

NBP-92-101

Stormwater Basin Plants & Landscaping Guide:

A Simple Guide for Designers and Communities

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The Land Management Project

Narragansett Bay Estuary Program

Current Report

The Narragansett Bay Project

STORMWATER BASIN PLANTS AND LANDSCAPING GUIDE: A SIMPLE GUIDE FOR DESIGNERS AND COMMUNITIES

PREPARED BY:

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Ms. Jennie C. Myers

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The Narragansett Bay Project is sponsored by
the U.S. Environmental Protection Agency and
the R.I. Department of Environmental Management.



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FOREWORD

In 1985 the United States Congress directed the U.S. Environmental Protection Agency (US EPA) to conduct programs in four estuaries including Narragansett Bay, citing its concern for the "health and ecological integrity" of the nation's estuaries and estuarine resources. The Narragansett Bay Project (NBP) was established in 1985 under the joint sponsorship of the US EPA and the Rhode Island Department of Environmental Management with the mandate to direct a program of research and planning focussed on managing Narragansett Bay and its resources for future generations. The National Estuary Program was created by the amendments to the Clean Water Act in 1987; and Narragansett Bay was designated an "estuary of national significance" in 1988.

The NBP developed a draft Comprehensive Conservation and Management Plan (CCMP) in December 1991, which recommended actions to improve and protect the Bay and its natural resources.

The NBP has established the following seven issues of concern for Narragansett Bay:

- management of fisheries
- nutrients and potential for eutrophication
- impacts of toxic contaminants
- health and abundance of living resources
- land-based impacts on water quality
- recreational uses

The NBP is taking a watershed-based ecosystem approach to address these problems and has funded research that will help to improve our understanding of various aspects of these priority problems. The Project is also working to expand and coordinate existing programs among federal, state and local agencies, as well as academic researchers, in order to apply research findings to the practical needs of managing the Bay and improving the environmental quality of its watershed.

This report summarizes the activities and accomplishments of the Land Management Project between 1988 and 1991. The Land Management Project was established by a competitive "action plan" grant to the NBP from the US EPA under Cooperative Agreement #CX815457 in 1988. The grant was awarded for the purpose of developing guidance for state and local planners regarding 1) "best management practices" for controlling nonpoint source pollution, and 2) innovative land use and growth management techniques for protecting environmental quality.

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The Land Mangement Project is sponsored by the U.S. EPA and the R.I. DEM

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STORMWATER BASIN PLANT AND LANDSCAPING GUIDE: A Simple Guide for Designers and Communities

by

Jed S. Merrow
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Land Management Project - October 1991

Detention and retention basins and other kinds of man-made stormwater ponds are an increasingly common method of runoff control and treatment. An often overlooked but key aspect of the design of these basins is landscaping. Proper landscaping contributes to several important basin functions by:

- stabilizing the slopes surrounding the pond
- trapping sediments and preventing their resuspension
- reducing runoff velocity and thereby promoting settling of sediments
- removing pollutants
- improving habitat, aesthetic, and recreational value
- minimizing maintenance requirements
- providing shade to reduce thermal pollution

Because it is critical to the effectiveness of stormwater basins, **a landscape plan, developed by a registered landscape architect, should be submitted with every stormwater basin design**. The plan should include planting, construction, and maintenance schedules. This guidance serves as a reference for those involved in the design or review of stormwater basins. It lists plants suited to different zones of a basin and describes the erosion control value, wildlife value, pollutant uptake value, and other characteristics of some key species. References are provided for those seeking further information or plant materials.

