notes

*T. latifolia* grows to 10' high, while *T. angustifolia* grows to 5'.







# *Typha x glauca*

Hybrid Cattail - a.k.a. White Cattail

## Habitat/Plant Community and Geographic Range

**Habitat/Community:** Marshes, shores and shallow water, wherever broad-leaved cattail (*T. latifolia*) and narrow-leaved cattail (*T. angustifolia*) both occur because this is a hybrid of those two species. [7, 35] **Range:** Throughout but not common in ne. Minn. (Eco-Region: All), s. Wis., LP of Mich. (especially common in Lake Erie marshes of se. Mich.), and may be found wherever populations of *T. angustifolia* and *T. latifolia* overlap. N. and e. USA and adjacent Can. [7, 21]

## Description

**General:** A hybrid, emergent, perennial herb often 6' or more tall. **Flower:** Minute flowers are in a dense spike, usually larger than those of either parent species, and separated by a stretch of smooth stem 1½' long. The male portion of the spike is light brown, 2-8" long, while the female portion is dark brown, 4-8" long. The staminate (upper portion) male flowers fall soon after they shed pollen, leaving only a rough stem. **Leaf:** Leaves are elongate, about ½" wide and D-shaped in cross section. **Stem:** Long, erect, smooth stem, 3-7½' long. **Fruit:** Seeds, although sterile, are wind-borne on a tuft of down. **Root:** Rhizomes. **Soil:** Wet substrates of many types and often in 1-2' or more of standing water. [7, 35]

## Normal Water Level

This species prefers deep or shallow water at 12-24" of inundation or less (although it can be deeper) to wet/saturated conditions. Plants can form floating mats. Broad-leaved cattail disappeared from continuously flooded areas in 4-5 years, whereas hybrid cattail survived in 24" of water through 5 years of flooding. Generally *T. angustifolia* will grow in water up to 3' deep; *T. latifolia*, up to 1' deep; and *T. glauca*, up to 2' deep. [19, 21, 33]

## Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 12". **Duration:** Long - 6 days (decreasing 2"/day). This species can tolerate regular, irregular or seasonal inundation. With constant inundation, this species can tolerate increased flood depth with high frequency and moderate-to-long durations. Light is essential for young plants and germination. [1]

## Sensitivities or Other Tolerances

**Exposure:** No shade. **Salt:** High. **Nutrient:** Moderate to high, with a population increase of N and P and a decrease with a decrease in nutrients. **Siltation:** High. **Insect:** Infrequent. **Other:** This species has a rapid rate of spread. It is moderately tolerant to general disturbance and stress. [1]

## Design Considerations

Hybrid cattail is a cool-season soil stabilizer that can be used in many erosion-control situations. It also colonizes an open wet area quickly if it naturally is in the area, and can be used to revegetate a mitigation or other wet site. It provides wildlife habitat and has a decorative use. **Concerns:** In some cases, cattails can form extensive, dense, monotypic colonies. They are considered pest species in many states because

## Indicator Status: OBL

they lack diversity. This species is extremely aggressive and takes over the habitat of its parent plants of *T. latifolia* and *T. angustifolia*. Draining and summer burning is an effective way to increase diversity of wetlands and decrease cattail dominance. It is favored by draw-downs. [30, 42]

### Wildlife Use

Hybrid cattail rootstock is more valuable as food than are the seeds. The starchy underground stems are eaten by geese and muskrats. Cattail stands also provide nesting for marsh wrens, and redwing and yellow-headed blackbirds. [32]

### Nursery/Plant Information

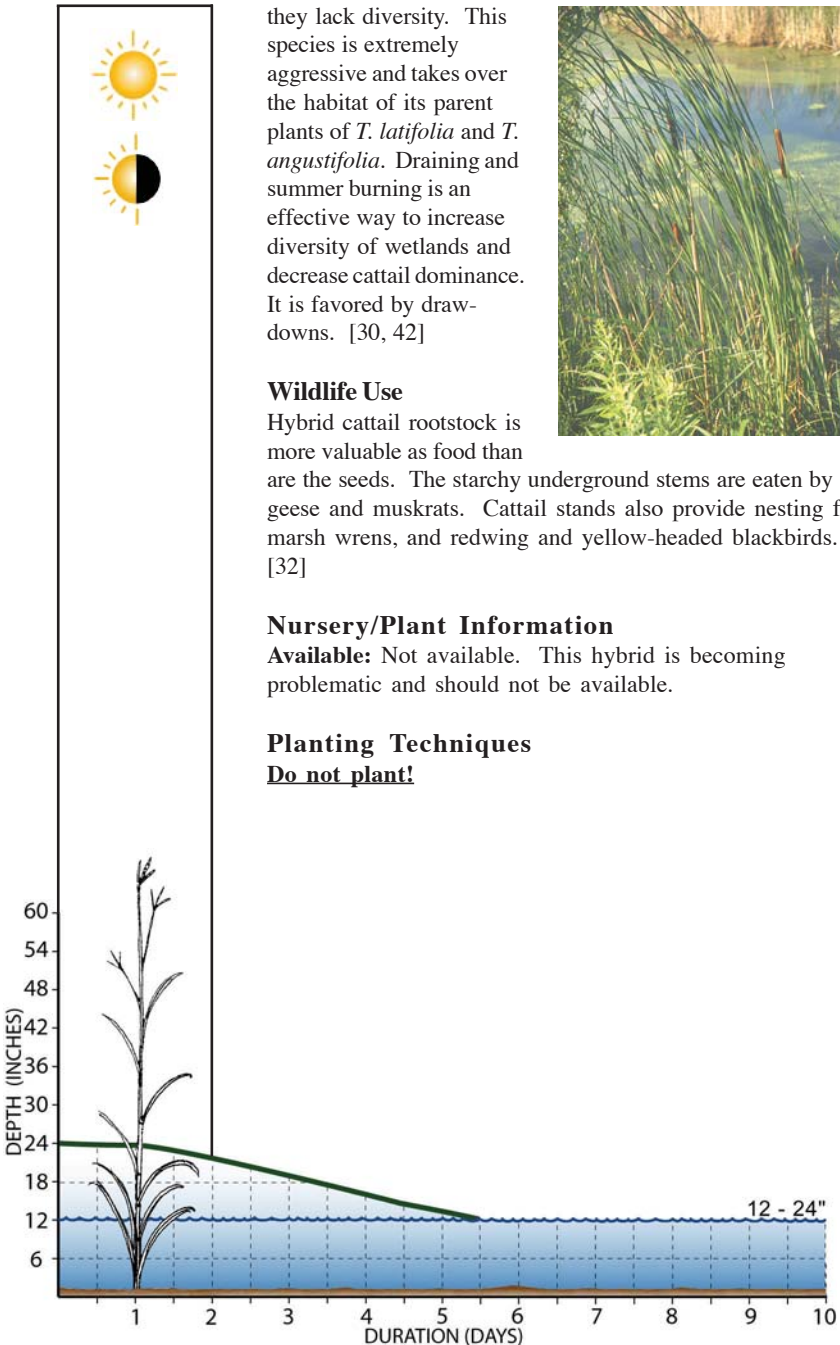
**Available:** Not available. This hybrid is becoming problematic and should not be available.

### Planting Techniques

**Do not plant!**



Photo: Dan Shaw





## *Verbena hastata*

Blue Vervain - a.k.a. Common Vervain, False Vervain, or Wild Hyssop

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Marshes, sedge meadows, wet meadows, wet prairies, shores, stream banks, openings in swamps, wet fields, roadsides and ditches. [7, 11, 16, 35, 41, 44] **Range:** Common; Minn. (Eco-Region: All), Wis., Mich. N.S. to B.C., s. to Fla. and Ariz. [7, 21]

### **Description**

**General:** Robust, usually clumped, native, perennial herb that is 2-4' tall. **Flower:** Blue vervain has multiple, pencil-thin, purple/blue flower spikes that bloom from the bottom up. Flowers are 5 petals fused at the base to form a short tube and overlap, packing a panicle 2-5" long that blooms from July to August. **Leaf:** Opposite, lance-shaped or tapering leaves are coarsely toothed and often 3-lobed, 4-6" long and 2" wide. **Stem:** Usually 2-4' tall with square, erect stems. **Fruit:** Achenes are linear with faint striations and smooth. **Root:** Short, spreading, rough hairs. **Soil:** Tolerates a variety of soil conditions with a pH range of 6.0-7.0. [7, 11, 35, 41, 44]

### **Normal Water Level**

This species prefers upland moist/mesic to wet/saturated conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 12". **Duration:** Long – 5 days (decreasing 6" the first 2 days, then 6" the next 3 days). This species tolerates moderate flood duration. [1, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Full to part sun. **Salt:** Moderate to high. **Nutrient:** Moderate to high. **Siltation:** Moderate to high. **Insect:** Infrequent. **Other:** It has a moderate-to-high tolerance to general disturbance and stress. [1, 44]

### **Design Considerations**

Blue vervain has been used in vegetated swales, stream bank stabilization, and shore line zones. It has been seen colonizing exposed, moist soils in wetland mitigation sites. Its flood tolerance suggests a good plant for rain water gardens. It is a butterfly plant, and provides wonderful cutflowers. **Concerns:** This species can be aggressive and short lived, though this may be desirable characteristics in some designs. [11, 16, 44]

### **Wildlife Use**

Sandpipers, lark buntings, cardinals, juncos, and field, song, swamp, tree and white-crowned sparrows eat the seeds as do mice. Rabbits and other small mammals eat the shoots and plants. Due to its high nectar content; bees and butterflies visit blue vervain. [16, 21, 32, 41, 44]

### **Nursery/Plant Information**

**Available:** Widely **Types:** Mainly seed, although plants can be found.

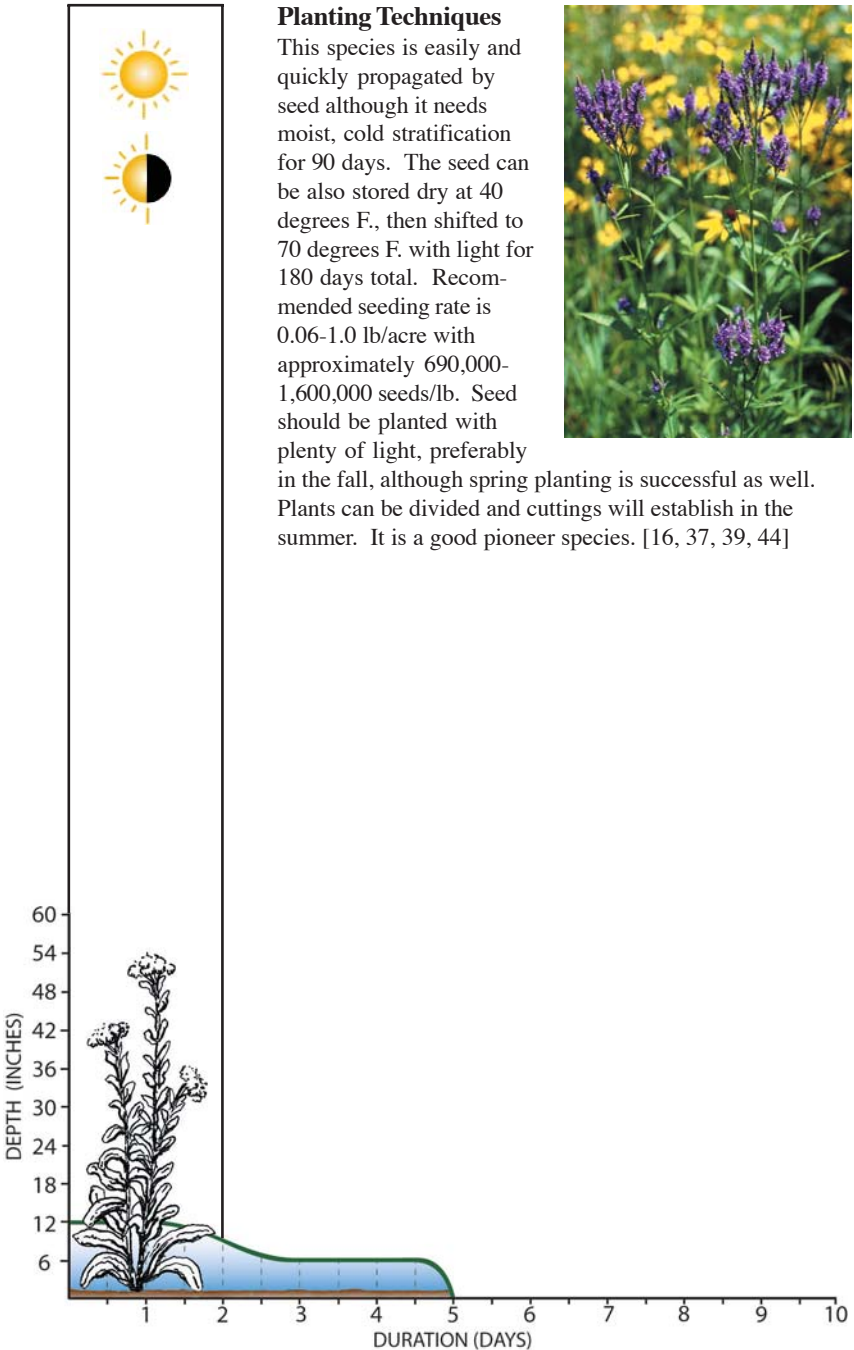
**Indicator Status: FACW+**

### Planting Techniques

This species is easily and quickly propagated by seed although it needs moist, cold stratification for 90 days. The seed can be also stored dry at 40 degrees F., then shifted to 70 degrees F. with light for 180 days total. Recommended seeding rate is 0.06-1.0 lb/acre with approximately 690,000-1,600,000 seeds/lb. Seed should be planted with plenty of light, preferably in the fall, although spring planting is successful as well. Plants can be divided and cuttings will establish in the summer. It is a good pioneer species. [16, 37, 39, 44]



Photo: Paul Jackson





## *Vernonia fasciculata*

Ironweed - a.k.a. Common Iron Weed, Western Ironweed, Smooth Ironweed

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Marshes, sedge meadows, low prairies and stream banks. Ironweed often thrives in wet pastures, where cattle graze around it. [7, 16, 35, 44]

**Range:** All but ne. Minn. (Eco-Region: 4, 6-9), Wis., Mich. Ohio to Man. and Sask., s. to Mo. and n. Tex. [7, 21]

### Description

**General:** Stout, native, perennial herb that clumps and is up to 5' tall. **Flower:** Deep purple, flat-topped disc flower heads only in a spreading cluster 5" across. Blooms from July to August. **Leaf:** Elongate hairless and sharply toothed leaves can be 6" long and over 1" wide with many tiny pits on the underside of each leaf.

