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]

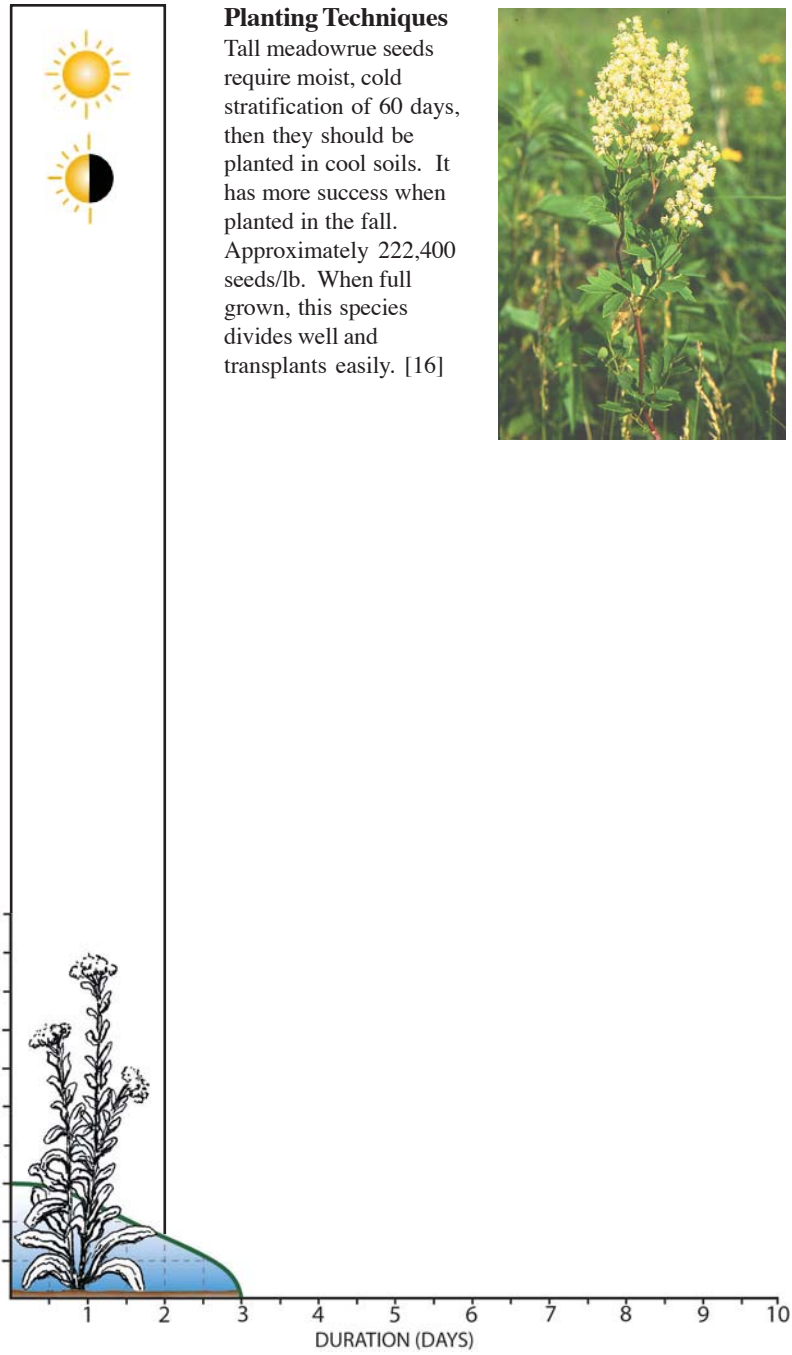
Wildlife Use

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 ohiensis

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]

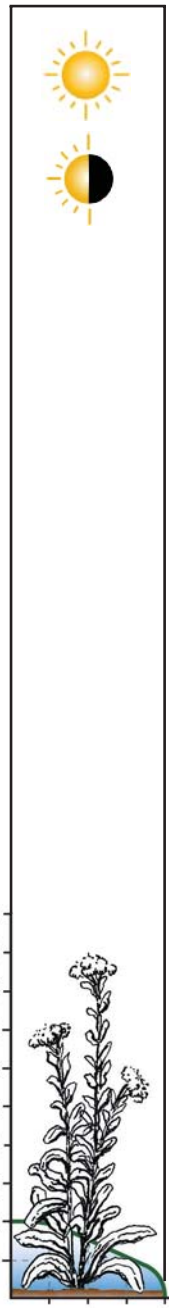
Nursery/Plant Information

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]

Photo: Paul Jackson

Additional Notes

Spiderwort is a monocot, so it is not damaged by broadleaf herbicides. [16]

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 ¼"-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, 3-7½' 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

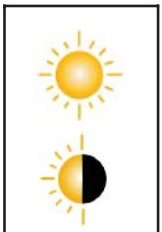
Frequency: High. **Depth:** 24". **Duration:** Long – 42 days (decreasing 12"/21 days). This species can tolerate regular, irregular or seasonal inundation. With constant inundation, this species can tolerate increased flood depth with high frequency and moderate-to-long durations. Light is essential 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



these stands lack diversity. [11, 16, 37]

Photo: Paul Jackson

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

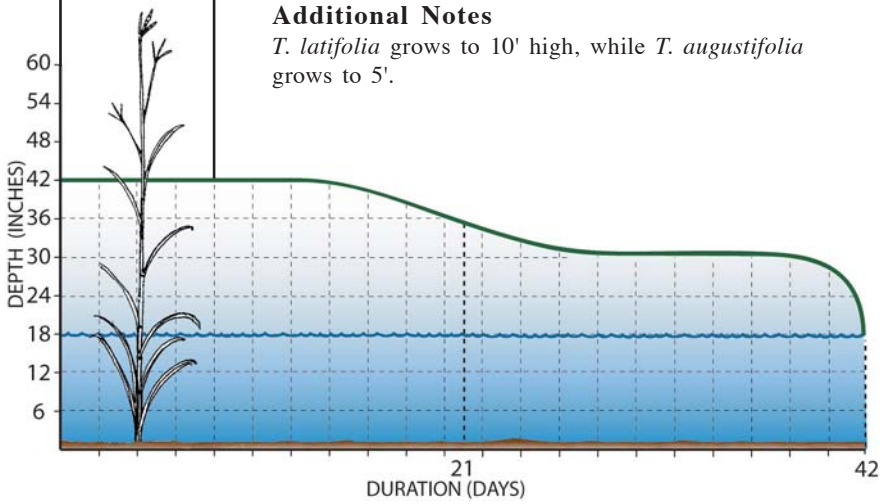
Available: Limited.
Types: Seeds, plants and roots.