The following topics are covered in this guide:

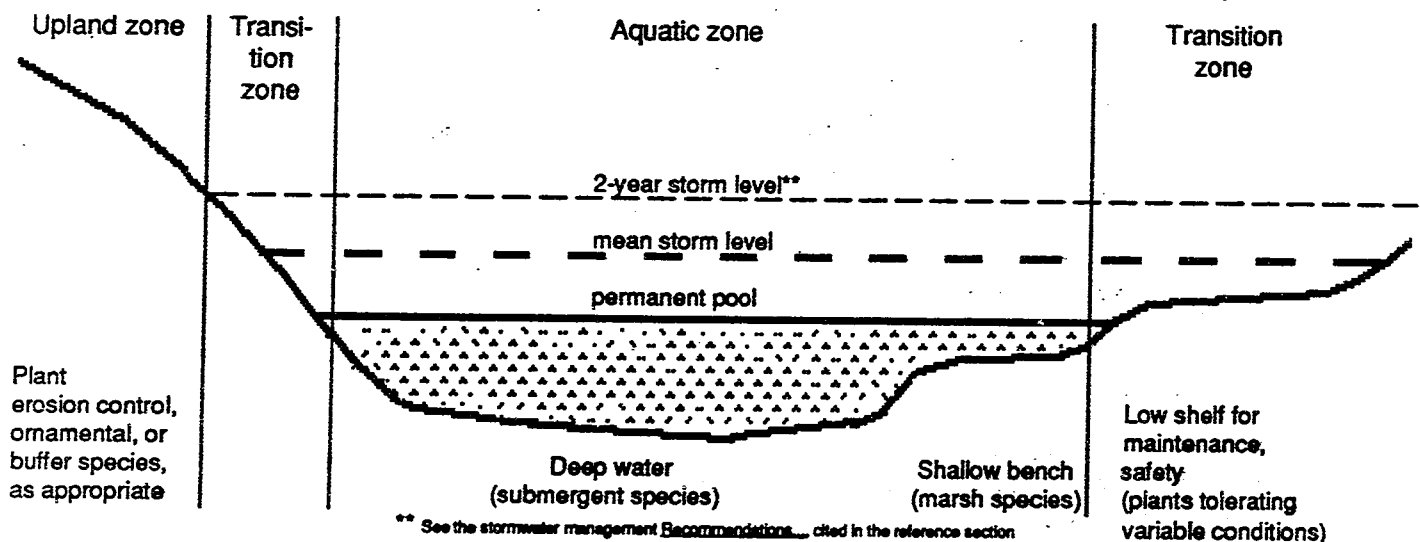
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Site Selection and Basin Design

There are many important technical guidelines for determining basin shape, depth, volume, and area. The publications listed in the references section are excellent resources and should be consulted for basin design. Some important general considerations for basin siting and design include:

- **Location:** A stormwater basin should be located in a naturally low area in the landscape. However, the basin floor should be at least 1 foot above the seasonal high water table (top surface of the groundwater) to avoid direct contact with the groundwater and to allow treatment by infiltration through the soil.
- **Slopes:** Avoid steep slopes - use soft, varying slopes of 3:1 (i.e., 3 feet of "run" for every foot of rise) or lower that follow existing topography as much as possible. Low slopes are important, as they promote vegetational diversity, erosion control, pollutant removal, and safety. A low shelf should be built within and around the pond for vegetation establishment, maintenance and safety.
- **Appearance:** The pond design should follow the landscape, but the pond may be designed to either blend in or provide contrast with the landscape. A vegetated basin can and should be aesthetically attractive.
- **Shape:** The length should be at least two times the width, and there should be no "dead storage," i.e., "backwater" areas where there is no flow or mixing and water can become stagnant, a condition which promotes mosquito breeding. These areas will not receive direct stormwater input and will provide less pollutant removal. Informal, undulating shapes fit better into the landscape than rectangular, square or circular shapes.
- **Fencing:** Fencing is sometimes required because of liability concerns, but detracts from the natural beauty and wildlife value of a pond. Previous court cases suggest that artificial ponds with low slopes and natural appearance are natural hazards, and fencing is unnecessary; towns should consult their attorneys on this issue. Low fencing may discourage children, can be screened with vegetation, and can be a part of pond design.