**Stem:** Stems are smooth, usually 2-4' tall, often reddish purple. **Fruit:** Ribbed achene with purple-to-brown, slender bristles. **Root:** A thick, stoloniferous rootstock. **Soil:** Moist-to-wet soils of many types with a pH range of 5.6-7.0. [7, 35, 44]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [21, 44]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate **Depth:** 18" **Duration:** Medium long – 4 days (decreasing 6"/day for 2 days, then 6" over the last 2 days). This species is more tolerant early in the season and somewhat to moderately tolerant to flood duration. [1, 44]

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. [1, 44, 47]

### Design Considerations

Ironweed has good rootstock that stabilizes soils in buffers, slopes and shorelines. It is a beautiful and underutilized plant for landscapes, cutflowers, lake edges and rain water gardens. It provides good wildlife habitat. **Concerns:** This species is considered aggressive. It forms clumps and will compete with non-native or invasive species. [16, 44]

### Wildlife Use

Ironweed serves as a nectar source for butterflies, bees and other insects. It increases in density under grazing. [16, 21, 44]

### Nursery/Plant Information

**Available:** Widely. **Types:** Seeds and some plants.

### Planting Techniques

Ironweed seeds require moist, cold stratification and have a low germination rate, though rates increase in controlled environments of consistently warm soil tempera-

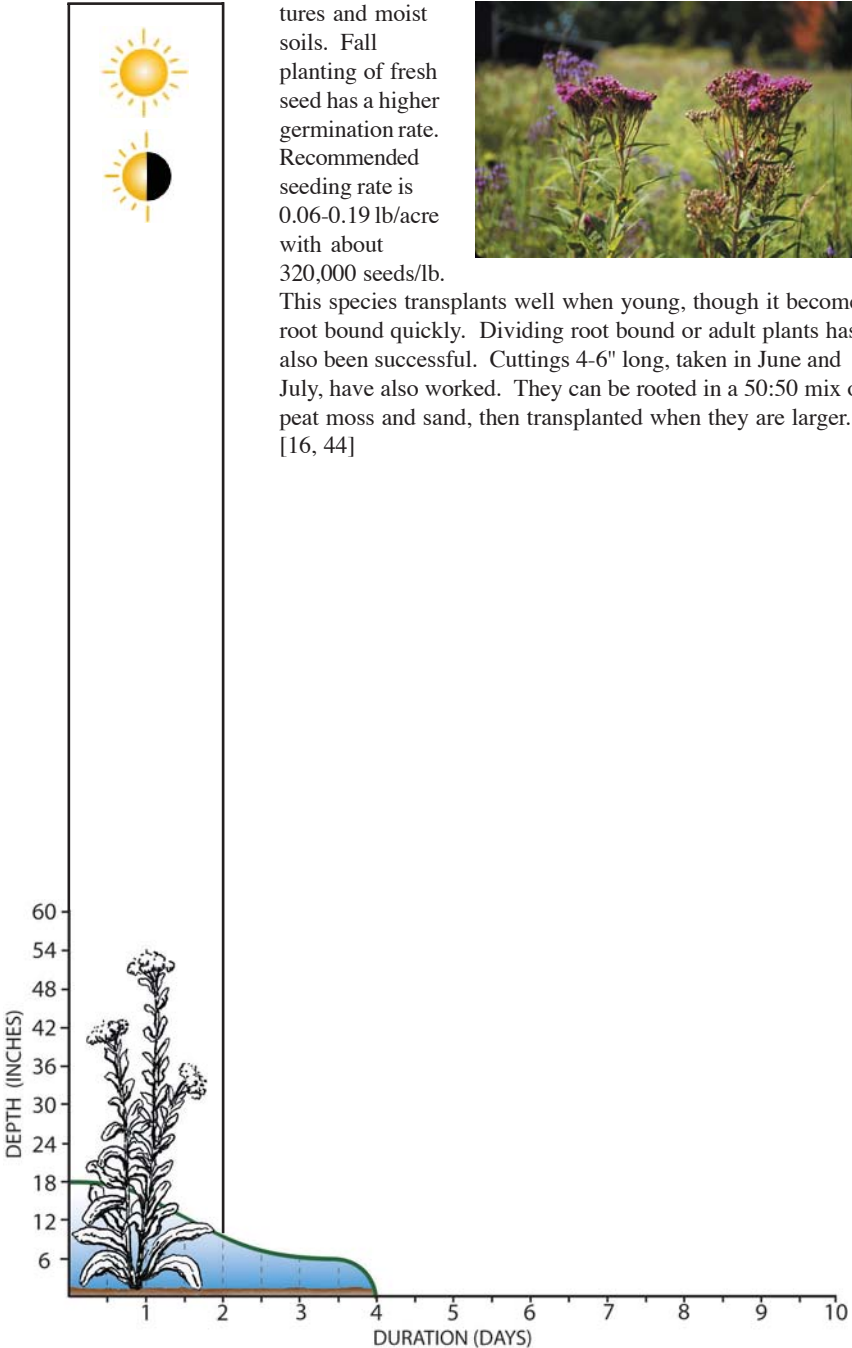
## Indicator Status: FACW

tures and moist soils. Fall planting of fresh seed has a higher germination rate. Recommended seeding rate is 0.06-0.19 lb/acre with about 320,000 seeds/lb.



Photo: Paul Jackson

This species transplants well when young, though it becomes root bound quickly. Dividing root bound or adult plants has also been successful. Cuttings 4-6" long, taken in June and July, have also worked. They can be rooted in a 50:50 mix of peat moss and sand, then transplanted when they are larger. [16, 44]





## *Veronicastrum virginicum*

Culver's Root - a.k.a. *Leptandra virginica*

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Fens, meadows, stream banks, moist-to-wet prairies (also found in drier deciduous forests and sandy grasslands), fields, and along railroad tracks. [7, 11, 16, 35, 41] **Range:** Minn. (Eco-Region: All), Wis., especially LP of Mich. New England to Ont. and Man., s. to Ga. and La. [7, 21]

### Description

**General:** Erect, native, perennial herb usually 3-6½' tall. **Flower:** Showy, small, white flowers 1/4" long, in tapering spikes, 10-12" long. Each flower has 2 conspicuous stamens that are longer than the 4 fused petals. **Leaf:** Elongate leaves in whorls of 3-7 that are narrow, finely divided with both stem and basal leaves present. **Stem:** Usually with several upright branches. **Fruit:** Narrowly oval, 1/8"-long capsule, opening with 4 terminal slits. **Soil:** Good in most soils except extremely dry ones, although it prefers moist-to-mesic loam soils. [7, 11, 35, 41]

### Normal Water Level

This species prefers upland moist-to-wet/saturated conditions. [21]

### Flooding/Fluctuation Tolerances

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/ day).

### Sensitivities or Other Tolerances

**Exposure:** Full to part sun. **Salt:** Low. **Nutrient:** Moderate. **Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species has a moderate tolerance to general disturbance or stress. [1, 47]

### Design Considerations

This species has been used in buffer, shoreline and vegetated swales. It is a wonderful landscape design plant for gardens, rain water gardens and shores. Restorations, such as fens; wet meadows; wet, open woodlands; and stream banks, are good opportunities for this plant. Butterflies and bees love this plant and it provides cut and dried flowers. [16]

### Wildlife Use

The flowers of culver's root attract butterflies and especially bees. [16, 21, 41]

### Nursery/Plant Information

**Available:** Widely. **Types:** Plants and seed (although it is expensive).

### Planting Techniques

The seed requires a cold-warm-cold stratification to break dormancy. Approximately 12,000,000 seeds/lb. Culver's root can be propagated by cuttings and division also, and it transplants easily. [16]

Indicator Status: FAC

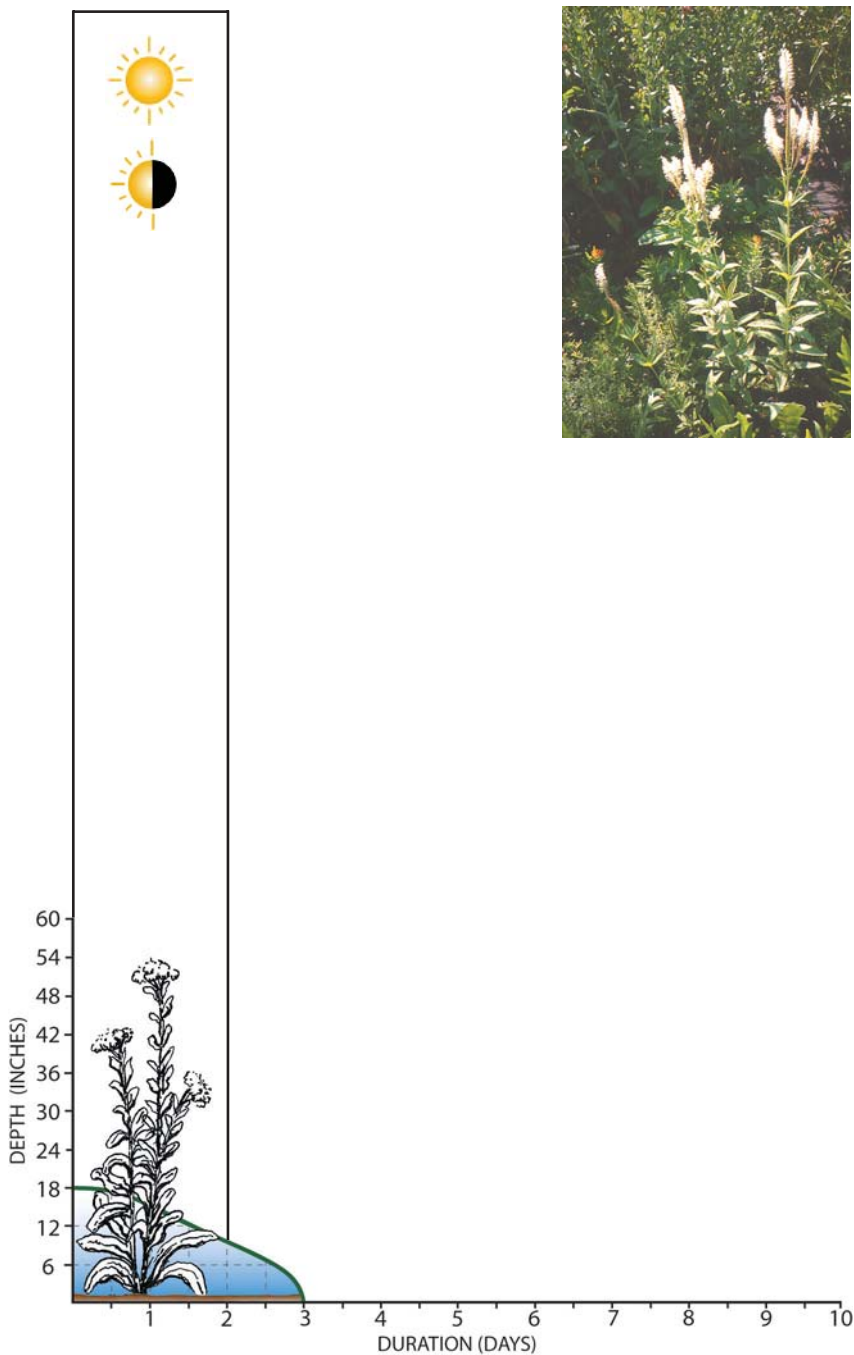


Photo: Dan Shaw







## *Viburnum lentago*

Nannyberry - a.k.a. Blackhaw, Sheepberry

### **Habitat/Plant Community and Geographic Range:**

**Habitat/Community:** Mesic woods, swamps, along banks of streams, lake edges, roadsides and fencerows. [17, 22, 36, 44] **Range:** Minn. (Eco-Region: All), Wis., Mich. Que. to se. Sask. and sc. Mont., s. to N.J., Va., Ill., Neb., Wyo. and Colo. [17, 21]

### **Description**

**General:** Deciduous shrub 16-20' tall and 10-20' wide with a short trunk and compact, rounded crown of drooping branches. **Flower:** Small 1/4"-wide, white flowers with 5 rounded corolla lobes in clusters 3-5" wide that are slightly fragrant. Blooms from May to June. **Leaf:** Opposite 2½-4" long by 1½-2½" wide, elliptical, long, pointed leaves that are finely saw-toothed and have a prominent network of veins on broad, hairy leafstalks. The leaves are shiny green above, yellow-green with tiny black dots below and turn maroon-red in fall. **Bark:** Irregularly furrowed into scaly plates, reddish-brown or gray bark with an unpleasant, skunk-like odor. **Twigs:** Slender, slightly hairy twigs that are light green when young. **Bud:** Long, pointed, hairy, reddish bud. **Fruit:** ½" long, elliptical bluish-black fruit with sweet, juicy pulp. The seed is a somewhat flat stone in a droop on a slender, reddish stalk that matures in autumn and persists in winter. The berries are very tasty fresh or in jams. **Root:** Suckering, shallow, fibrous roots. **Soil:** Although it tolerates most soils, nannyberry prefers loam soils with a pH range of 6.0-7.5. [8, 17, 22, 36, 44]

### **Normal Water Level**

This species prefers upland moist/mesic to wet/saturated conditions. [21, 37, 44]

### **Flooding/Fluctuation Tolerances**

**Frequency:** Moderate. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). Nannyberry tolerates seasonal inundation and is moderately tolerant to flood duration. It is also drought resistant. [1, 8, 22, 37, 44]

### **Sensitivities or Other Tolerances**

**Exposure:** Partial to full sun and is shade tolerant. **Salt:** Moderate to low. **Nutrient:** Moderate. **Siltation:** Low. **Insect:** Infrequent. **Other:** Wind and ice damage nannyberry infrequently. It is sensitive to soil compaction, though resistant to drought, heat, alkaline soils, oil/grease, metals and mine spoils. It is moderately tolerant to general disturbance. [1, 8, 22, 25, 37, 44]

### **Design Considerations**

Nannyberry is used to stabilize soils in shorelines, buffers, slopes and stream banks. It is recommended for use in restorations and mitigation sites of mesic woodlands and stream banks. This species is a beautiful landscape plant, a contributor to wildlife habitat and is highly recommended for natural settings. [44]

**Indicator Status:** FAC+

### Wildlife Use

Ruffed and sharp-tailed grouse, pheasants, starlings, gray-cheeked and olive-backed thrushes, gray catbirds, common flickers, American robins, eastern bluebirds, rose-breasted grosbeaks, purple finches and cedar waxwings eat the fruit of this plant. The fruits also provide food for chipmunks and white-footed mice.