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. augustifolia* 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]

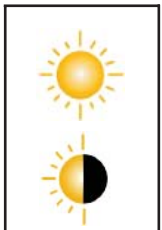
Sensitivities or Other Tolerances

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]

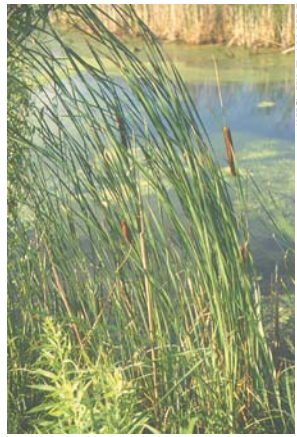


Photo: Dan Shaw

Wildlife Use

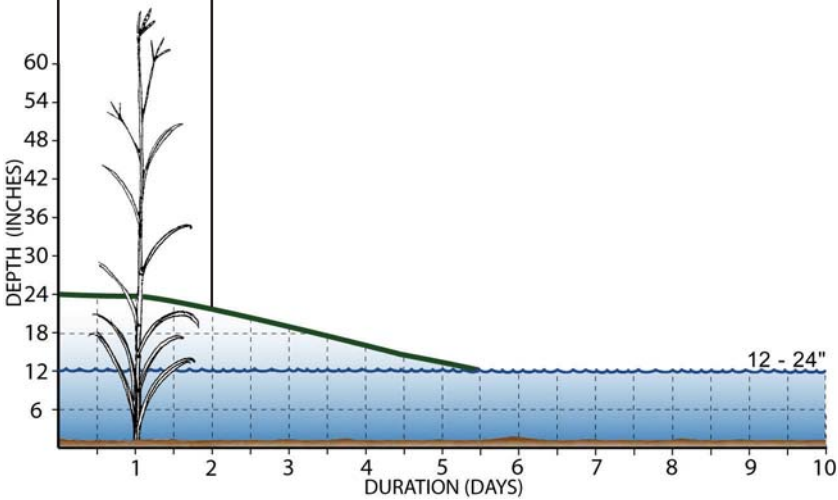
Hybrid cattail rootstock is more valuable as food than are the seeds. The starchy underground stems are eaten by geese and muskrats. Cattail stands also provide nesting for marsh wrens, and redwing and yellow-headed blackbirds. [32]

Nursery/Plant Information

Available: Not available. This hybrid is becoming problematic and should not be available.

Planting Techniques

Do not plant!



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

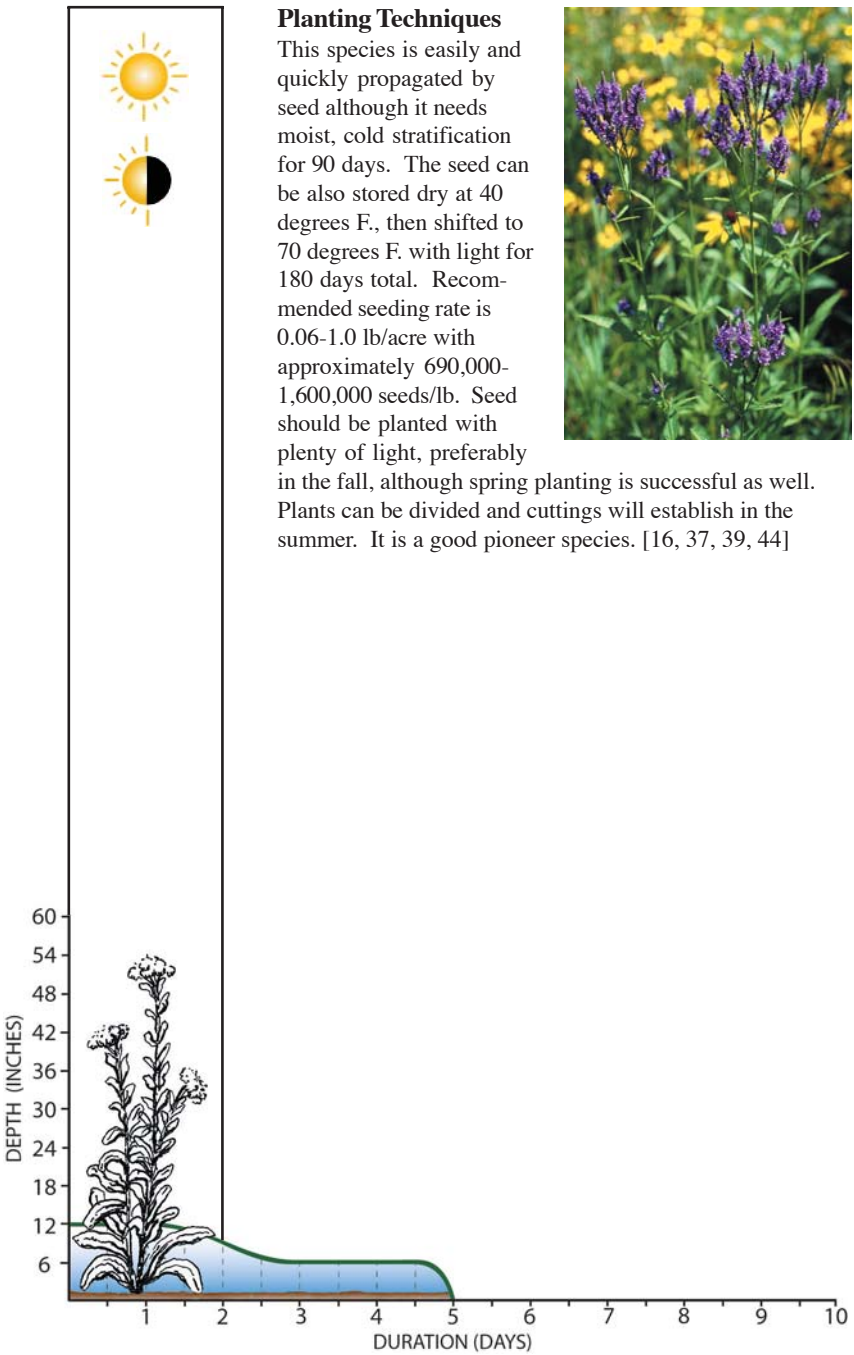
Available: Widely **Types:** Mainly seed, although plants can be found.