Figure 1. Cross-section of typical stormwater basin, showing vegetational zones (adapted from Schueler 1987)



Plant Selection

Plant species may be selected for their ability to provide pollutant uptake, habitat for wildlife, ornamental value, erosion control, etc. Initially, the most important consideration is to stabilize the soils and slopes and to establish a functioning ecosystem. Once these are ensured, other factors should be considered.

Detention and retention ponds are typically surrounded by slopes with a varying moisture content and corresponding vegetational zones. Because of the variability of stormwater flow and differences in basin construction, however, the soil moisture conditions in stormwater ponds will vary widely. For plant species to thrive they must be able to tolerate a range of conditions, even within a particular vegetational zone. "Wet ponds" (usually retention ponds that retain the water flowing into them) have a large permanent pool (aquatic zone) with transition zones and upland zones around the perimeter. "Extended detention basins" have less water but are frequently flooded, and have a large area of transition zone vegetation. Dry detention basins are less often flooded, but may have an extensive transition zone on the basin floor.

In Figure 1 above, the pond has been divided into three simplified vegetational zones: aquatic (nearly always wet), transition (alternately wet and dry), and upland (usually dry). A brief description of these zones, their functions, and plant recommendations follows. The tables on the following pages include a more comprehensive list of plants which are suited to these zones.

1. Aquatic Zone - nearly always wet

The aquatic zone, including both shallow and deep water areas, is almost always under water. The submergent vegetation (under water) and emergent vegetation (growing out of the water) in this zone enhance pollutant uptake, provide food and cover for wildlife, reduce water velocities, and stabilize soils. Submergent plants may be difficult to establish and can lead to clogging of outlets, and so are not usually planted; they may however be appropriate for some situations. Emergent vegetation can usually be established successfully.

Highly recommended emergent species include arrowhead, cattail, common three-square, lizard's-tail, and sweet flag. Of these, all but sweet flag are aggressive colonizers and are therefore good for marsh establishment. However, cattails may rapidly out compete other species and reduce the diversity and wildlife value of the marsh area.

2. Transition Zone - alternately wet and dry

The transition zone is the variably-wet area around the edge of a wet pond or in the floor of an extended detention pond. It can be subdivided into the pond shoreline, "riparian fringe" (the upper shore that is occasionally inundated), and floodplain terrace (infrequently inundated, low-sloped areas). The key characteristic of the transition zone is the variability of conditions; plants with wide tolerances are required. Vegetation in this zone stabilizes the soil from erosion, traps sediments, provides cover, nesting and foraging areas for wildlife, reduces water velocities, and helps maintain soil infiltration capacity through root penetration.

The lower, more consistently wet parts of this zone are suited to emergent and other herbaceous vegetation and some shrubs. The side slopes are suited to erosion-control species, while the gentler slopes and floodplain areas can accommodate more woody species. Some of the species that do particularly well in the transition zone are reed-canary grass, switchgrass, red osier dogwood, sweet pepperbush, and red maple. See the tables provided for other species.

3. Upland Zone - usually dry

The upland zone includes areas that are rarely inundated. The upper slopes may be dry but may be important for erosion control, sediment trapping, reduction of water velocity, and nutrient removal. Wildlife forage and cover, aesthetics, and safety are some of the other values that the upland plants may provide. Most of the vast number of upland species are not included in the tables, but many of the species listed, especially the erosion control species, may be appropriate. Some of the grasses, including tall fescue and perennial rye, have high nutrient uptake capability and may be very effective in "pre-treating" runoff flow to the pond from adjacent areas, assuming that channeling of the buffer zone can be prevented.

Landscaping Tips and Establishment Techniques

The following landscaping methods are drawn from the Maryland-National Capital and other publications, cited in the reference section.