Beaver, rabbits, and skunks eat the fruit and wood. Deer eat the twigs and foliage. The fruit is edible and sweet. [21, 22, 32, 36, 37, 44]



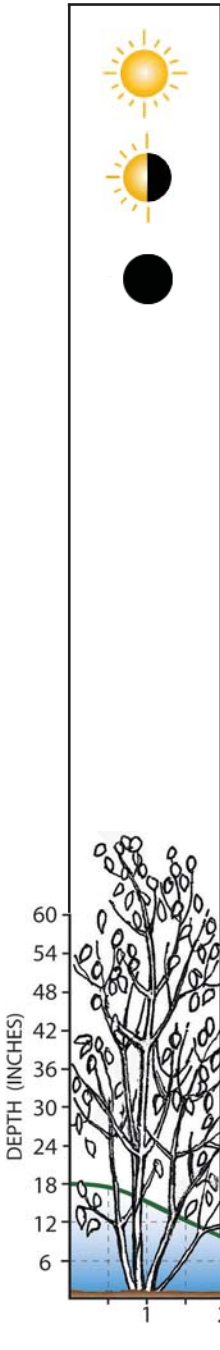
Photo: Dan Shaw

### Nursery/Plant Information

**Available:** Widely. **Types:** Bareroot, container-grown or balled-and-burlapped plants.

### Planting Techniques

Nannyberry seed should be moist, warm stratified, followed by moist, cold stratification. The berry pulp should be washed off the seed to improve germination. This species spreads by suckers. Sprouts form roots when cut, and old branches will take root if in contact with the ground. It transplants easily in the early spring. [22, 36, 44]





## *Viburnum trilobum*

High Bush Cranberry - a.k.a. *Viburnum opulus* - American Cranberrybush  
Viburnum

### Habitat/Plant Community and Geographic Range

**Habitat/Community:** Swamps, fens, streambanks, peat bogs, swampy woods, alder thickets, shores, wet pastures, lake banks and ditches. [7, 22] **Range:** All but sw. Minn. (Eco-Region: 1-8), Wis., Mich. Nfld. to B.C., s. to Pa., n. Ohio, Ind., Ill., Iowa and Wash. This species in part has been introduced. **Endangered in Ind.** [7, 21]

### Description

**General:** Upright, arching, deciduous shrub, 6-12' tall that forms dense clusters. **Flower:** Large, flat-topped, broad clusters of white flowers 2-6" wide at the ends of the stems in June. The outer flowers have large petals and are sterile and surround the inner, smaller, fertile flowers. **Leaf:** Opposite, maple-like, sharply 3-lobed, dark-green leaves that turn red-maroon in autumn. The leaves are palmately veined, 2-4" long and about as wide, smooth or hairy beneath, especially on the veins. The lobes are tapered to sharp tips with entire or coarsely toothed margins and grooved petioles with several club-shaped glands present near the base or blade. **Twigs:** Smooth young stems. **Fruit:** Produces clumps of pretty scarlet berries that persist through winter. **Root:** Shallow, fibrous roots. **Soil:** It will grow in almost any type of soil, although it prefers loams to organic peats and moist, rich woods. [7, 22]

### Normal Water Level

This species prefers upland moist/mesic to wet/saturated conditions. [21, 37]

### Flooding/Fluctuation Tolerances

**Frequency:** High. **Depth:** 18". **Duration:** Medium short – 3 days (decreasing 6"/day). This species tolerates flooding with a moderate tolerance to duration, especially seasonally. [1, 22, 37]

### Sensitivities or Other Tolerances

**Shade:** Full to part sun and very tolerant of shade. **Salt:** Moderate to low. **Nutrient:** Moderate. **Siltation:** Moderate. **Insect:** Infrequent. **Other:** Wind and ice infrequently damage this species. It is sensitive to SO<sub>2</sub> and HFI. It is somewhat sensitive to Cl, although it is resistant to drought, heat and soil compaction. This species is moderately tolerant to general disturbance and stress. [1, 10, 22, 37]

### Design Considerations

High bush cranberry has wonderful fall color and is beautiful throughout the year. It is recommended in landscape designs, wildlife habitat improvement areas, mitigation designs, and slope and soil-stabilization areas.

## Indicator Status: FACW

### Wildlife Use

High bush cranberry provides fruit for ruffed and sharp-tailed grouse, pheasants, starlings, gray-cheeked and olive-backed thrushes, gray catbirds, common flickers, American robins, eastern bluebirds, rose-breasted grosbeaks, purple finches, and cedar waxwings. The fruit also provide food for chipmunks and white-footed mice. Beavers, rabbits and skunks eat the fruit and wood. Deer eat the twigs and foliage. The fruit is edible and sharply acid. [21, 22, 32, 37]



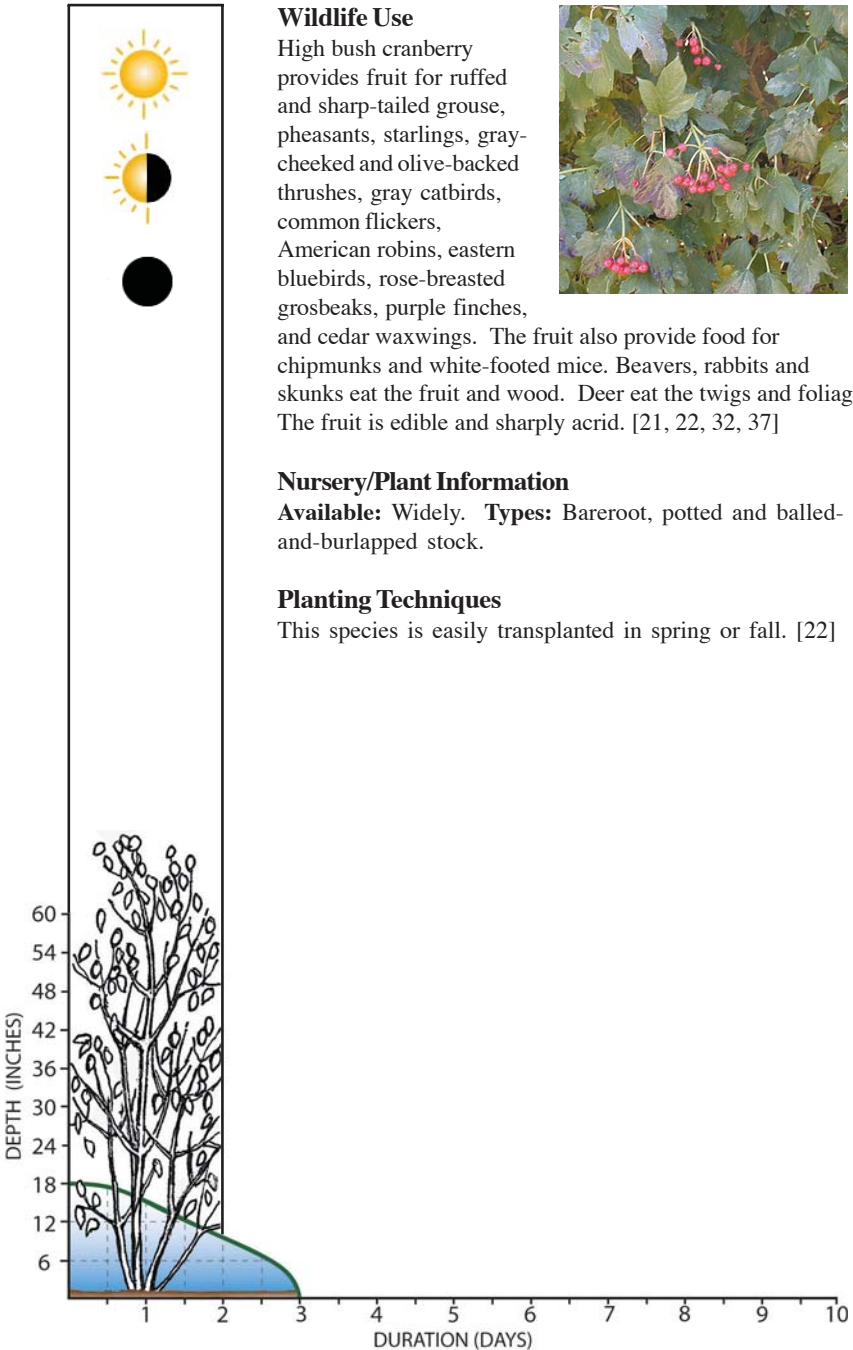
Photo: www.ceia2.umt.edu/las574

### Nursery/Plant Information

**Available:** Widely. **Types:** Bareroot, potted and balled-and-burlapped stock.

### Planting Techniques

This species is easily transplanted in spring or fall. [22]





## *Zizia aurea*

**Golden Alexanders** - a.k.a. Early or Golden Meadow-Parsnip

### **Habitat/Plant Community and Geographic Range**

**Habitat/Community:** Moist meadows, prairies, wet savannas, stream banks, ditches, roadsides, moist fields and brushy places. [16, 17, 35, 41] **Range:** Minn. (Eco-Region: All), Wis., Mich. Que. and Me. to Sask., s. to Fla. and Tex. [17, 21]

### **Description**

**General:** This late-spring wildflower is a native, perennial herb usually 1-3' tall.

**Flower:** The small, ¼"-wide, yellow flowers are in a 3"-wide, flat-topped cluster (compound umbel) that blooms from May to July. The outer 10-18 rays of the terminal umbel are stiffly ascending. **Leaf:** A single (compound) leaf that divides into 3 stalks. Each stalk has 3-7 narrow, coarsely toothed, pointed elongate leaflets.

**Stem:** Smooth, branched, often tinged with red. **Fruit:** The seed heads, which are attractive throughout the year, contain ovate-to-oblong, laterally flattened seeds.

**Root:** Cluster of thickened roots. **Soil:** Wet-to-mesic soils of many types. [17, 35, 41]

### **Normal Water Level**

This species prefers upland moist/mesic to wet/saturated conditions. [21]

### **Flooding/Fluctuation Tolerances**

**Frequency:** High. **Depth:** 12". **Duration:** Short – 1 day (decreasing 12" in 1 day). This species is moderately tolerant to flood duration. [1]

### **Sensitivities or Other Tolerances**

**Shade:** Full to partial sun. **Salt:** Moderate. **Nutrient:** Moderate.

**Siltation:** Unknown. **Insect:** Infrequent. **Other:** This species is moderately tolerant to general disturbance and stress. [1]

### **Design Considerations**

Golden alexanders are used in soil stabilization of shores, vegetated swales, buffers and slopes. It is recommended this species be used for restorations of low prairies, calcareous fens, stream banks and other wet, open places. Butterfly gardens and cut flowers are some of the landscape design uses. **Concerns:** This species can be aggressive, which is desirable in many situations. [16]

### **Wildlife Use**

This species, a wonderful butterfly plant, is a host for the swallowtail butterfly. [21]

### **Nursery/Plant Information**

**Available:** Widely. **Types:** Plants and seed.

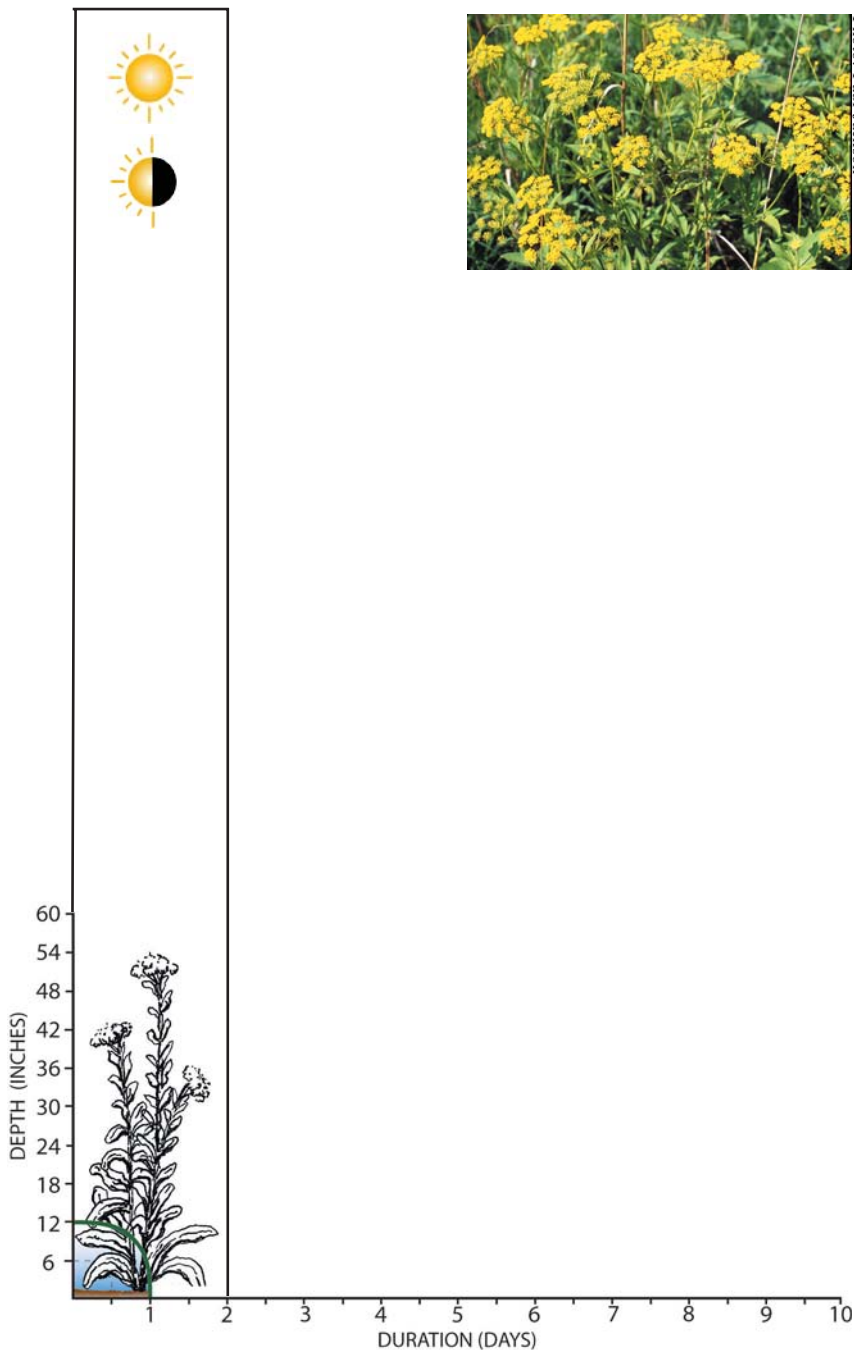
### **Planting Techniques**

Seeds propagate easily and seedlings transplant without difficulty. Approximately 192,000 seeds/lb.[16]