Indicator Status: FACW+

Photo: Paul Jackson

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]



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 root-stock. **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.

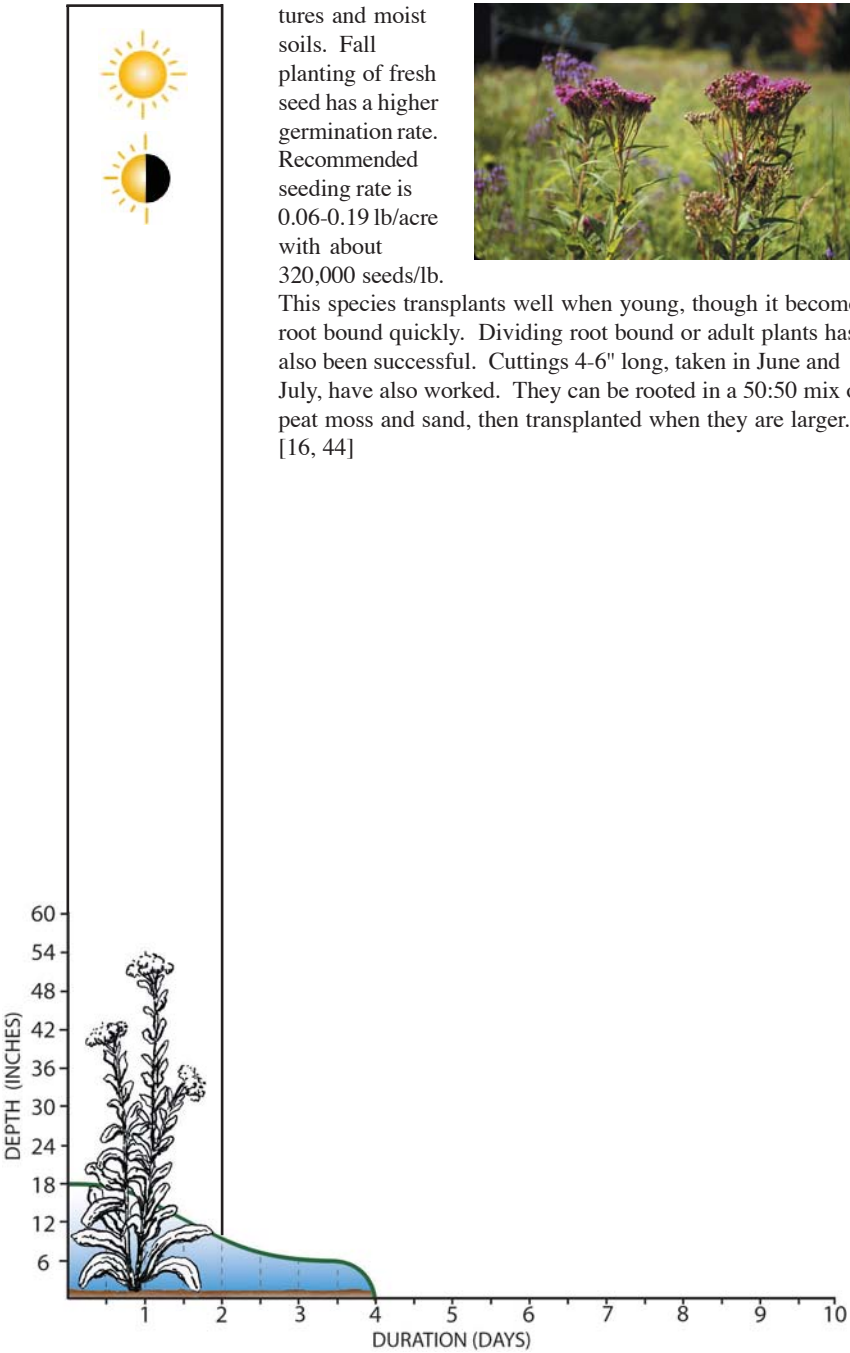
Planting Techniques

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

Photo: Paul Jackson

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. 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