1. **Consider aesthetics in species selection and basin design.** The species and form should correspond with the setting and design.
 2. **Native plant species are generally preferable**, as they are better adapted to local conditions, blend in with the landscape better, and require less maintenance than other species. Non-native species (ornamentals, some grasses) may be appropriate for some situations, e.g., to create a park-like atmosphere around a wet pond or to enhance nutrient removal. Except for a few grasses, almost all of the species listed below are native.
 3. **Use high-quality seed and nursery stock;** a small extra expense could make a big difference in successful establishment. Some sources of nursery stock are listed below.
 4. **The best time for planting** in Rhode Island is the spring and fall, or roughly late March to early June and mid-August to late September.
 5. **Prepare the soil before planting.** Soils are compacted during construction and will have to be loosened before planting. Amendments such as topsoil, fertilizer, and organic matter may be necessary in non-aquatic zones. Areas to be seeded should have at least 6" of loam.
 6. **Plant a temporary vegetational cover.** After construction, soils are highly erodible and should be planted with fast-growing, temporary ground cover such as ryegrass, millet, and reed-canary grass, or stabilized with jute netting. Erosion control materials such as netting may be desirable. Refer to the Rhode Island Soil Erosion and Sediment Control Handbook for guidelines on erosion control plantings and BMPs.
 7. **Fertilizer:** No fertilizer should be used in aquatic areas. Elsewhere, for establishment only, use 10-10-10 or equivalent applied at a rate of about 300 lb/acre. At least one third of the fertilizer should be slow release.
 8. **During the first few years of establishment**, the vegetation will be highly exposed to sun, wind, and cold. Appropriate species should be selected. Extra maintenance (fertilizer, weeding, etc.) may be required for the first few years after planting.
 9. **Trees with large root balls (>30")** should not be planted on pond embankments, as they threaten the stability of the slope.
 10. **Holes for trees and shrubs:** Soils around ponds are usually compacted during construction, so planting holes will have to be dug larger and filled with loose soil and mulch. Tree holes should be at least 12" wider than the plant ball and no deeper than the ball height. In wet or poorly drained areas, it may be preferable to plant trees 2"-4" above the grade.
 11. **Marsh establishment can be particularly difficult.** Some guidelines:
 - The marsh area should be a shallow bench about 0.5-3 feet deep and 10-20 feet wide.
 - The optimum water depth is around 6 inches to a foot; regrading may be necessary to achieve this depth. Do not plant in more than 3 feet of water.
 - Live plants, peat pots, or dormant rhizomes or tubers from nursery stock have proven much more successful than seeds. Muck from a natural wetland can provide an inexpensive, natural seed source.
 - Tubers and peat pots should be weighted (so they will sink) and gently pushed into the muck bottom.
 - At least two "aggressive" species should be planted in a few large clumps over about 30% of the marsh.
- Aggressive marsh species include arrowhead, cattail (may be too aggressive, but suitable for certain situations), common three-square, and lizard's tail. Three or more "secondary" species - species that are not as