Indicator Status: FAC+



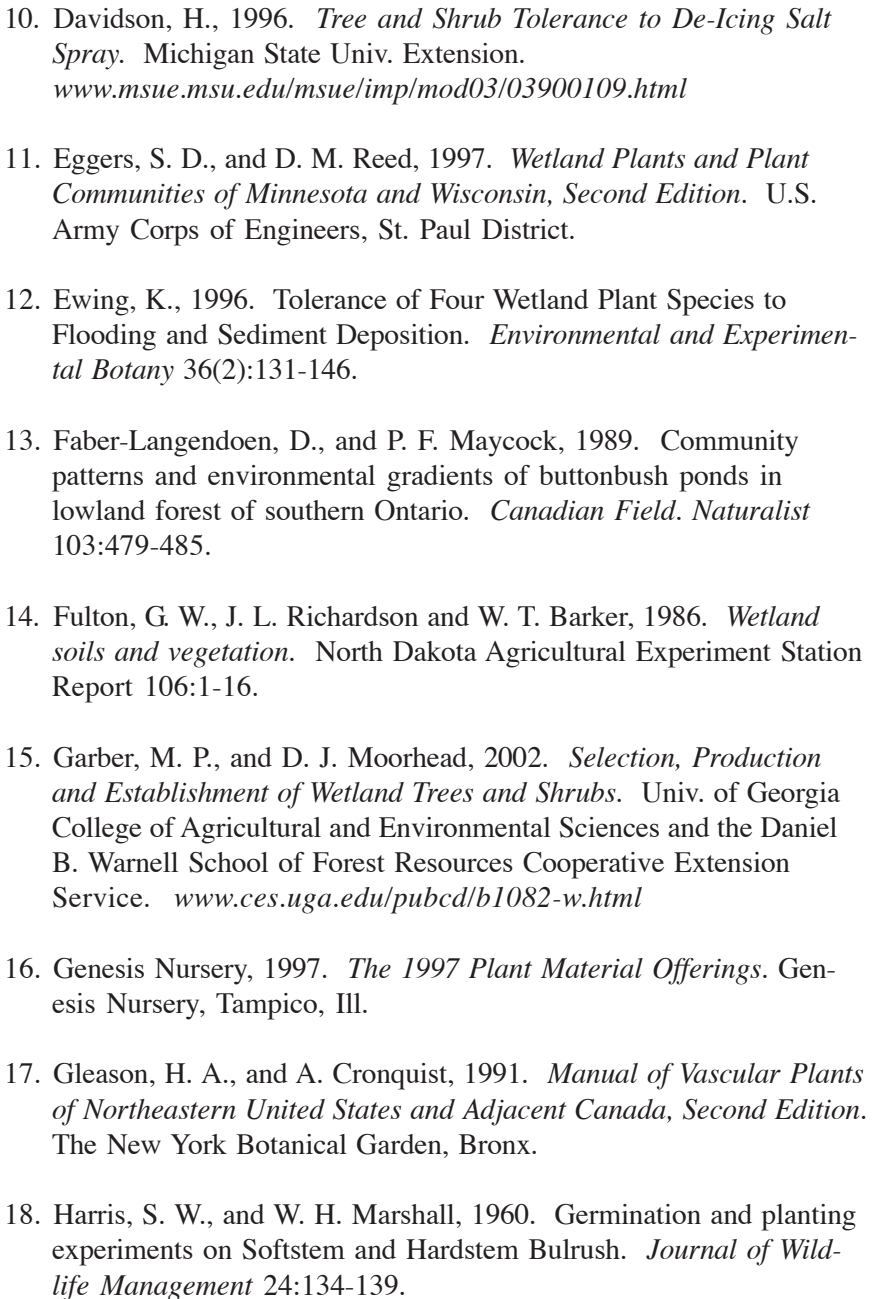
Photo: Paul Jackson






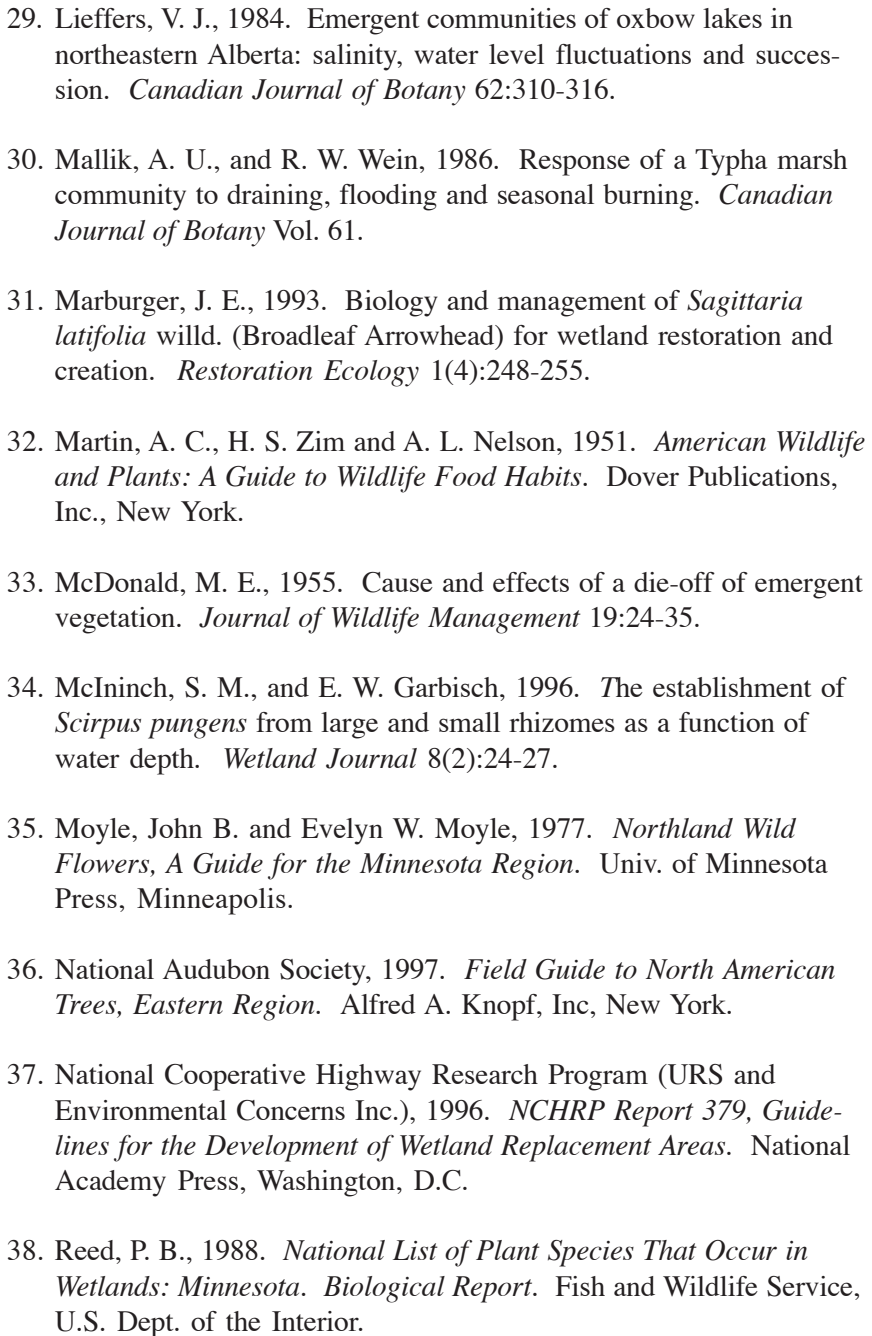
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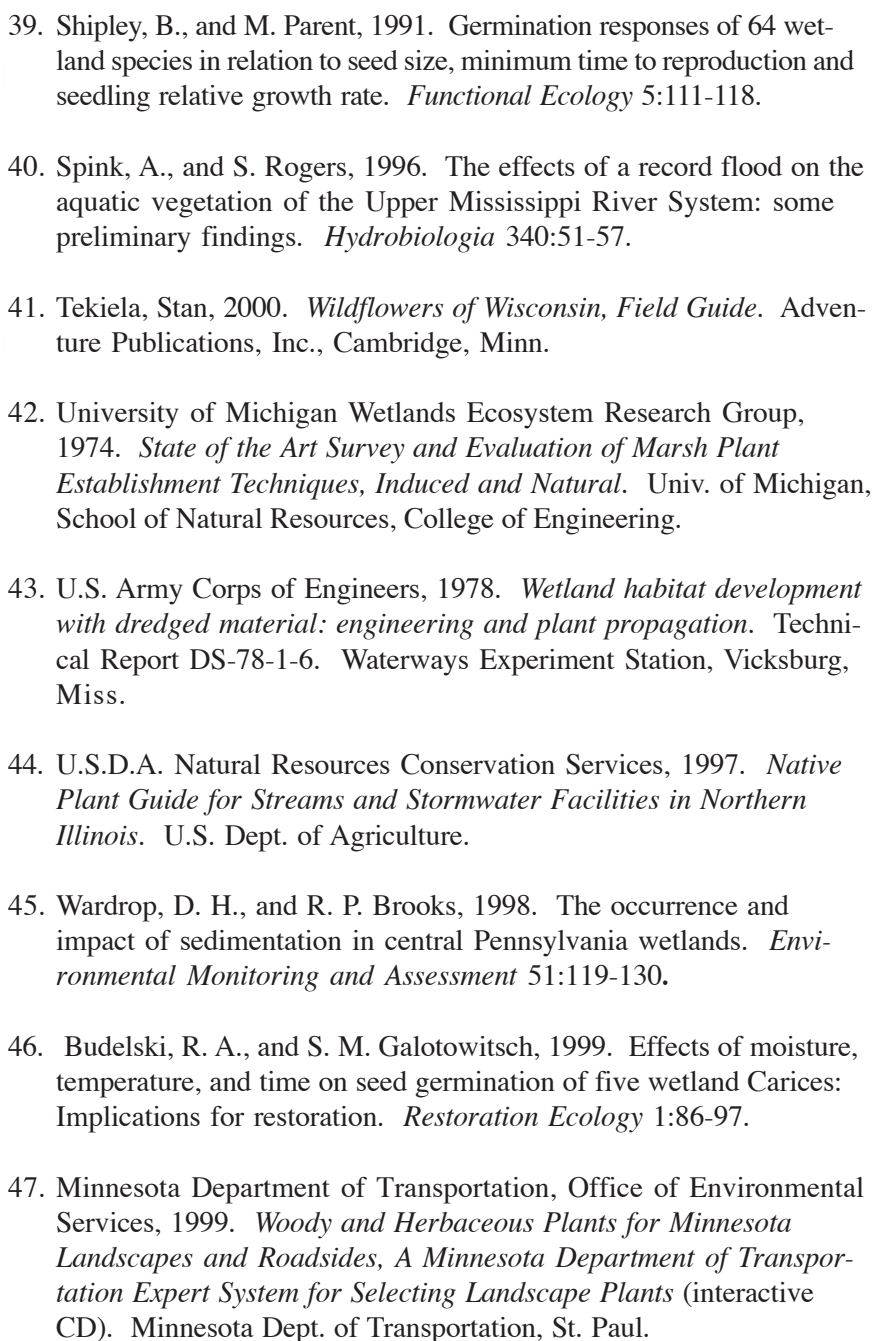
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Photo: Beth Kunkel





## APPENDIX 1

### PLANTING AND MAINTENANCE RECOMMENDATIONS

This appendix includes a summary of planting and maintenance concerns for stormwater-management techniques. For a more detailed discussion of planting wetlands and buffers, see *Native Vegetation in Restored and Created Wetlands, Its Establishment and Management in Minnesota and the Upper Midwest* (Shaw 2000)\*.

#### Planting

Thorough site analysis is very important for a successful planting design. Information that should be collected during site analysis includes data on soil characteristics, site hydrology, steepness and aspect of slopes, areas of sun and shade, existing vegetation, plant communities in the area, and potential influences from surrounding land. Understanding the geographic location of a project is also important as characteristics of plant species may vary throughout the region.

Site analysis will aid in deciding where different types of vegetation (plant communities) will be best suited at the site. Many management practices may require the planting of several zones of vegetation, depending on soil types and hydrologic conditions.

Selection of plant species will depend on site conditions, such as soils, hydrology, water fluctuations, road salt, salt spray and inputs of pollutants, including nutrients and sediment. Other potential plant stressors are discussed earlier in this guidebook. Choosing species from plant communities that will provide the most ecological value to the management practice should also be a consideration. The species lists provided for each type of management practice and the plant selection matrix on page 66 will help with species selection. It is recommended that experienced specialty contractors install native species in accordance with a contractual agreement. Such contractors are usually more

\* Citations in this appendix can be found in the Literature Cited section beginning on page 53 of this guide.

qualified to identify undesirable vegetation and be acquainted with native seeding and management techniques.

Proper site preparation cannot be stressed enough as an integral part of the planting process. Undesirable existing vegetation must be removed before a site is planted. It takes a full growing season or longer to eliminate many non-native species, so allow at least one full growing season to manage aggressive, non-native species before planting the site. A couple of the more popular techniques for removing aggressive, non-native species are:


1. **Herbicide Applications** — Herbicide application may be required for one or possibly two growing seasons, depending on the tenacity of existing vegetation and the amount of weed seed in the soil. Herbicide application is often combined with burning to remove vegetation. In some cases, disking is also conducted to cut rhizomes and stimulate growth to increase the effectiveness of herbicide applications. Many repeated applications of herbicide may be necessary. Nonselective herbicides, such as glyphosate (e.g., Round-up® for land treatment and Rodeo® for aquatic treatment), are most often used to eliminate unwanted vegetation from a project site.
2. **Topsoil Scraping** — Topsoil scraping generally involves removing the top 12 inches of soil from the project site. Advantages of this technique are that the roots of invasive species as well as invasive plant seed are removed from the site and it is a rapid way to prepare a site for seeding. Topsoil scraping is particularly effective when mat-forming species such as red canary grass dominate a site. The limitation of this method is that it is expensive and may remove desirable topsoil.



Photo: Rusty Schmidt

*DRILL SEEDING*





Seed can be used to vegetate some projects, but only if water levels can be controlled. Most wetland species germinate only under saturated soil conditions or in up to 1-2 inches of standing water. Excess water can inhibit growth, kill seedlings and wash away seed. The seeds of many wetland species float and can be moved to other sides of an open water system. Utilize the seedbank when possible as this will introduce local sources of propagules and decrease project costs. Also, be wary of aggressive cultivars of native grasses; they may be not a good choice for a project.

Fluctuating water levels, equipment limitations, and an understanding of the water requirements of various wetland species complicate seeding within wet areas. Basins are usually too wet for heavy equipment, so it may be necessary to use hand-held broadcast seeders. Hydroseeding is also an option in saturated areas. This involves spraying seed mixed with a slurry that will bind to the soil surface (use the hose instead of the turret from the top of the truck, though, for good soil-to-seed contact and complete coverage). Care needs to be taken so that seed is not buried too deeply because many species require light to germinate.



Photo: Rusty Schmidt

*HYDROSEEDING*



Cover crops, such as oats and annual rye grass, are useful to hold soil and compete with weed species. Since cover crops germinate quickly, areas that have low coverage after the cover crop germinates indicate where seeding was not successful because of washout, a malfunction with seeding equipment or because they were missed in seeding. These low-coverage areas should be reseeded as soon as possible.