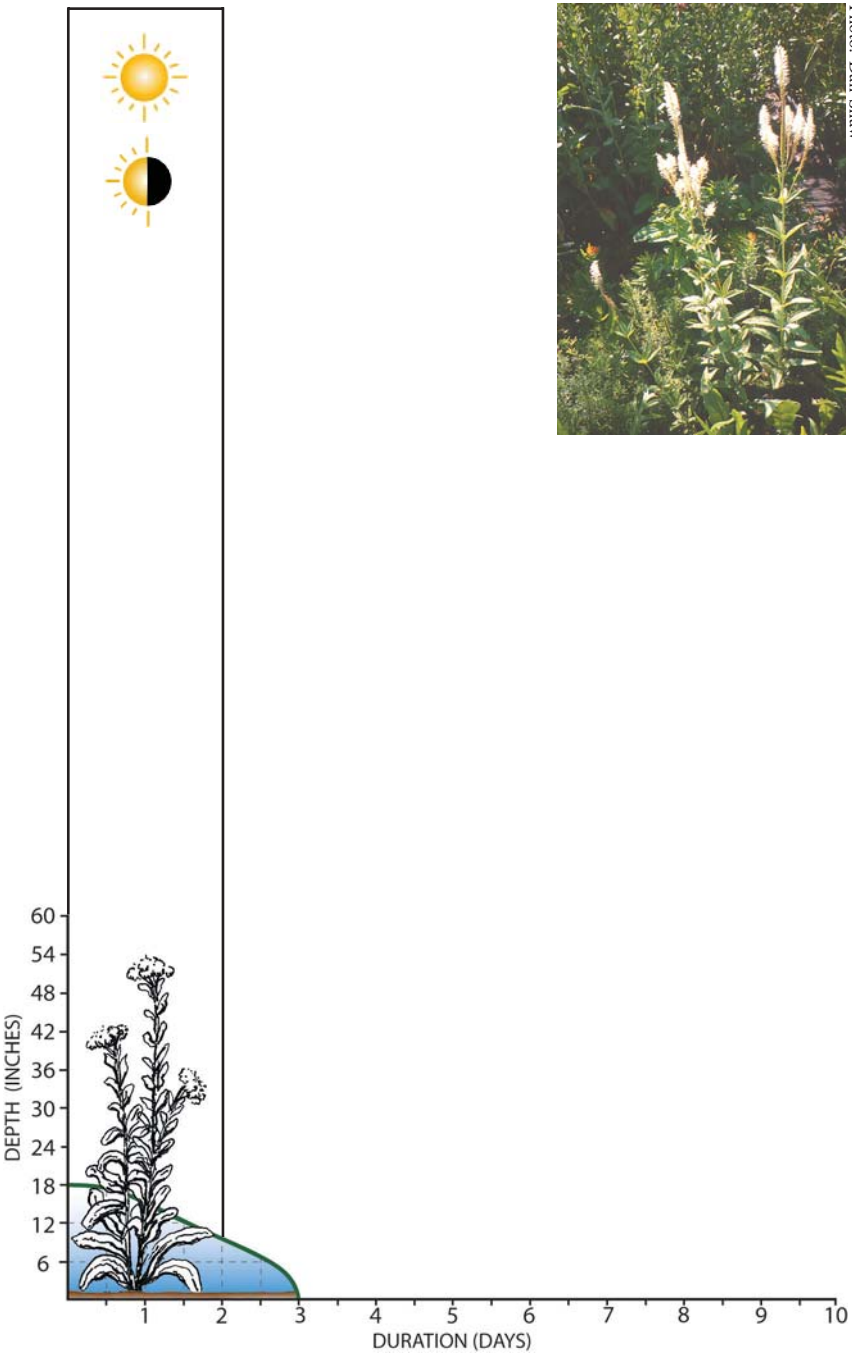
Available: Widely. **Types:** Plants and seed (although it is expensive).

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+

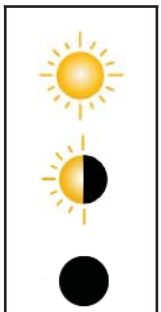


Photo: Dan Shaw

Wildlife Use

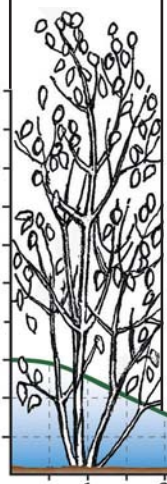
Ruffed and sharp-tailed grouse, pheasants, starlings, gray-cheeked and olive-backed thrushes, gray catbirds, common flickers, American robins, eastern bluebirds, rose-breasted grosbeaks, purple finches and cedar waxwings eat the fruit of this plant. The fruits also provide food for chipmunks and white-footed 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]

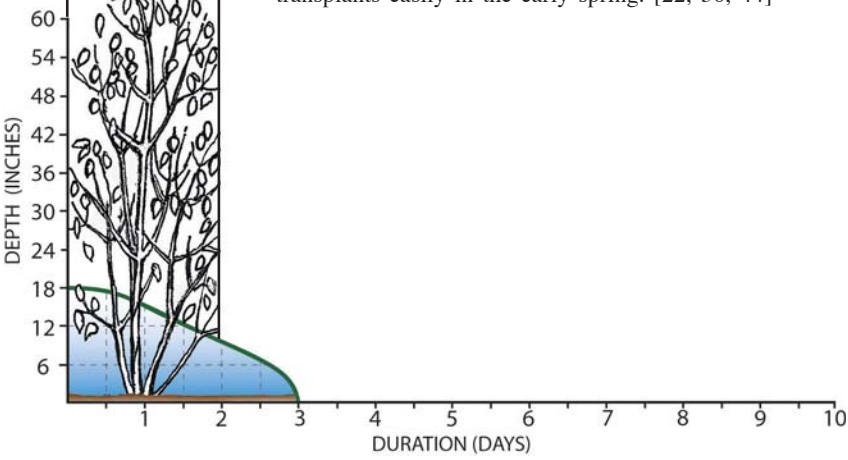
Nursery/Plant Information

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_2 and HFl. 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

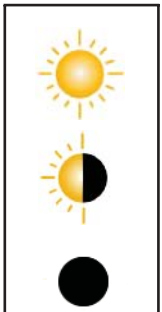


Photo:www.cala2.umn.edu/la5574

Wildlife Use

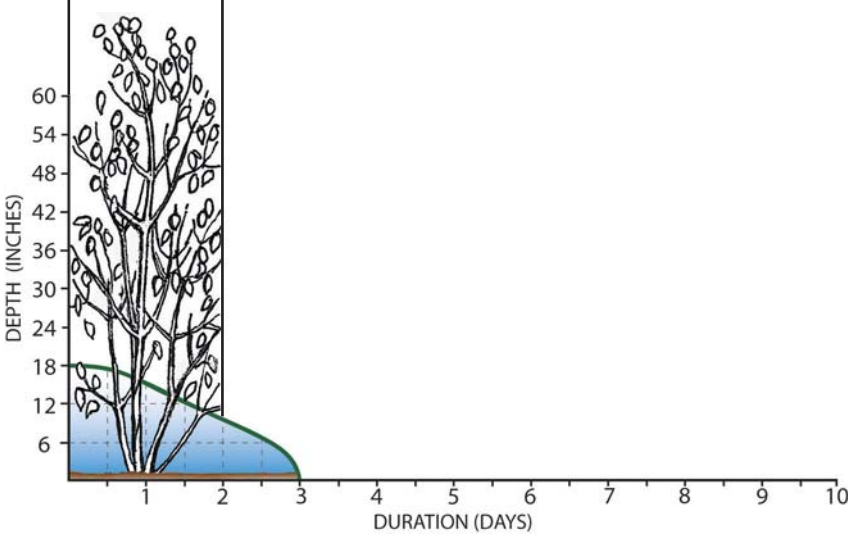
High bush cranberry provides fruit for ruffed and sharp-tailed grouse, pheasants, starlings, gray-cheeked and olive-backed thrushes, gray catbirds, common flickers, American robins, eastern bluebirds, rose-breasted grosbeaks, purple finches, and cedar waxwings. The fruit also provide food for chipmunks 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 acrid. [21, 22, 32, 37]