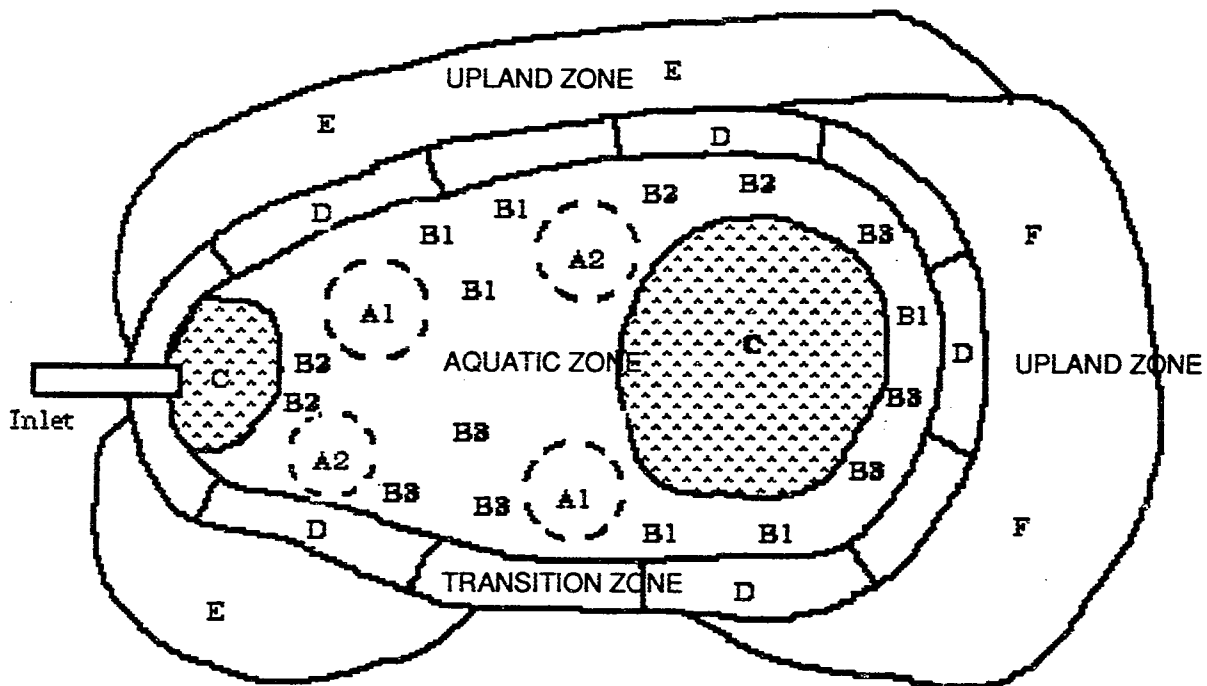
aggressive but have some desired value (wildlife, aesthetics, nutrient uptake) - should be randomly distributed in smaller clumps across the marsh. See Figure 2 below for a sample planting scheme.

12. **Maintenance:** Extra maintenance, especially watering, is required during the establishment period, and there may also be other long-term maintenance requirements. Some species (e.g., reed-canary grass, *Phragmites*) will invade downstream areas and should be prevented from seeding by harvesting seed heads. If grasses are planted for nutrient removal, they should be harvested and the clippings removed annually (and disposed of properly).

Determine ahead of time what maintenance requirements there will be and who will be responsible, and write provisions into the town's approval. Contact the RI DEM Freshwater Wetlands Section to request clarification regarding maintenance procedures.

13. **Follow-up:** To ensure that a basin is constructed properly and vegetation is successfully established, it should be inspected prior to release of construction bonds, and at regular intervals thereafter. Note that full establishment and stabilization of a vegetated basin may take several years. Certification of successful establishment can be part of a town's conditions of approval. See RIDEM's Recommendations of the Stormwater Management... publication, listed in the reference section, for recommendations on maintenance and

Figure 2. Example of a stormwater basin planting strategy
(Adapted from Maryland-National Capital Park and Planning Commission 1988)



LEGEND

- A1, A2 - Locations of the two primary (aggressive) wetland species, planted in large clumps in aquatic zone
- B1, B2, B3 - The three secondary wetland species, planted in small clumps in aquatic zone
- C - Deep open water areas: submergents or no vegetation
- D - Shoreline fringe/safety bench (transition zone): emergent vegetation
- E - Riparian or floodplain buffer (mainly upland zone): wildlife or wetland trees and shrubs
- F - Embankment (upland zone): grass/herbaceous cover for slope stabilization, nutrient removal (no trees)

Sources of Hard to Obtain Plant Materials

Applewood Seed Company
(For grasses and wildflower mixes)
5380 Vivian Street
Arvado, CO 80002
(303) 431-6283

Salem Country Gardens
(Wide selection in stock; can be special ordered)
380 New London Road
Salem, CT 06145
(203) 859-2508

Blackledge River Nursery
(Wetland plants)
Route 354
Salem, CT 06415
(203) 859-2428

Slocum Water Gardens
(Wetland plants)
1101 Cypress Gardens Road
Winter Haven, FL 33880
(813) 293-7151

Botanicals
(Xeriscaping - New England)
219 Concord Road
Wayland, MA 01778
(508) 358-4846