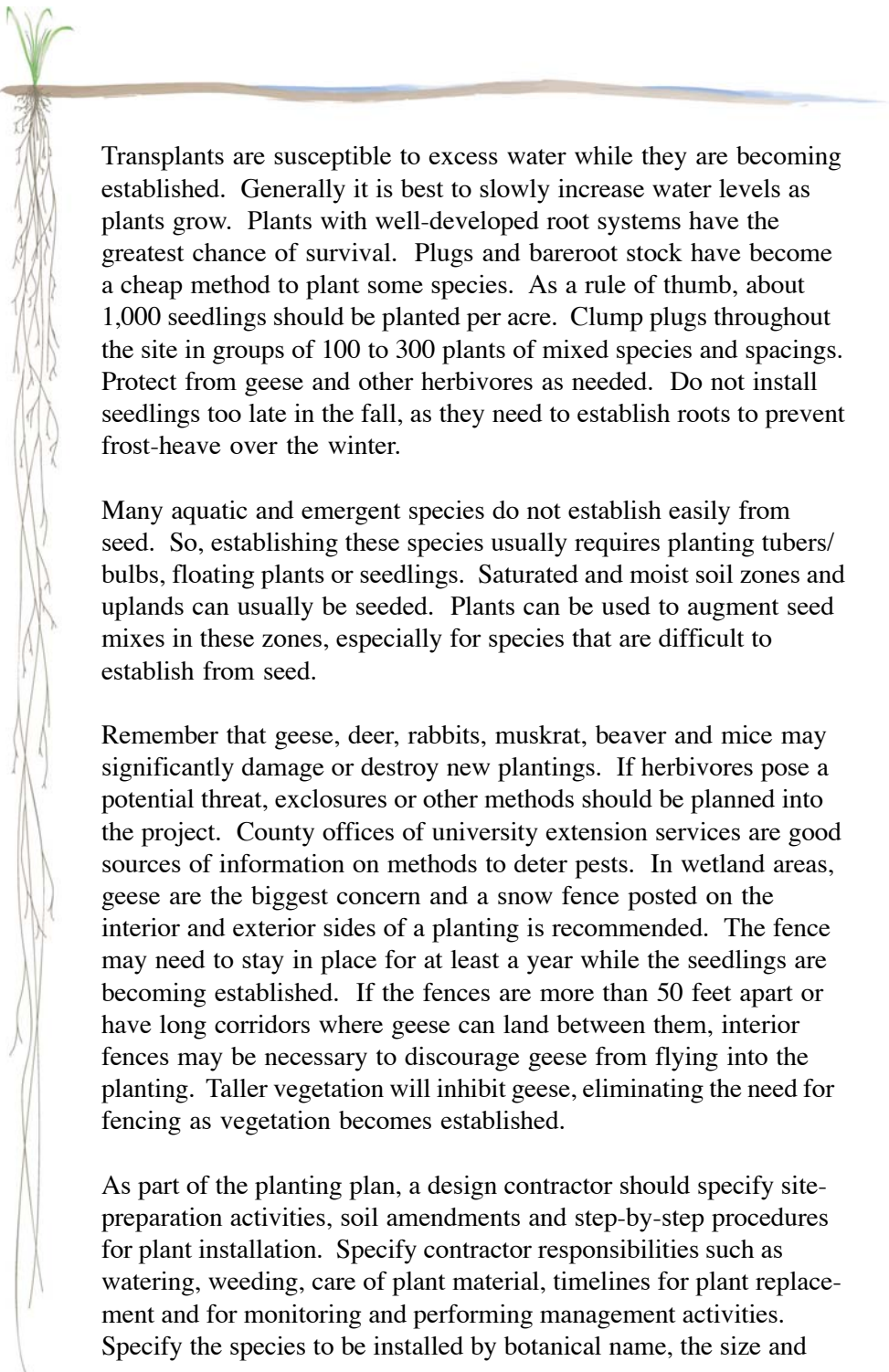
An advantage of broadcast seeding and hydroseeding is that rows are not created. If interseeding or drill seeding, seed over the site in multiple directions to reduce the visibility of rows.

Fertilizers are generally not used in native plantings unless the soils are extremely low in available nutrients. Fertilizers usually promote weed growth. If a fertilizer is to be used, use an organic fertilizer or a slow-release, inorganic fertilizer.

Nearly all terrestrial plants have symbiotic associations with bacteria and fungi. Most legumes have associated rhizobial bacteria that fix atmospheric nitrogen for the plants in exchange for carbohydrates. Unfortunately, most inocula available commercially for native legumes are either the wrong type or not viable. And, the commercial mycorrhizal inocula currently available are typically the wrong kind for grassland species. University of Minnesota Professor Peter Graham has developed rhizobia specific for most of the native legumes currently planted in Minnesota. His source of inoculum is prairies in Minnesota. One should check with the vendor who is providing seed mixes to ensure that good bacterial inoculum is included with legumes. Dr. Graham can produce inocula for several legumes for a fee. Fungal inoculum for native plantings probably won't be available commercially for a number of years.

After seeding is complete, mulch is recommended to stabilize the soil and protect young plants from moisture loss. A "weed-free" straw or native prairie mulch is ideal and should be disked into the soil. If a site is very steep, an erosion-control blanket may be needed. Hydroseeding is often conducted on steep slopes where other equipment cannot be used. Hydroseeding with a heavy tackifier can eliminate the need for additional mulch.



An illustration of a plant with a well-developed root system. The plant has several green blades at the top, and its roots are shown as a dense network of fine lines extending downwards from the soil surface. The soil surface is represented by a horizontal line with a light blue and brown gradient. The roots are shown in a light brown color, and the overall style is simple and educational.

Transplants are susceptible to excess water while they are becoming established. Generally it is best to slowly increase water levels as plants grow. Plants with well-developed root systems have the greatest chance of survival. Plugs and bareroot stock have become a cheap method to plant some species. As a rule of thumb, about 1,000 seedlings should be planted per acre. Clump plugs throughout the site in groups of 100 to 300 plants of mixed species and spacings. Protect from geese and other herbivores as needed. Do not install seedlings too late in the fall, as they need to establish roots to prevent frost-heave over the winter.

Many aquatic and emergent species do not establish easily from seed. So, establishing these species usually requires planting tubers/bulbs, floating plants or seedlings. Saturated and moist soil zones and uplands can usually be seeded. Plants can be used to augment seed mixes in these zones, especially for species that are difficult to establish from seed.

Remember that geese, deer, rabbits, muskrat, beaver and mice may significantly damage or destroy new plantings. If herbivores pose a potential threat, exclosures or other methods should be planned into the project. County offices of university extension services are good sources of information on methods to deter pests. In wetland areas, geese are the biggest concern and a snow fence posted on the interior and exterior sides of a planting is recommended. The fence may need to stay in place for at least a year while the seedlings are becoming established. If the fences are more than 50 feet apart or have long corridors where geese can land between them, interior fences may be necessary to discourage geese from flying into the planting. Taller vegetation will inhibit geese, eliminating the need for fencing as vegetation becomes established.

As part of the planting plan, a design contractor should specify site-preparation activities, soil amendments and step-by-step procedures for plant installation. Specify contractor responsibilities such as watering, weeding, care of plant material, timelines for plant replacement and for monitoring and performing management activities. Specify the species to be installed by botanical name, the size and



form of materials, time of year for installation, and the schedule for inspections, watering and maintenance (Claytor and Schueler 1996)\*. We recommend that maintenance continue for two to five years after instillation is completed to successfully establish native plantings. Although native plantings are usually more expensive to install than most manicured landscapes, they will cost less to maintain over the long term.

Specify the warranty period, the required survival rate and expected condition of plant species at the end of the warranty period (Claytor and Schueler 1996)\*. In the last five to six years, there have been many advances in restoration, mitigation and stormwater-management techniques. Many of these advances are the result of federal and state regulations related to wetland mitigation and banking credits. Plant specifications should be tailored to the plant zone or community that is to be established, and specifications should be written for each zone within a project site.

Plant all emergent species at the upper margins of their tolerance range zones and allow them to migrate into deeper zones. The only exception is when the site has a stable bounce zone and the planting technique is live plants. Plants should be planted in water that is no higher than the top 2 inches of the plants. When possible, plant mature plants as they will be better able to tolerate deeper water and poor water quality.



Photo: Rusiy Schmidt



## Management

The management of native plantings is very important for project success.

Stormwater-management practices are prone to invasion by invasive species, such as reed canary grass, purple loosestrife and hybrid cattail, and ongoing control of these species should be anticipated. Repeated visits during the growing season is the best way to keep invasive species from becoming a significant problem. Vegetation management can occur during these site visits as well as checking for other problems, such as erosion and excessive sedimentation.

Maintenance should include site evaluations for weed species and erosion concerns. To prevent weeds from producing seed in upland areas, mow as needed through the first two years to a height of 6-10 inches. Mow and spot spray over years 3 to 5 as needed. Make sure that contractors do not create ruts in wet areas. Prescribe burn upland areas on a three- to six-year rotation, and release biocontrol agents for purple loosestrife and/or leafy spurge if needed.

Locations of problematic species should be mapped during site visits so their status can be tracked.

Mowing may be necessary for some management practices, such as dry swales and infiltration basins. See recommendations in this guide for individual species.

Mulch degrades over time and mulch beds should be supplemented about once a year. If a thick (6-inch) layer of mulch is maintained on tree and shrub plantings, the mulch may need to be supplemented less frequently. Rain water gardens should not be mulched in most cases because the mulch may float and plug outlets. Instead, discourage weeds in rain gardens by using erosion-control blankets.



## APPENDIX 2

### VEGETATION AND HYDROLOGY DATA FOR THREE TWIN CITIES STORMWATER PROJECTS

During the autumn of 2002, the authors of this guidebook studied vegetation at three stormwater projects in the Twin Cities area. A retention basin was studied in Eagan and stormwater wetland/retention ponds were studied in Little Canada and Maplewood.

The authors used survey equipment at these sites to record the elevation of plant species in relation to outlets at each of the projects. The highest and lowest elevations were recorded for each plant species found at the sites and this information is summarized in the tables that follow.

Hydrographs for the Little Canada and Maplewood sites were provided by the Ramsey-Washington Metro Watershed District. The watershed district also provided background information for these sites. The City of Eagan provided hydrographs for the Cedar Pond site, while the engineering firm URS provided plant lists and background information.

The combination of project background information, hydrographs and species distribution information is provided in this guidebook as additional reference material for designers.



## Cedar Pond



Photo: Rusty Schmidt

Cedar Pond is located at Cedar Pond Park in the City of Eagan, Minnesota. The pond is about 3 acres in size. It is a wet retention pond that was re-engineered in 2001 to have decreased water fluctuations and higher biological function and plant diversity. The site was planted in 2002 with a combination of seed and plugs. Site management involves the removal of invasive species, including cattails.

The authors field surveyed Cedar Pond along one side of the site. The survey was intended to locate the elevation and document occurrence or relative success of all plant species found at Cedar Pond that are included in this guide. The survey was not intended to be a comprehensive floristic study or survey of the site, and there was bias toward plants listed in this book.

While comparing the plant list of what was seeded or planted in the pond and the species observed, a couple of significant observations were made. Of the 45 species observed at Cedar Pond that are included in this guide, 11 were considered volunteer species and as such had not been planted or seeded. One of the volunteer species was reed canary grass (*Phalaris arundinacea*), which was in low abundance and will be



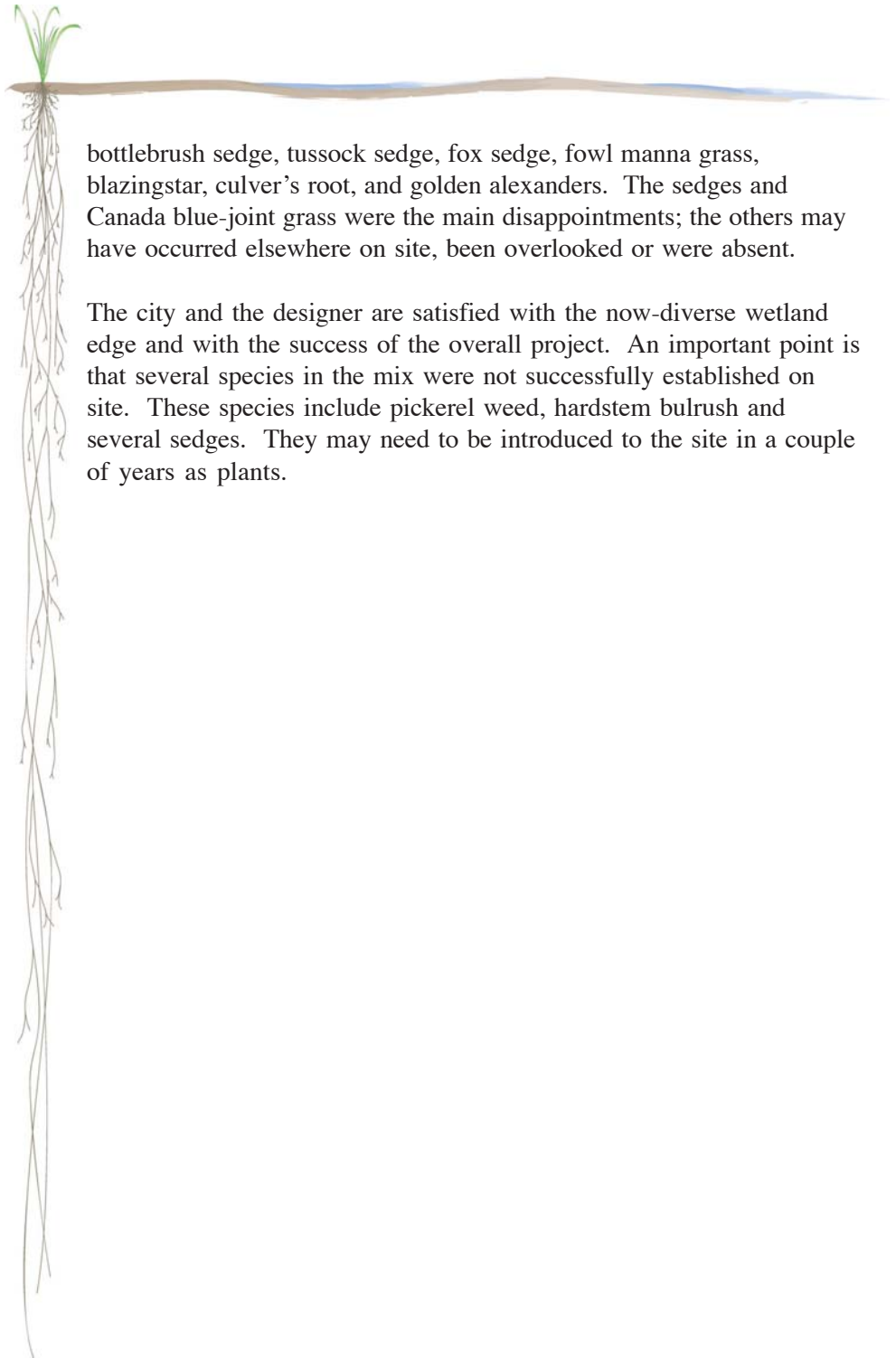
managed aggressively in the future. Four of the volunteer species (silver maple, cottonwood, sandbar willow and American elm) were woody plants, although only one (cottonwood) was a seedling and a true volunteer; the other three species had existed on site before the stormwater-management project was started.