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

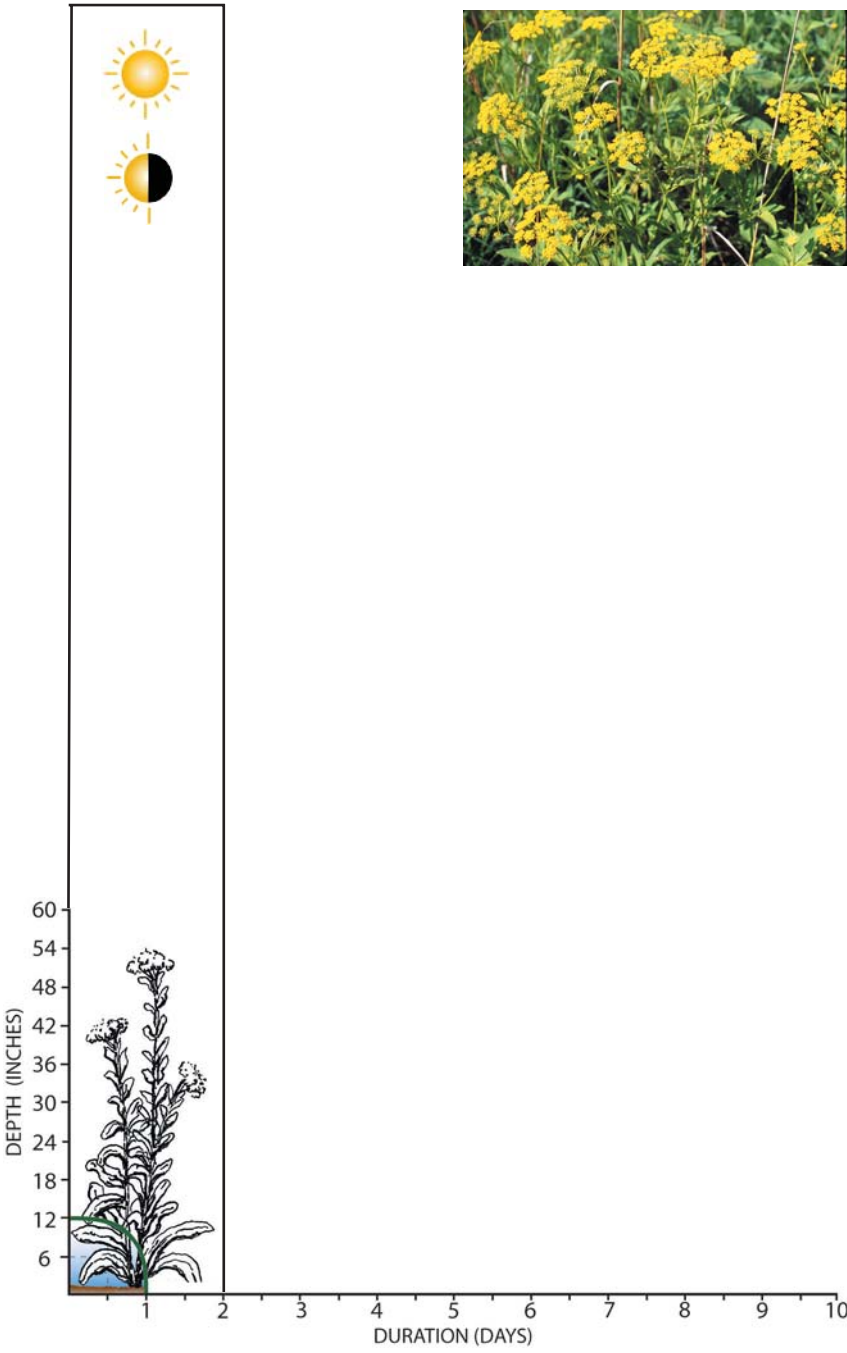


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Photo: Beth Kunkel

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 contractural 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 aquainted 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 commerical mycorrihizal 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 stablilize 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 tackafier can eliminate the need for additional mulch.

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: Rusty Schmidt

BROADCAST SEEDING

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.

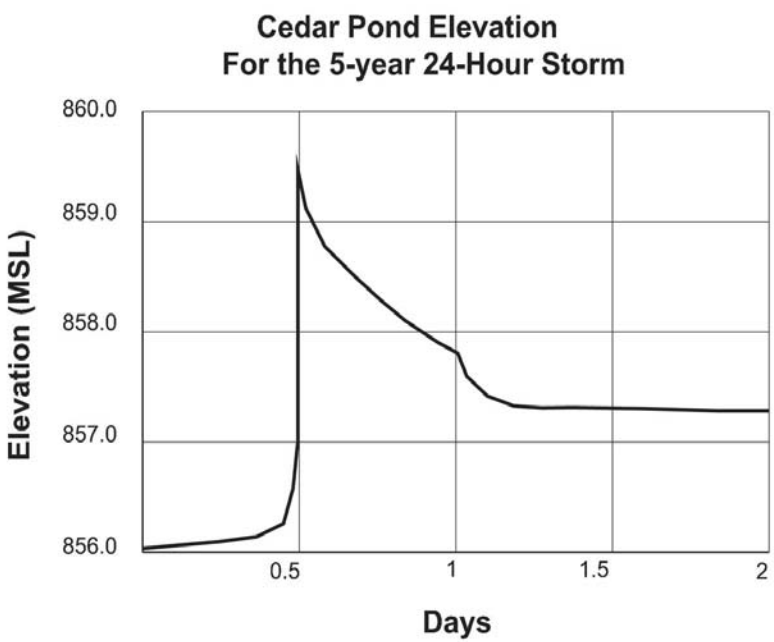
More than 3,000 plugs were added to the seed mix, and just a few species were not observed during the field survey. We were surprised to find pickerelweed and hardstem bulrush absent at the site even though they had been seeded and planted as plugs. The city has indicated that pickerelweed and two other 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.