Three Spring Fisheries
(Wetland Plants)
124 Hougar Road
Lilypons, MD 21717
(301) 662-2230

Environmental Concern, Inc.
(Sells selected wetland and wildlife habitat plants)
P.O. Box P, 210 West Chew Avenue
St. Michaels, MD 21663
(301) 745-9620

Tricker, William, Inc.
(Wetland plants)
74 Allendale Avenue
Saddle River, NJ 10758
(216) 524-3491

Kester's Wild Game Food Nurseries, Inc.
(Wide selection, including many wetland species)
P.O. Box V
Omro, WI 54963
(414) 685-2929

Van Ness Water Gardens
(Wetland plants)
2640 North Euclid Avenue
Upland, CA 91786
(714) 982-2425

Lilypons Water Garden
(Mainly aquatic plants)
6800 Lilypons Road
Lilypons, MD 21717
(301) 874-5133

Wildlife Nurseries
(Marsh and other wildlife plants)
P.O. Box 2724
Oshkosh, WI 54901
(414) 231-3780

R.A. Gasser
(Wetland plants)
Route 2, Box 75
Stuart, FL 33494
(407) 283-1379

TABLE 1. PLANT SPECIES RECOMMENDED FOR STORMWATER BASIN LANDSCAPING IN RHODE ISLAND

AQUATIC ZONE					
Herbaceous plants		Shrubs		Trees	
	<u>Subzone</u>		<u>Subzone</u>		<u>Subzone</u>
Arrow arum	2	Buttonbush*	2-3	(None)	
Arrowhead	2				
Broom sedge	2-3				
Cattail*	2-3				
Common three-square*	2				
Coontail	1				
Lizard's tail*	2				
Marsh hibiscus	2-3				
Pickeralweed	2-3				
Pondweed	2-3				
Rice cutgrass	2-3				
Sedges	2-3				
Smartweed	2				
Softstem bulrush*	2-3				
Sweetflag*	2-3				
Switchgrass	2-6				
Wild celery	1				

TRANSITION ZONE					
Herbaceous plants		Shrubs		Trees	
	<u>Subzone</u>		<u>Subzone</u>		<u>Subzone</u>
Annual rye	5-6	Arrowwood*	4-5	American beech	5-6
Bermudagrass	4-6	Elderberry*	4-6	American elm	5-6
Cattail*	2-3	High bush blueberry*	3-5	American holly	5-6
Creeping red fescue*	4-6	Red chokeberry	3-5	Black birch	4-6
Foxtail	4-6	Red osier dogwood*	3-5	Black gum	4-6
Kentucky bluegrass	5-6	Rhododendrons	3-6	Black locust	4-6
Ladino clover	4-5	Silky dogwood*	5-6	Black willow*	3-5
Millet*	4-6	Spicebush*	5-6	Box elder	4-5
Redtop	3-6	Sweet pepperbush*	3-6	Green ash	4-5
Reed-canary grass*	3-6	Virburnum species	3-6	Larch	3-6
Perennial rye*	5-6	Winterberry*	4-5	Pin oak*	4-6
Rice cutgrass	3-4	Witch hazel	4-6	Red maple*	4-6
Sedges	2-3			River birch*	3-4
Soft rush*	2-4			Shadbush	5-6
Switchgrass	2-6			Silver maple	4-6
Tall fescue*	4-6			Sugar maple	5-6
Winter rye	5-6			Swamp white oak	4-5
				Sweet gum	4-6
				Sycamore	4-6
				Tulip tree	5-6
				Willows	3-6

TABLE 1. (Continued)