More than 3,000 plugs were added to the seed mix, and just a few species were not observed during the field survey. We were surprised to find pickerelweed and hardstem bulrush absent at the site even though they had been seeded and planted as plugs. The city has indicated that pickerelweed and two other large-leaved, emergent plants will be added to the site in the summer of 2003. Three species of sedges (porcupine, fox and pointed broom sedge) that were planted as plugs were absent. These species may have been overlooked, were in other areas or were truly absent from the site. Four upland species (*Liatris* spp., culver's root, butterflyweed and Riddell's goldenrod) were absent from the plug list during field tests for similar reasons.

Only three grasses contained in the mesic tall-grass prairie seed mix (MnDOT 15B with F3 forb mix) were not encountered during the field survey. However, switchgrass is the only species of the three that is included in this guidebook. The other two were sideoats grama and slender wheatgrass. Only four forbs from the seed mix were found in the field survey. They were wild bergamot, yellow coneflower, spiderwort and blue vervain. Of the remaining species contained in the seeding mix, only five are discussed in this guide and all of these would be found at elevations higher than the pond edge. These species may have been overlooked, may have occurred in other areas along the shore or were truly absent from the site.

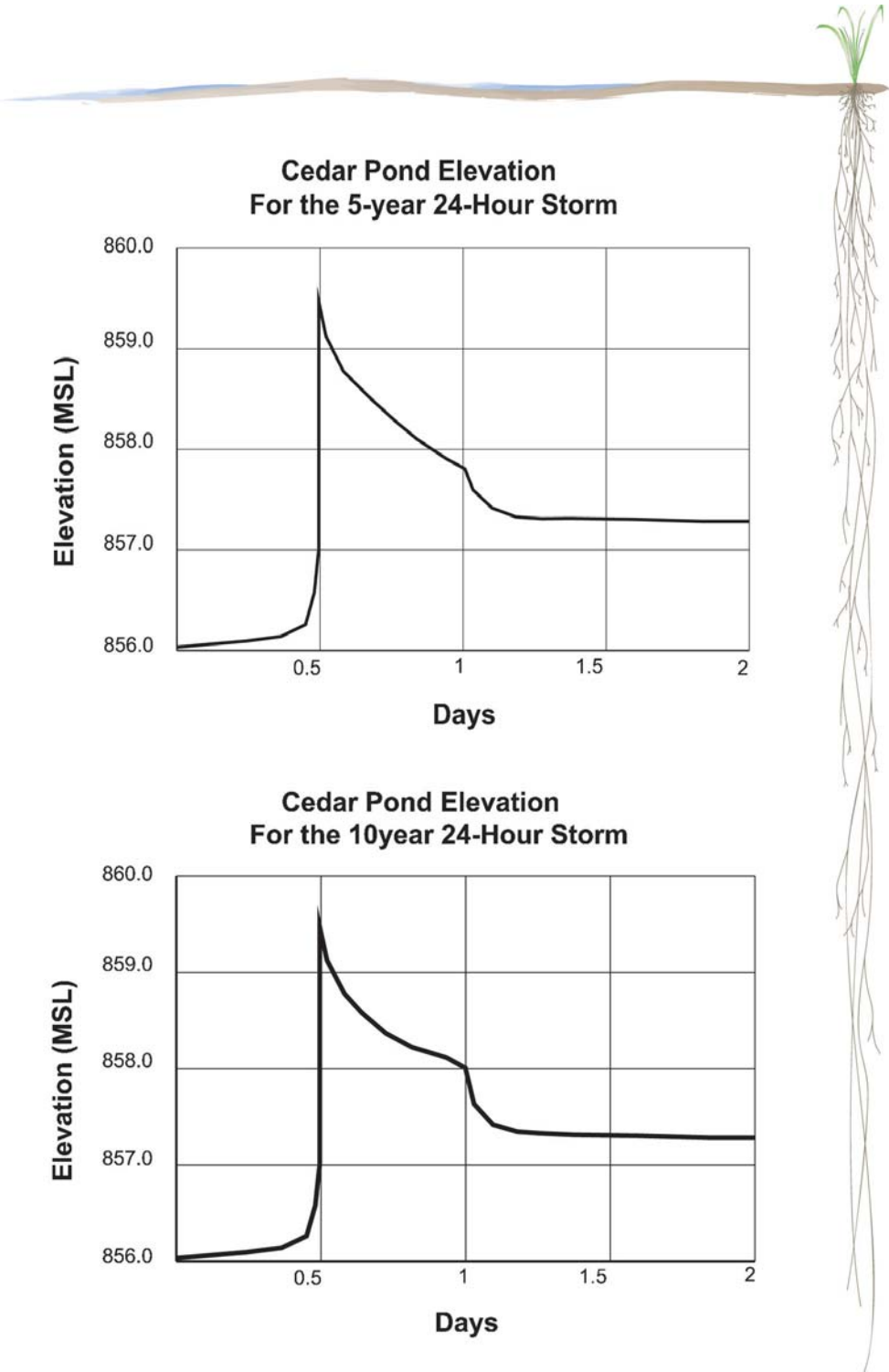
An emergent zone seed mix was developed with all five species present at the survey. Only reed manna grass was not part of the plug list. The other species encountered were broad-leaf arrowhead, green bulrush, softstem bulrush and water plantain.

From the prairie sedge meadow seed mix (MnDOT 25B) 20 of the 38 species were observed at the field survey. Of the 18 absent, the standout absentees were fringed brome, Canada blue-joint grass,

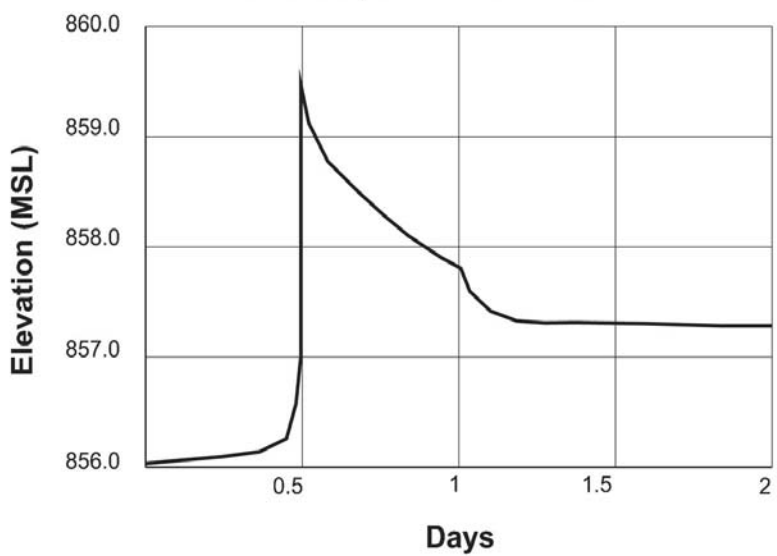


bottlebrush sedge, tussock sedge, fox sedge, fowl manna grass, blazingstar, culver's root, and golden alexanders. The sedges and Canada blue-joint grass were the main disappointments; the others may have occurred elsewhere on site, been overlooked or were absent.

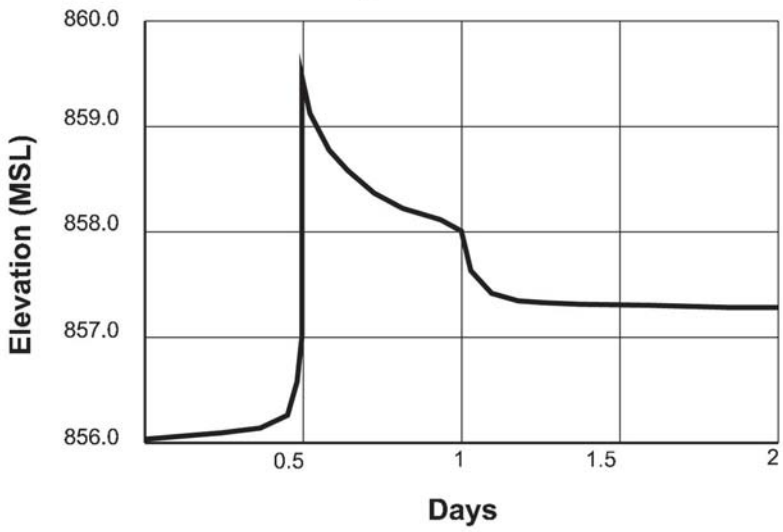
The city and the designer are satisfied with the now-diverse wetland edge and with the success of the overall project. An important point is that several species in the mix were not successfully established on site. These species include pickerel weed, hardstem bulrush and several sedges. They may need to be introduced to the site in a couple of years as plants.




**Cedar Pond Elevation  
For the 5-year 24-Hour Storm**



**Cedar Pond Elevation  
For the 10-year 24-Hour Storm**







Scientific Name	Common Name	Lowest Elevation in Relation to Outlet*	Highest Elevation in Relation to Outlet*
<i>Acer saccharinum</i>	Silver maple	+1.08 (single record)	
<i>Acorus calamus</i>	Sweet flag	+.58 (single record)	
<i>Alisma trivale</i>	Water plantain	+.63 (single record)	
<i>Amorpha fruticosa</i>	Indigo bush	+1.93 (single record)	
<i>Andropogon gerardii</i>	Big bluestem	+1.85	Unlimited
<i>Aronia melanocarpa</i>	Black chokeberry	+.83	Unlimited
<i>Asclepias incarnata</i>	Marsh milkweed	+1.19	+2.03
<i>Aster laevis</i>	Smooth aster	+1.11	
<i>Aster novae-angliae</i>	New England aster	+1.48	Unlimited
<i>Aster puniceus</i>	Red-stemmed aster	+.83 (single record)	
<i>Bidens cernua</i>	Beggarsticks	+2.25 (single record)	
<i>Carex bebbii</i>	Bebb's sedge	+.83	+1.13
<i>Carex lacustris</i>	Lake sedge	+.82	+1.56
<i>Carex stipata</i>	Awl-fruited sedge	+.67	+2.31
<i>Eleocharis</i> sp.	Spikerush	+1.03 (single record)	
<i>Elymus virginicus</i>	Virginia wild rye	+1.19	Unlimited
<i>Eupatorium maculatum</i>	Joe-pye weed	+1.38	+2.88
<i>Eupatorium perfoliatum</i>	Boneset	+1.11	+2.29
<i>Glyceria grandis</i>	Giant manna grass	+.38	+.75
<i>Helenium autumnale</i>	Sneezeweed	+.95	+1.91
<i>Iris versicolor</i>	Blueflag	+.84	+2.17
<i>Juncus effusus</i>	Soft rush	+.31	+.87
<i>Lobelia cardinalis</i>	Cardinal flower	+.78	+2.21
<i>Lobelia siphilitica</i>	Blue lobelia	+2.07 (single record)	
<i>Lolium multiflorum</i>	Annual rye grass	+1.71	Unlimited
<i>Monarda fistulosa</i>	Bergamot	+1.32	Unlimited
<i>Phalaris arundinacea</i>	Reed canary grass	+.53	+3.96
<i>Polygonum</i> sp.	Smartweed	+.79	+2.92
<i>Populus deltoides</i>	Eastern cottonwood (seedling)	+1.12	Unlimited
<i>Ratibida pinnata</i>	Yellow coneflower	+2.33	Unlimited
<i>Sagittaria latifolia</i>	Broadleaved arrowhead	-.01	+.87
<i>Salix exigua</i>	Sandbar willow	+.77 (single record)	
<i>Schizachyrium scoparium</i>	Little bluestem	+1.71	Unlimited
<i>Scirpus atrovirens</i>	Green bulrush	+.55	+.97
<i>Scirpus cyperinus</i>	Woolgrass	+.38	+1.36
<i>Scirpus fluviatilis</i>	River bulrush	-1.05	+1.20
<i>Scirpus pungens</i>	Three-square bulrush	-.70	
<i>Scirpus validus</i>	Soft-stem bulrush	-.67	+.01
<i>Sorghastrum nutans</i>	Indian grass	+2.33	Unlimited
<i>Sparganium eurycarpum</i>	Giant burreed	-.22	+.83
<i>Spartina pectinata</i>	Prairie cord grass	+.61	+1.49
<i>Tradescantia ohioensis</i>	Ohio spiderwort	+2.09	Unlimited

<i>Ulmus americana</i>	American elm	+1.49	Unlimited
<i>Verbena hastata</i>	Blue vervain	+1.19	+2.08
<i>Vernonia fasciculata</i>	Ironweed	+1.56 (single record)	

\*Elevations refer to height in inches above or below the pond or wetlands outlet.

“Single record” refers to instances where only one plant of a species was found during the site visit. “Unlimited” refers to upland species that had a range that was generally not limited by moisture conditions at the site.



Photo: Jason Husveith

*GIANT BURREED*



## Gervais Beach



Photo: Dan Shaw

The Gervais Beach stormwater project is located in the City of Little Canada, Minnesota. The project was designed to address a drainage problem on the southwest side of Gervais Lake. The pond/wetland was constructed to treat diverted stormwater. The project is about 0.5 acre in size and consists of prairie, emergent and shrub species. Prairie and emergent species were planted as seed and plugs and shrubs were planted as container stock. Site management included the spot treatment of cattails and invasive species, such as purple loosestrife and reed canary grass.

The authors field surveyed the near-shore area along the entire perimeter. The field survey was intended to locate the elevation and to document occurrence or relative success of all plant species found at Gervais Beach which are included in this guidebook. There was no intent to complete a comprehensive floristic survey of the site. There was an admitted bias toward plants included in this guide, and the survey was conducted only once, in late September 2002.



While comparing the list of plant species seeded or planted within the site and the species observed during the field survey, a couple of significant observations were made. This former beach area was planted with seed over three distinct time periods and with plugs during three other, desynchronous time periods. Only 11 of the 23 species planted as plugs were observed during the field survey. None of the five upland prairie species were observed, although this may be understandable given the survey's nearshore wetland edge focus. One of the wet-meadow species present is not discussed in this book. Hardstem bulrush is the most significant absent species. It was planted two times in two years but with no success. The other unsuccessful species were bottlebrush sedge, turtlehead, fowl manna grass and culver's root.

Of the 37 plants observed during the site visit, 11 were considered volunteer species and as such were not planted. Three of the volunteer species are reed canary grass, narrow-leaved cattail and purple loosestrife, all of which are invasive and should be discouraged and controlled in all planting projects. Five of the volunteer species (silver maple, green ash, cottonwood, sandbar willow and black willow) were woody species that may have been present prior to the planting. The final three volunteer species were fringed sedge, brown-eyed Susan, and broadleaf arrowhead.