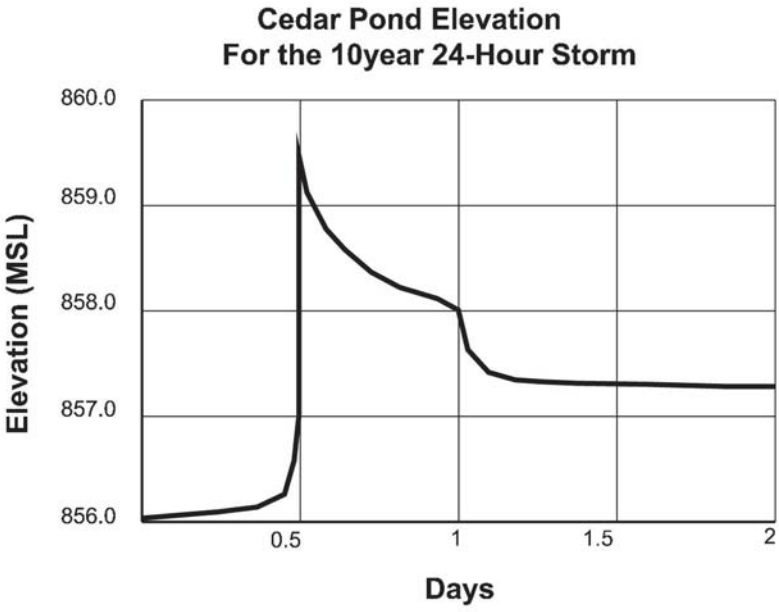
Only three grasses contained in the mesic tall-grass prairie seed mix (MnDOT 15B with F3 forb mix) were not encountered during the field survey. However, switchgrass is the only species of the three that is included in this guidebook. The other two were sideoats grama and slender wheatgrass. Only four 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
Elevation (MSL)
860.0
859.0
858.0
857.0
856.0
0.5
1
1.5
2
Days


Cedar Pond Elevation
For the 10year 24-Hour Storm
Elevation (MSL)
860.0
859.0
858.0
857.0
856.0
0.5
1
1.5
2
Days

Scientific Name	Common Name	Lowest Elevation in Relation to Outlet*	Highest Elevation in Relation to Outlet*
Acer saccharinum	Silver maple	+1.08 (single record)	
Acorus calamus	Sweet flag	+.58 (single record)	
Alisma trivale	Water plantain	+.63 (single record)	
Amorpha fruticosa	Indigo bush	+1.93 (single record)	
Andropogon gerardii	Big bluestem	+1.85	Unlimited
Aronia melanocarpa	Black chokeberry	+.83	Unlimited
Asclepias incarnata	Marsh milkweed	+1.19	+2.03
Aster laevis	Smooth aster	+1.11	
Aster novae-angliae	New England aster	+1.48	Unlimited
Aster puniceus	Red-stemmed aster	+.83 (single record)	
Bidens cernua	Beggarsticks	+2.25 (single record)	
Carex bebbii	Bebb's sedge	+.83	+1.13
Carex lacustris	Lake sedge	+.82	+1.56
Carex stipata	Awl-fruited sedge	+.67	+2.31
Eleocharis sp.	Spikerush	+1.03 (single record)	
Elymus virginicus	Virginia wild rye	+1.19	Unlimited
Eupatorium maculatum	Joe-pye weed	+1.38	+2.88
Eupatorium perfoliatum	Boneset	+1.11	+2.29
Glyceria grandis	Giant manna grass	+.38	+.75
Helenium autumnale	Sneezeweed	+.95	+1.91
Iris versicolor	Blueflag	+.84	+2.17
Juncus effusus	Soft rush	+.31	+.87
Lobelia cardinalis	Cardinal flower	+.78	+2.21
Lobelia siphilitica	Blue lobelia	+2.07 (single record)	
Lolium multiflorum	Annual rye grass	+1.71	Unlimited
Monarda fistulosa	Bergamot	+1.32	Unlimited
Phalaris arundinacea	Reed canary grass	+.53	+3.96
Polygonum sp.	Smartweed	+.79	+2.92
Populus deltoides	Eastern cottonwood (seedling)	+1.12	Unlimited
Ratibida pinnata	Yellow coneflower	+2.33	Unlimited
Sagittaria latifolia	Broadleaved arrowhead	-.01	+.87
Salix exigua	Sandbar willow	+.77 (single record)	
Schizachyrium scoparium	Little bluestem	+1.71	Unlimited
Scirpus atrovirens	Green bulrush	+.55	+.97
Scirpus cyperinus	Woolgrass	+.38	+1.36
Scirpus fluviatilis	River bulrush	-1.05	+1.20
Scirpus pungens	Three-square bulrush	-.70	
Scirpus validus	Soft-stem bulrush	-.67	+.01
Sorghastrum nutans	Indian grass	+2.33	Unlimited
Sparganium eurycarpum	Giant burreed	-.22	+.83
Spartina pectinata	Prairie cord grass	+.61	+1.49
Tradescantia ohiensis	Ohio spiderwort	+2.09	Unlimited

Ulmus americana	American elm	+1.49	Unlimited
Verbena hastata	Blue vervain	+1.19	+2.08
Vernonia fasciculata	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 Husveth

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 loose-strife, 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.