UPLAND ZONE					
Herbaceous plants		Shrubs		Trees	
	Subzone		Subzone		Subzone
Annual rye	5-6	Autumn olive	6	American beech*	5-6
Bermudagrass	4-6	Chokecherry*	5-6	American elm	5-6
Bird's-foot trefoil	5-6	Elderberry	4-6	American holly	5-6
Colonial bentgrass	5-6	Mountain laurel	6	Ashes	4-6
Creeping red fescue	4-6	Rhododendron sp.	3-6	Cherries	6
Crown vetch*	6	Shadbush*	5-6	Flowering dogwood	6
Flatpea*	6	Silky dogwood	5-6	Oaks: black, red, scarlet, white	6
Foxtail	4-6	Viburnum species	3-6	Pin oak	4-6
Kentucky bluegrass	5-6	Witch hazel	4-6	Pines	6
Millet	4-6			Shadbush	5-6
Perennial rye*	5-6			Silver maple	4-6
Redtop*	3-6			Spruces	6
Reed-canary grass*	3-6			Sugar maple	5-6
Switchgrass	5-6			Sycamore	4-6
Tall fescue*	4-6			Tulip tree	5-6
Winter rye	5-6				

KEY

* indicates a species of particular importance, described in more detail in Table 2.

Subzones: 1 = Deep water, 2 = Shallow water, 3 = Shoreline, 4 = Riparian Fringe, 5 = Floodplain, 6 = Upland zone

TABLE 2. CHARACTERISTICS OF PRIMARY SPECIES FOR STORMWATER BASIN LANDSCAPING
(Notes on other selected species are listed at the end of the table.)

Herbaceous Plants		Where to Plant	Erosion Control	Wildlife Value	Ht.	Inundation	Toler. to Sun/shade	Soil Requir.	Notes
Arrowhead (<i>Sagittaria latifolia</i>)	Shallow marsh to 1'			High: seeds, tubers	1-3'	Y	Sun, partial shade	Wet	Spreads rapidly
Cattail (<i>Typha latifolia</i>)	Shallow marsh to 1'			Moderate	to 10'	Y	Sun	Wet	Aggressive
Common three-square (<i>Scirpus americanus</i>)	Shallow marsh to 1', shores		Good	High: waterfowl, other birds	2-4'	Y	Sun	Wet	Spreads rapidly; tolerates drying; attractive
Creeping red fescue (<i>Festuca comutata</i>)	Erosion control, swales, basins		Good	Moderate		Y	Shade		Low maintenance
Crown vetch (<i>Coronilla varia</i>)	Erosion control areas		Excel.	Low	Low	N	Sun	Dry	Drought-tolerant, low maintenance
Flatpea (<i>Lathyrus sylvestris</i>)	Erosion control or disturbed areas		Excel.	Low	Low	N	Sun	Dry, poor	May require liming
Lizard's tail (<i>Saururus cernuus</i>)	Shallow marsh to 1'			Low	2-3'	Y	Shade-tolerant	Wet	Grows rapidly
Loosestrife (<i>Lythrum</i>)	Swales, floodplains		Good	Low	3-4'	Y	Sun	Wet to well drained	Grows rapidly; No Maintenance
Millet (<i>Echinochloa</i> spp.)	Rapid growth for slope stabilization		Good		3-6'	Y	Sun	Wet, moist	
Perennial ryegrass (<i>Lolium perenne</i>)	Rapid growth for slope stabilization; nutrient uptake areas		Good	Low		Y	Sun	Moist to dry	Moderate maint., high nitr. uptake
Redtop (<i>Agrostis alba</i>)	Erosion control, swales		Good		to 4'	Y	Sun	Wet	Low maintenance
Reed-canary grass (<i>Phalaris arundinacea</i>)	Grows well in var. conditions		Good	Low	to 5'	Y	Sun	Wet to moist	General purpose; good nitr. uptake; very aggressive
Soft rush (<i>Juncus effusus</i>)	Shallow marsh				to 3'	Y	Sun	Wet	