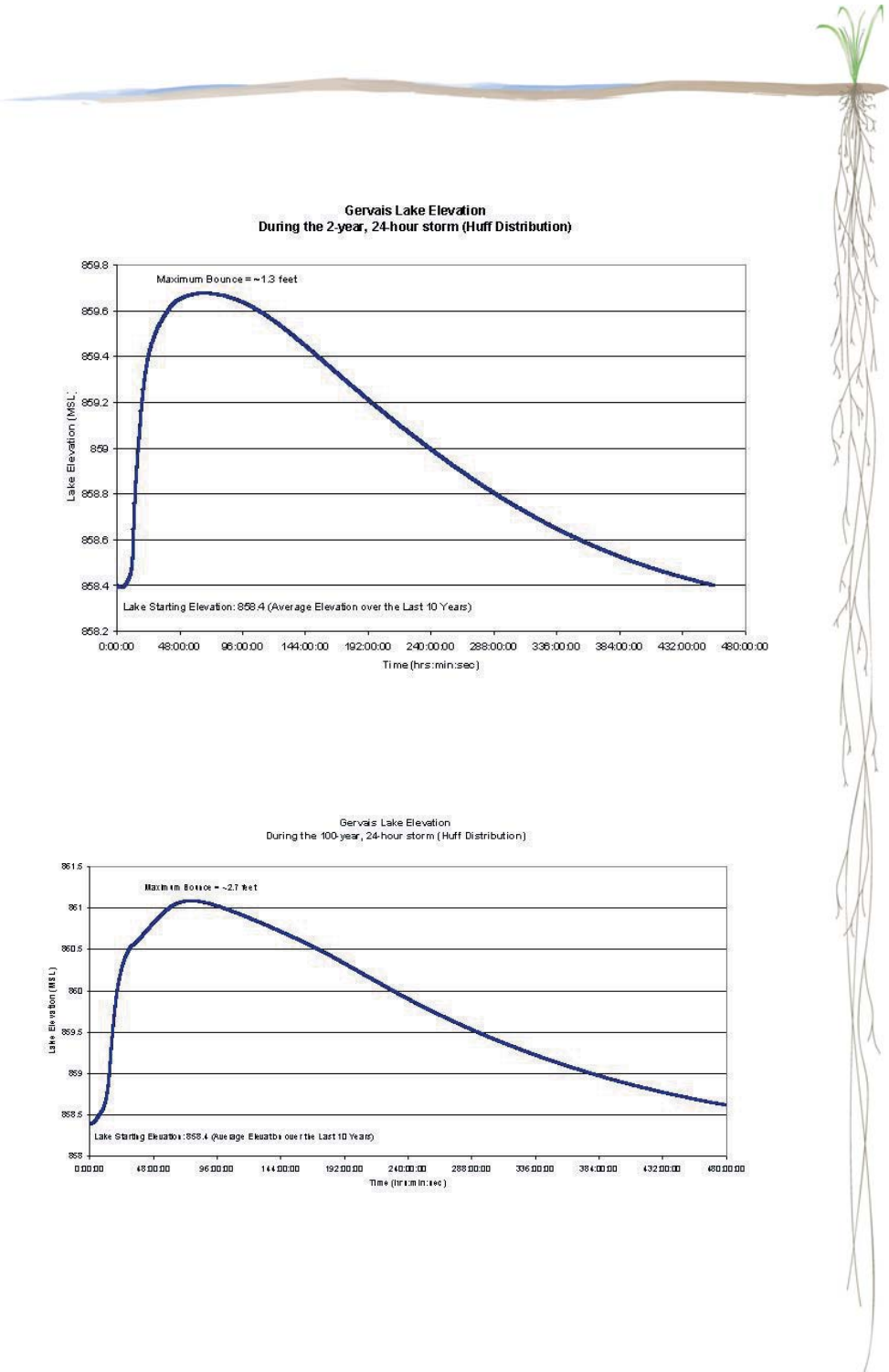
Only three of the 29 species in the short/dry grass seed mix were observed on site. This may be due to the location of seeding to the edge of the beach and also included several species not discussed in this guide. Of the 23 absent short-grass species, only five are included in this book: butterflyweed, azure aster, silky aster, alum root and golden alexander.

The tall/wet grass and wildflower mix had very different results. Of the 36 species seeded, 17 were observed during the field survey. Fourteen of the remaining 19 are discussed in this book. Plant species absent from the fresh meadow wetland area were Canada bluejoint grass, wild rye, switchgrass, fragrant giant hyssop, smooth aster, paniced aster, grass-leaved goldenrod, blazingstar, wild bergamot, mountain mint, tall meadow rue, ironweed, culver's root and golden alexanders. It is important to note that Canada bluejoint grass, switchgrass, culver's root and golden

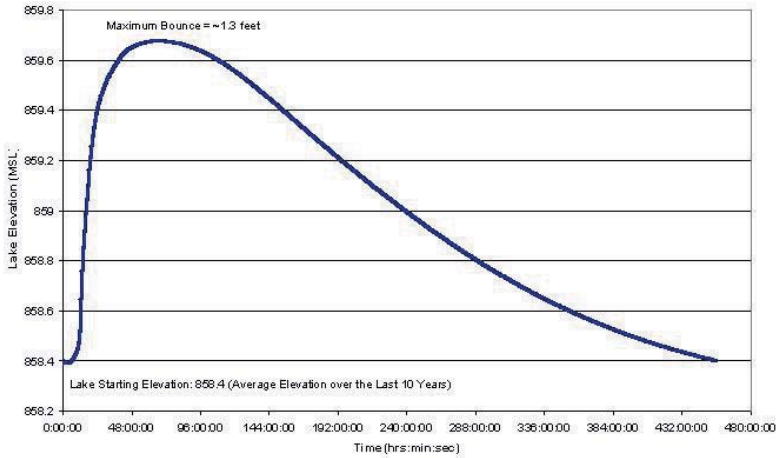


alexanders did not establish well from seed as they were not encountered during the survey.

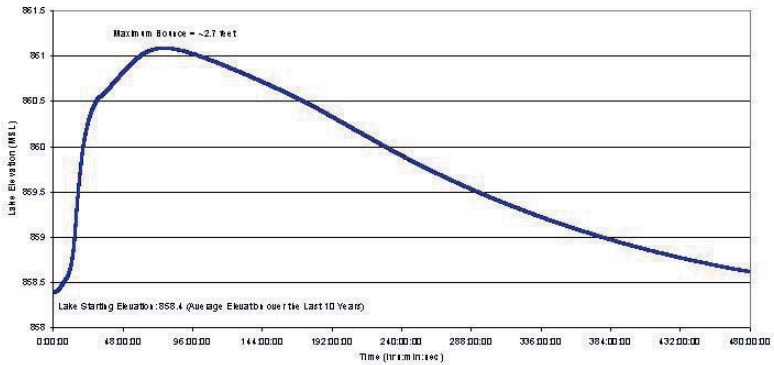
Finally, a seed mix of emergent and wet meadow species was collected from other watershed district wetlands and planted early in the project's history. Of 19 plant species collected and seeded by hand, only five were not observed during the field survey. Of those five, one species is not included in this book. The important absentees were pickerelweed, arrowhead, ironweed and culver's root. All but the arrowhead have been mentioned in this project and in the Cedar Pond project as not having been successfully established.

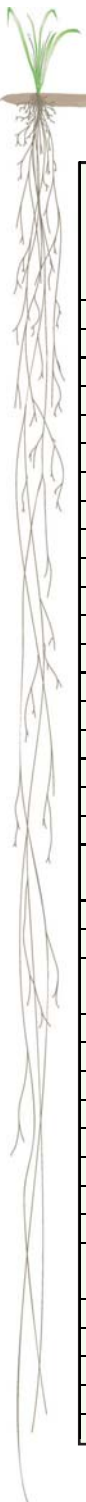


**Gervais Lake Elevation  
During the 2-year, 24-hour storm (Huff Distribution)**



**Gervais Lake Elevation  
During the 100-year, 24-hour storm (Huff Distribution)**





Scientific Name	Common Name	Lowest Elevation in Relation to Outlet*	Highest Elevation in Relation to Outlet*
<i>Acer saccharinum</i>	Silver maple	+0.93 (single record)	
<i>Acorus calamus</i>	Sweet flag	+0.67 (single record)	
<i>Alisma trivale</i>	Water plantain	+0.01 (single record)	+0.23
<i>Andropogon gerardii</i>	Big bluestem	+1.21	Unlimited
<i>Asclepias incarnata</i>	Marsh milkweed	+0.67 (single record)	
<i>Aster novae-angliae</i>	New England aster	+1.06	Unlimited
<i>Aster puniceus</i>	Red-stemmed aster	+0.9 (single record)	
<i>Carex crinita</i>	Caterpillar sedge	+0.68 (single record)	
<i>Cornus sericea</i>	Red-osier dogwood	+1.23	Unlimited
<i>Eupatorium maculatum</i>	Joe-pye weed	+0.72	+0.85
<i>Eupatorium perfoliatum</i>	Boneset	+0.95	+1.93
<i>Fraxinus pennsylvanica</i>	Green ash	+1.34	Unlimited
<i>Helenium autumnale</i>	Sneezeweed	+0.90	Unlimited
<i>Iris versicolor</i>	Blueflag	+0.88 (single record)	
<i>Larix laricina</i>	Tamarack	+1.60	+1.63
<i>Lobelia siphilitica</i>	Blue lobelia	+1.69 (single record)	
<i>Lythrum salicaria</i>	Purple loosestrife	-0.18	+0.701
<i>Phalaris arundinacea</i>	Reed canary grass	+0.95 (single record)	
<i>Populus deltoides</i>	Eastern cottonwood	+1.63	Unlimited
<i>Rudbeckia subtomentosa</i>	Brown-eyed Susan	+1.57	Unlimited
<i>Salix exigua</i>	Sandbar willow	+1.29 (single record)	
<i>Salix nigra</i>	Black willow	+1.03 (single record)	
<i>Schizachyrium scoparium</i>	Little bluestem	+1.74	Unlimited
<i>Scirpus atrovirens</i>	Green bulrush	+0.91 (single record)	
<i>Scirpus cyperinus</i>	Woolgrass	+1.17 (single record)	
<i>Scirpus effusus</i>	Common rush	-0.3	+1.74
<i>Scirpus fluviatilis</i>	River bulrush	+0.33	+2.83
<i>Scirpus pungens</i>	Three-square bulrush	+0.72	+1.36
<i>Scirpus validus</i>	Soft-stem bulrush	+0.01 (single record)	
<i>Solidago rigida</i>	Stiff goldenrod	+1.39	+1.55
<i>Sorghastrum nutans</i>	Indian grass	+1.23	Unlimited
<i>Sparganium eurycarpum</i>	Giant burreed	-0.37	+1.28
<i>Spartina pectinata</i>	Prairie cord grass	+0.3	+1.08
<i>Typha latifolia</i>	Broadleaved cattail	+0.71	+0.93
<i>Typha angustifolia</i>	Narrow-leaved cattail	-0.22 (single record)	+1.28
<i>Verbena hastata</i>	Blue vervain	+1.62	+1.91
<i>Viburnum trilobum</i>	High bush cranberry	+1.43	+2.07

\*Elevations refer to height in inches above or below the pond or wetlands outlet.

“Single record” refers to instances where only one plant of a species was found during the site visit. “Unlimited” refers to upland species that had a range that was generally not limited by moisture conditions at the site.

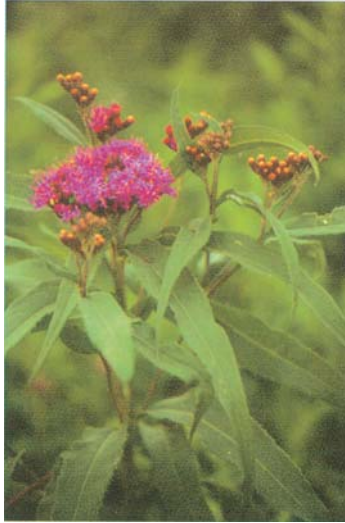


Photo: Dan Shaw

*IRONWEED*





## Alum Pond



Photo: Dan Shaw

The alum treatment facility was planted in the fall of 1997 and spring of 1998. The pond was constructed to implement phosphorus reduction in the watershed in which it is located, and it utilizes alum injection. The site, about 1.5 acres in size, is located in the City of Maplewood, Minnesota. Prairie and emergent species at the site were planted with seed and plugs. In addition, shrubs were planted in many locations throughout the site. Site management involves the removal of cattails and invasive species, such as purple loosestrife and reed canary grass. Spot treatment has been the primary method of controlling invasive species.

The authors field surveyed the Alum Pond, which was constructed as part of Ramsey-Washington Metro Watershed District's phosphorus-reduction efforts for Tanners Lake in Oakdale. The field survey was completed along one-half of the pond near the shore-edge area. The field survey was intended to locate the elevation and to document the occurrence or relative success of all plant species found at Gervais Beach that are included in this guide. This field survey was not intended to be a

complete floristic study of the Alum Pond. Admittedly there was a bias toward plants discussed in this book and the survey was conducted only during late September 2002.