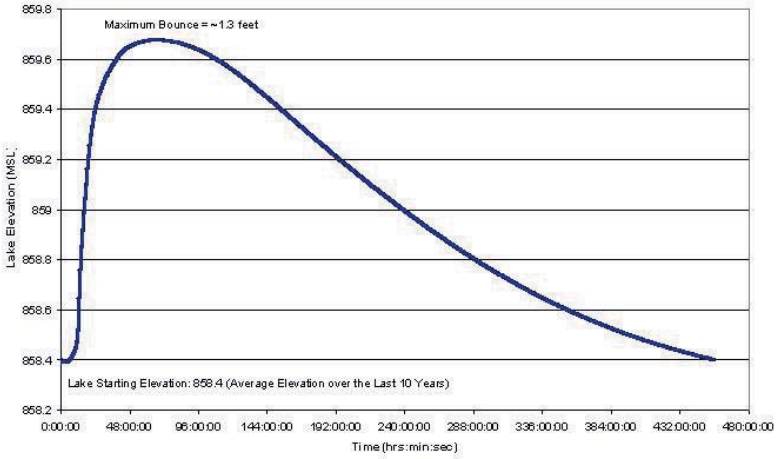
Only three of the 29 species in the short/dry grass seed mix were observed on site. This may be due to the location of seeding to the edge of the beach and also included several species not discussed in this guide. Of the 23 absent short-grass species, only five are included in this bood: butterflyweed, 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, panicled 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

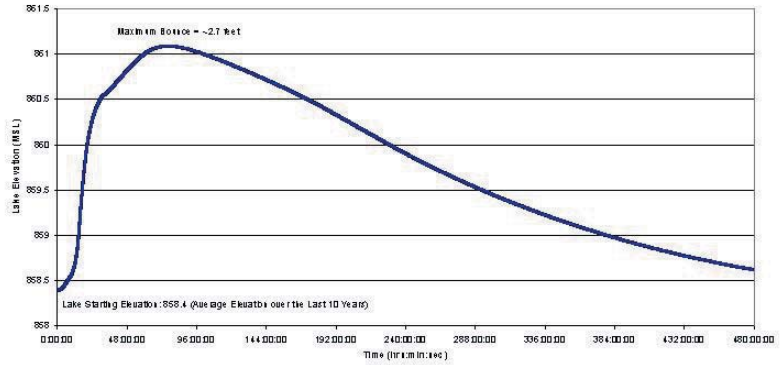
alexanders did not establish well from seed as they were not encountered during the survey.

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*
Acer saccharinum	Silver maple	+.93 (single record)	
Acorus calamus	Sweet flag	+.67 (single record)	
Alisma trivale	Water plantain	+.01 (single record)	+.23
Andropogon gerardii	Big bluestem	+1.21	Unlimited
Asclepias incarnata	Marsh milkweed	+.67 (single record)	
Aster novae-angliae	New England aster	+1.06	Unlimited
Aster puniceus	Red-stemmed aster	+.9 (single record)	
Carex crinita	Caterpillar sedge	+.68 (single record)	
Cornus sericea	Red-osier dogwood	+1.23	Unlimited
Eupatorium maculatum	Joe-pye weed	+.72	+85
Eupatorium perfoliatum	Boneset	+.95	+1.93
Fraxinus pennsylvanica	Green ash	+1.34	Unlimited
Helenium autumnale	Sneezeweed	+.90	Unlimited
Iris versicolor	Blueflag	+.88 (single record)	
Larix laricina	Tamarack	+1.60	+1.63
Lobelia siphilitica	Blue lobelia	+1.69 (single record)	
Lythrum salicaria	Purple loosestrife	-.18	+7.01
Phalaris arundinacea	Reed canary grass	+.95 (single record)	
Populus deltoides	Eastern cottonwood	+1.63	Unlimited
Rudbeckia subtomentosa	Brown-eyed Susan	+1.57	Unlimited
Salix exigua	Sandbar willow	+1.29 (single record)	
Salix nigra	Black willow	+1.03 (single record)	
Schizachyrium scoparium	Little bluestem	+1.74	Unlimited
Scirpus atrovirens	Green bulrush	+.91 (single record)	
Scirpus cyperinus	Woolgrass	+1.17 (single record)	
Scirpus effusus	Common rush	-.3	+1.74
Scirpus fluviatilis	River bulrush	+.33	+2.83
Scirpus pungens	Three-square bulrush	+.72	+1.36
Scirpus validus	Soft-stem bulrush	+.01 (single record)	
Solidago rigida	Stiff goldenrod	+1.39	+1.55
Sorghastrum nutans	Indian grass	+1.23	Unlimited
Sparganium eurycarpum	Giant burreed	-.37	+1.28
Spartina pectinata	Prairie cord grass	+.3	+1.08
Typha latifolia	Broadleaved cattail	+.71	+.93
Typha angustifolia	Narrow-leaved cattail	-.22 (single record)	+1.28
Verbena hastata	Blue vervain	+1.62	+1.91
Viburnum trilobum	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.

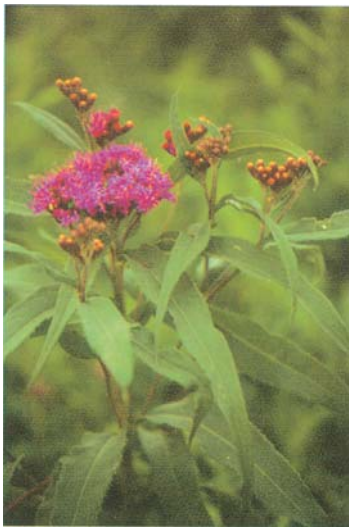


Photo: Dan Shaw

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.

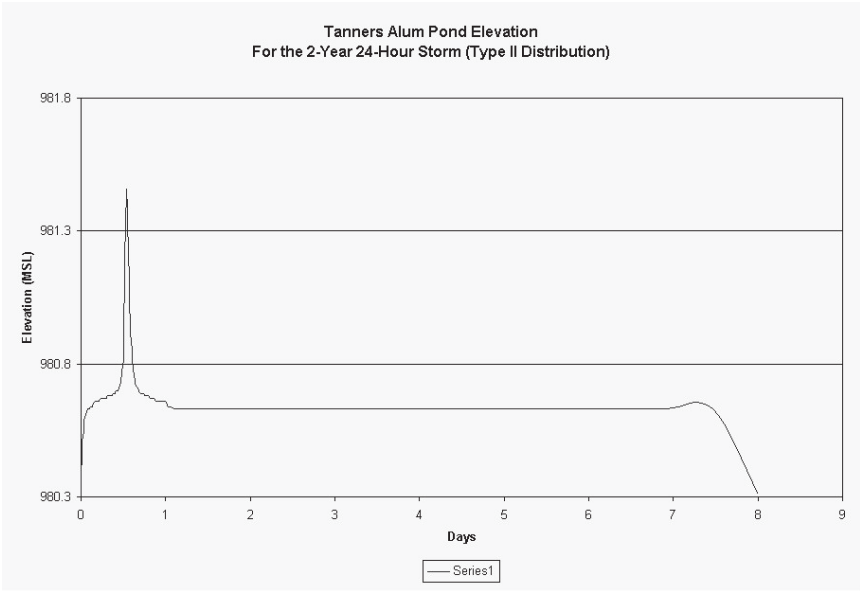
While comparing the planting and seeding list of Alum Pond with what was observed during the field survey, a couple of significant findings were noted. Other than the shrubs, this species was not planted with plugs but just seeded. Thirteen of the 37 species observed were volunteer species, or species 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.