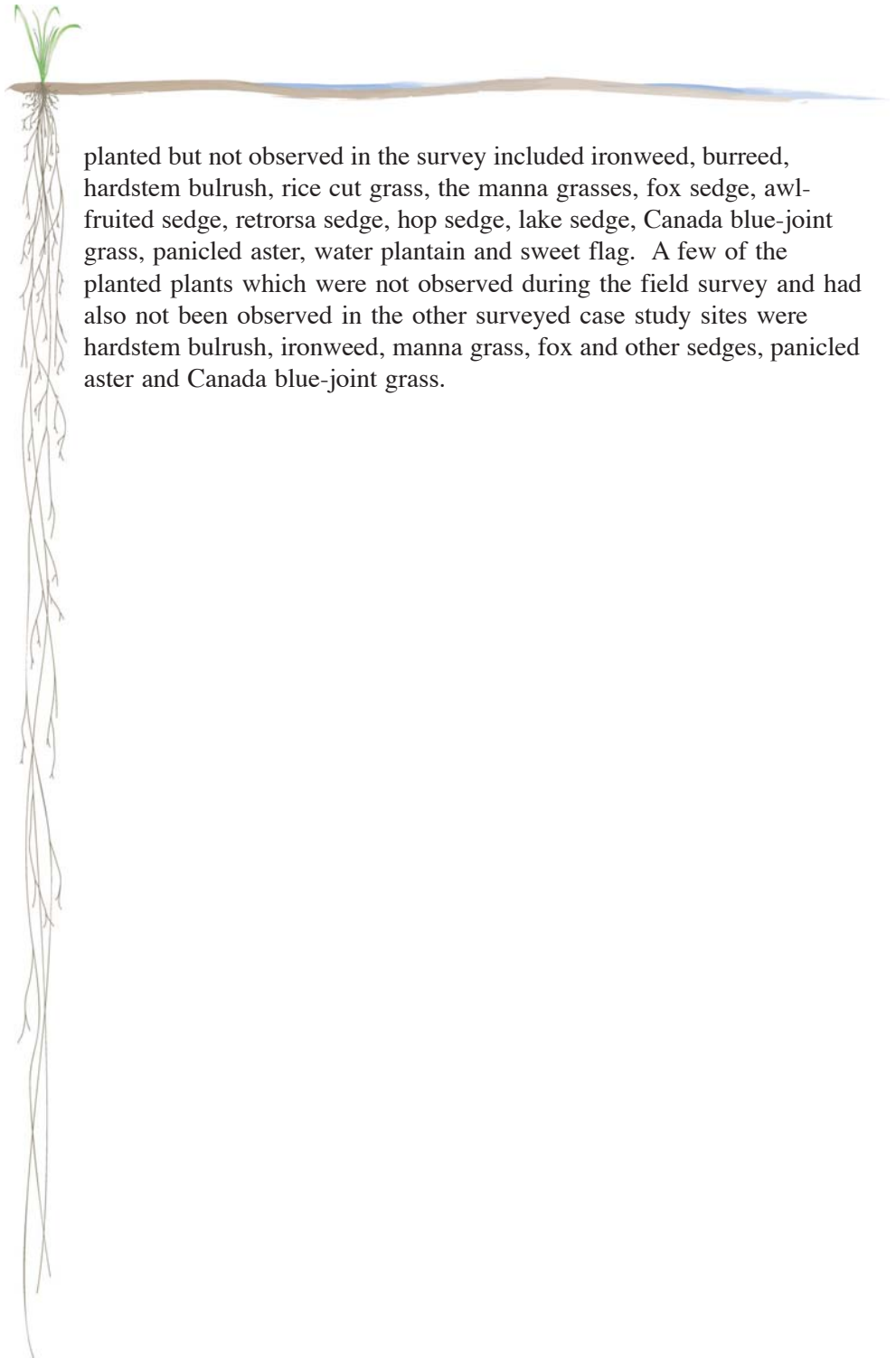
While comparing the planting and seeding list of Alum Pond with what was observed during the field survey, a couple of significant findings were noted. Other than the shrubs, this species was not planted with plugs but just seeded. Thirteen of the 37 species observed were volunteer species, or species that were not intentionally planted. Three of the 13 — narrow-leaved cattail, reed canary grass and purple loosestrife — are invasive plants and should be discouraged and controlled in all planting projects. Two of the volunteer species, spike rush and mad dog skullcap, are annuals. The most notable volunteer species were Torry's rush, common rush, white meadowsweet, woolgrass, river bulrush and mad dog skullcap. The other three species were cottonwood, black willow and elderberry.

Seed was planted in distinct wetland zones as three mixes; mesic grass/forb mix (lowland prairie), wet grass/forb mix (wet meadow) and marsh mix (emergent and lower zones). In the upper zone, 32 plant species were encountered during the survey, eight of which were documented. The remaining 24 plant species included only nine species discussed in this book. These are Virginia wild rye, little bluestem, giant hyssop, prairie wild onion, lead plant, Canada anemone, butterflyweed, rattlesnake master, blazingstar and brown-eyed susan. All of the planted or seeded plants which were not encountered in the field survey may have occurred elsewhere on the site, may have been overlooked or were truly absent from the site.

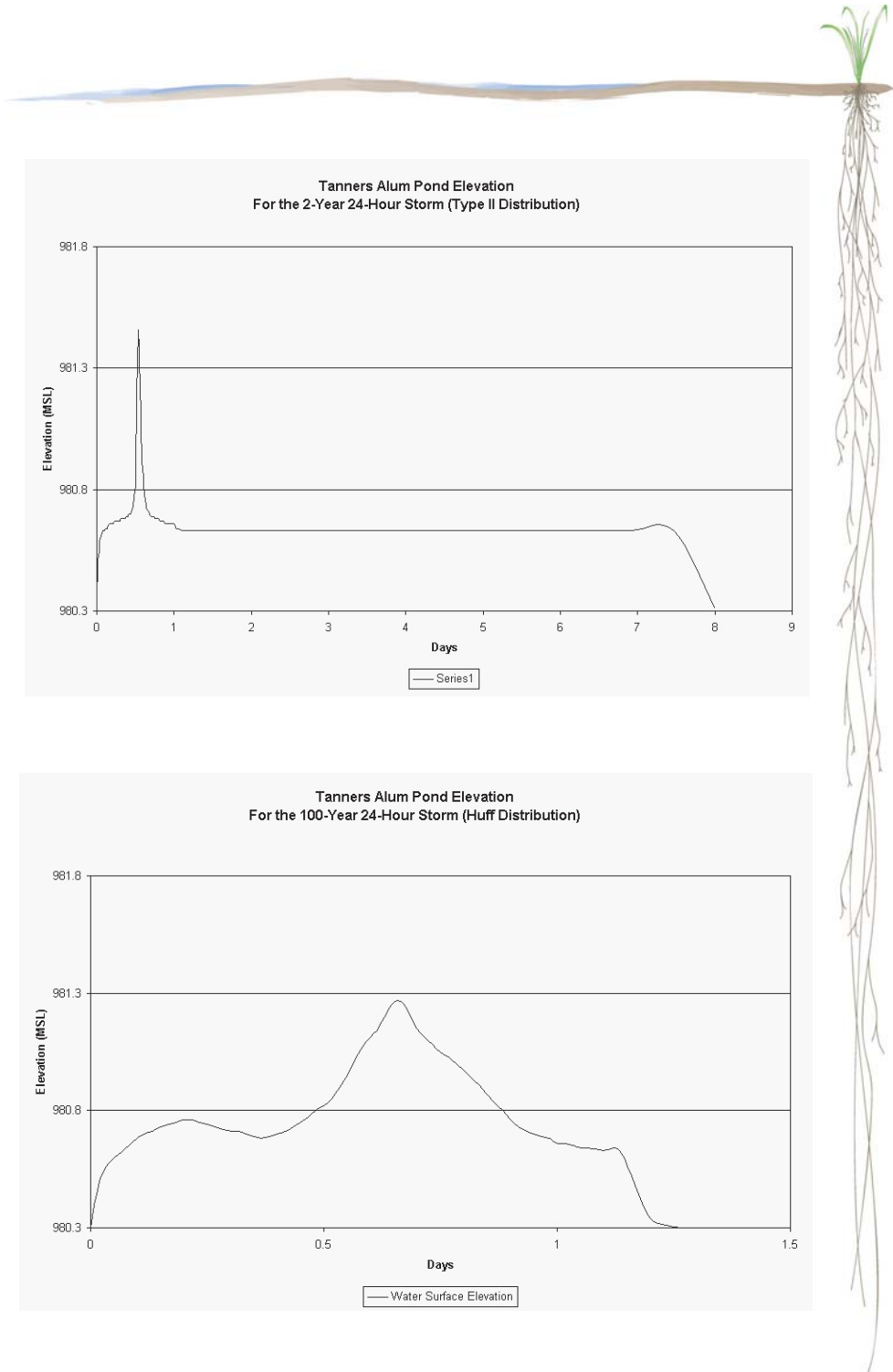
Twenty-nine species were seeded in the lower zone planting. Twelve of these species were present in the field survey. Of the 17 species planted which were not encountered in the survey, notable absences included culver's root, ironweed, meadow rue, blazingstar, red-stem aster and Virginia wild rye.

The emergent and lower zone seed mix included 35 plant species. Of these 35 species, 13 were observed at the field survey. The 22 species

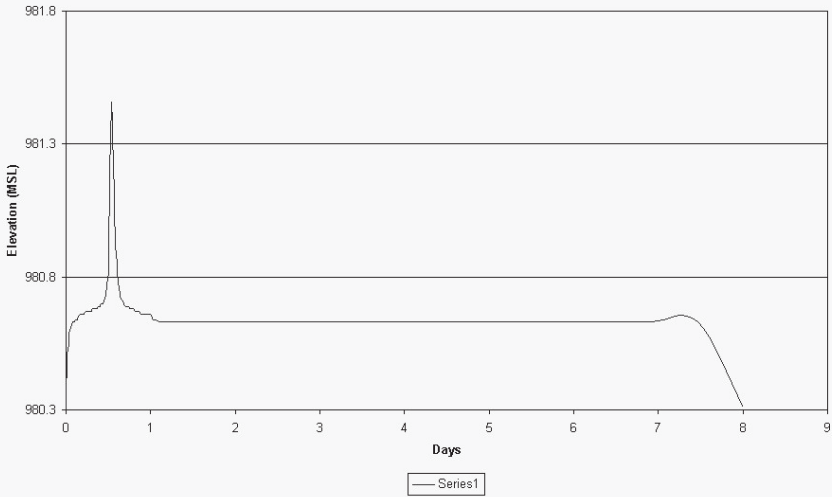




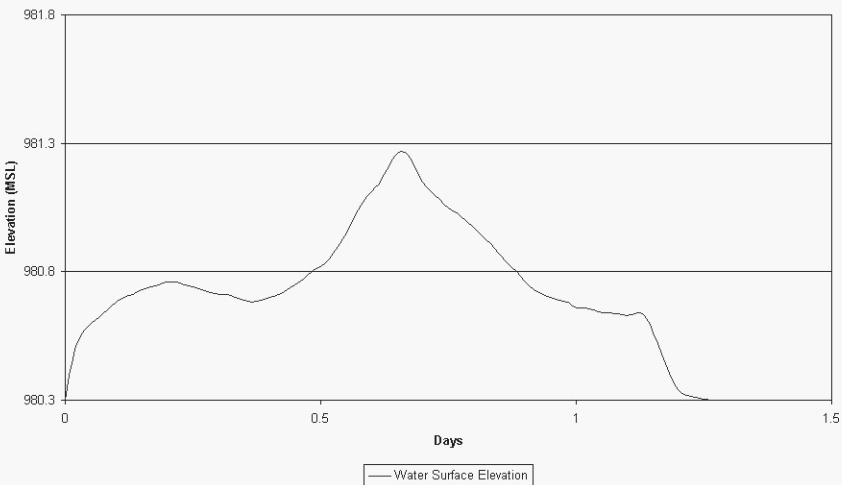
planted but not observed in the survey included ironweed, burreed, hardstem bulrush, rice cut grass, the manna grasses, fox sedge, awl-fruited sedge, retrorsa sedge, hop sedge, lake sedge, Canada blue-joint grass, panicked aster, water plantain and sweet flag. A few of the planted plants which were not observed during the field survey and had also not been observed in the other surveyed case study sites were hardstem bulrush, ironweed, manna grass, fox and other sedges, panicked aster and Canada blue-joint grass.




**Tanners Alum Pond Elevation  
For the 2-Year 24-Hour Storm (Type II Distribution)**



**Tanners Alum Pond Elevation  
For the 100-Year 24-Hour Storm (Huff Distribution)**





Scientific Name	Common Name	Lowest Elevation Relation to Outlet*	Highest Elevation in Relation to Outlet*
<i>Andropogon gerardii</i>	Big bluestem	+1.27	Unlimited
<i>Asclepias incarnata</i>	Marsh milkweed	+0.52	+0.62
<i>Aster novae-angliae</i>	New England aster	+0.56	Unlimited
<i>Bidens</i> spp.	Beggersticks	+0.46 (single record)	
<i>Carex comosa</i>	Bottlebrush sedge	+0.07	+0.61
<i>Cornus sericea</i>	Red-osier dogwood	+1.16	Unlimited
<i>Eleocharis</i> sp.	Spikerush	-0.29 (single record)	
<i>Eupatorium maculatum</i>	Joe-pye weed	+0.51	+1.13
<i>Eupatorium perfoliatum</i>	Boneset	+0.46 (single record)	
<i>Helenium autumnale</i>	Sneezeweed	+0.88	Unlimited
<i>Helianthus grosseserratus</i>	Sawtooth sunflower	+1.34	+2.26
<i>Impatiens capensis</i>	Jewelweed	+0.38	+1.09
<i>Iris versicolor</i>	Blueflag	+0.28 (single record)	
<i>Juncus effusus</i>	Soft rush	-0.17 (single record)	
<i>Juncus torreyi</i>	Torrey rush	+0.21 (single record)	
<i>Lythrum salicaria</i>	Purple loosestrife	-0.30	+0.14
<i>Spiraea alba</i>	Meadowsweet	+0.91 (single record)	
<i>Monarda fistulosa</i>	Wild bergamot	+1.61	Unlimited
<i>Panicum virgatum</i>	Switchgrass	+0.48	Unlimited
<i>Populus deltoides</i>	Eastern cottonwood seedling	+0.51	Unlimited
<i>Ratibida pinnata</i>	Yellow coneflower	+1.24	Unlimited
<i>Sagittaria latifolia</i>	Broadleaved arrowhead	-0.48 (single record)	
<i>Salix nigra</i>	Black willow	+2.36	Unlimited
<i>Sambucus racemosa</i>	Red-berried elder	+1.64	Unlimited
<i>Scirpus atrovirens</i>	Green bulrush	+0.24	+0.51
<i>Scirpus cyperinus</i>	Woolgrass	+0.33 (single record)	
<i>Scirpus fluviatilis</i>	River bulrush	+0.25	+1.9
<i>Scirpus validus</i>	Soft-stem bulrush	-0.28	+0.52
<i>Scutellaria lateriflora</i>	Mad dog skullcap	+0.45 (single record)	
<i>Silphium perfoliatum</i>	Cup plant	+1.4 (single record)	
<i>Solidago rigida</i>	Stiff goldenrod	+0.58	Unlimited
<i>Sorghastrum nutans</i>	Indian grass	+1.46	Unlimited
<i>Spartina pectinata</i>	Prairie cord grass	+0.22 (single record)	
<i>Typha angustifolia</i>	Narrow-leaved cattail	-0.76	0.00
<i>Verbena hastata</i>	Blue vervain	+0.5	+0.63
<i>Viburnum trilobum</i>	High bush cranberry	+1.48 (single record)	
<i>Zizia aurea</i>	Golden alexanders	+0.77	Unlimited

\*Elevations refer to height in inches above or below the pond or wetlands outlet.

“Single record” refers to instances where only one plant of a species was found during the site visit. “Unlimited” refers to upland species that had a range that was generally not limited by moisture conditions at the site.



Photo: Paul Jackson

*BOTTLEBRUSH SEDGE*

How do you achieve beauty, functionality and clean water through landscape design? “Plants for Stormwater Design” offers specific, detailed suggestions on selecting appropriate species for all design environments while protecting water quality and mitigating stormwater runoff.

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