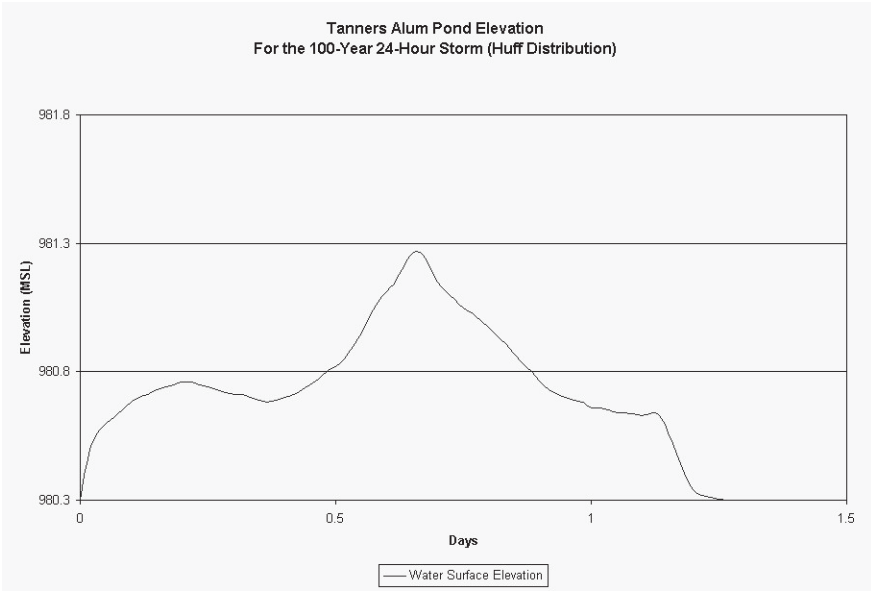
Seed was planted in distinct wetland zones as three mixes; mesic grass/forb mix (lowland prairie), wet grass/forb mix (wet meadow) and marsh mix (emergent and lower zones). In the upper zone, 32 plant species were encountered during the survey, eight of which were documented. The remaining 24 plant species 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, panicled 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, panicled aster and Canada blue-joint grass.


Tanners Alum Pond Elevation
For the 2-Year 24-Hour Storm (Type II Distribution)
981.8
981.3
980.8
980.3
Elevation (MSL)
0
1
2
3
4
5
6
7
8
9
Days
Series1


Tanners Alum Pond Elevation
For the 100-Year 24-Hour Storm (Huff Distribution)
981.8
981.3
980.8
980.3
Elevation (MSL)
0
0.5
1
1.5
Days
Water Surface Elevation

Scientific Name	Common Name	Lowest Elevation Relation to Outlet*	Highest Elevation in Relation to Outlet*
Andropogon gerardii	Big bluestem	+1.27	Unlimited
Asclepias incarnata	Marsh milkweed	+.52	+.62
Aster novae-angliae	New England aster	+.56	Unlimited
Bidens spp.	Beggersticks	+.46 (single record)	
Carex comosa	Bottlebrush sedge	+.07	+.61
Cornus sericea	Red-osier dogwood	+1.16	Unlimited
Eleocharis sp.	Spikerush	-.29 (single record)	
Eupatorium maculatum	Joe-pye weed	+.51	+1.13
Eupatorium perfoliatum	Boneset	+.46 (single record)	
Helenium autumnale	Sneezeweed	+.88	Unlimited
Helianthus grosseserratus	Sawtooth sunflower	+1.34	+2.26
Impatiens capensis	Jewelweed	+.38	+1.09
Iris versicolor	Blueflag	+.28 (single record)	
Juncus effusus	Soft rush	-.17 (single record	
Juncus torreyi	Torrey rush	+.21 (single record)	
Lythrum salicaria	Purple loosestrife	-.30	+.14
Spiraea alba	Meadowsweet	+.91 (single record)	
Monarda fistulosa	Wild bergamot	+1.61	Unlimited
Panicum virgatum	Switchgrass	+.48	Unlimited
Populus deltoides	Eastern cottonwood seedling	+.51	Unlimited
Ratibida pinnata	Yellow coneflower	+1.24	Unlimited
Sagittaria latifolia	Broadleaved arrowhead	-.48 (single record)	
Salix nigra	Black willow	+2.36	Unlimited
Sambucus racemosa	Red-berried elder	+1.64	Unlimited
Scirpus atrovirens	Green bulrush	+.24	+.51
Scirpus cyperinus	Woolgrass	+.33 (single record)	
Scirpus fluviatilis	River bulrush	+.25	+1.9
Scirpus validus	Soft-stem bulrush	-.28	+.52
Scutterlaria lateriflora	Mad dog skullcap	+.45 (single record)	
Silphium perfoliatum	Cup plant	+1.4 (single record)	
Solidago rigida	Stiff goldenrod	+.58	Unlimited
Sorghastrum nutans	Indian grass	+1.46	Unlimited
Spartina pectinata	Prairie cord grass	+.22 (single record)	
Typha angustifolia	Narrow-leaved cattail	-.76	.00
Verbena hastata	Blue vervain	+.5	+.63
Viburnum trilobum	High bush cranberry	+1.48 (single record)	
Zizia aurea	Golden alexanders	+.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.

This publication was completed with funding from the U.S. Environmental Protection Agency and the Minnesota Pollution Control Agency.

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