Species	Where to Plant	Erosion Control	Wildlife Value	Hi. Inundation	Toler. to Sun/shade	Soil Requir.	Notes
Softstem bulrush (<i>Scirpus validus</i>)	Shallow marsh		Moderate: some birds	6-10'	Y	Wet	Spreads rapidly
Sweet flag (<i>Acorus calamus</i>)	Shallow marsh/shore to 3' deep		Low except for muskrat, beaver	2-3'	Y	Wet; partial shade	Slow colonizer, tolerates drying
Tall fescue (<i>Festuca arundinacea</i>)	Swales, nutrient uptake, erosion	Good	Moderate: forage, cover		Y	Shade	Low maintenance, high nitr. uptake
Shrubs							
Arrowwood (<i>Viburnum recognitum</i>)	Slopes, floodplain		Moderate: songbirds	3-10'	Limited	Wet to well-drained	Grows in variable conditions
Buttonbush (<i>Cephalanthus occidentalis</i>)	Grows in standing water to 3' deep		High: ducks, shorebirds	3-10'	Y	Wet	
Chokecherry (<i>Prunus virginiana</i>)	Slopes, upland		High: birds and mammals	5-15'	N	Moist to well-drained	
Elderberry (<i>Sambucus canadensis</i>)	Grows in variable conditions	Good	Very high: food, cover	3-12'	Y	Wet to well-drained	
High bush blueberry (<i>Vaccinium corymbosum</i>)	Grows well in wet areas		High: birds & mammals	3-13	Y	Wet to moist	Some drought-tolerance
Red osier dogwood (<i>Cornus stolonifera</i>)	Grows well in wet areas, stabilizes banks	Excel.	High: songbirds	4-8'	Y	Wet to dry	
Shadbush (<i>Amelanchier</i> spp.)	Wet or moist areas		Very high: birds & mammals	15-20'	Y	Moist round	Attractive year-
Silky dogwood (<i>Cornus amomum</i>)	Screens, banks		Moderate: songbirds	4-10'	Y	Wet to dry	Somewhat drought-tolerant
Spicebush (<i>Lindera benzoin</i>)	Rich soils, streambanks		Moderate: songbirds	12-25'	Limited	Deep, moist, rich soils	

Species	Where to Plant	Erosion Control	Wildlife Value	Ht.	Toler. to Inundation	Prefers Sun/shade	Soil Requir.	Notes
Sweet pepperbush (<i>Clethra alnifolia</i>)	Grows in wet or dry areas		Some	to 10'	Limited	Sun, some shade	Wet to dry	
Winterberry (<i>Ilex verticillata</i>)	Grows well in wet areas		High: birds	4-16'	Y	Sun, some shade	Wet to moist	Somewhat drought-tolerant
<u>Trees</u>								
American beech (<i>Fagus grandifolia</i>)	Infrequently wet areas		High: birds & mammals	to 90'	N	Shade-tol.	Rich, acidic, well-drained	
Black willow (<i>Salix nigra</i>)	Bank stabilization	Good	Low	30-50'	Y	Sun	Wet to moist	
Pin oak (<i>Quercus palustris</i>)	Periodically wet areas		High: mast	50-70'	Y	Sun, partial shade	Wet to dry	
Red maple (<i>Acer rubrum</i>)	Grows well in wet areas; rapid growth		High: seeds & browse	40-70'	Y	Sun	Wet to dry	Grows rapidly
River birch (<i>Betula nigra</i>)	Variable conditions; bank stabilizer	Good	Low	20-60'	Y		Wet to moist	

Notes on other selected species

Other herbaceous plants

- Arrow arum (*Peltandra virginica*) - Shallow marsh emergent similar to arrowhead; does not spread rapidly.
- Bird's-foot trefoil (*Lotus corniculatus*) - Low maintenance, general purpose low ground cover; use inoculated seed.
- Colonial bentgrass - Low maintenance, general purpose.
- Ladino clover (*Trifolium repens*) - Wetland buffer zones; use inoculated seed.
- Ryegrass, annual or winter (*Lolium*) - Good temporary vegetation cover.

Other shrubs

Mountain laurel (*Kalmia latifolia*) - Grows in drier areas; attractive evergreen.

Red chokeberry (*Pyrus arbutifolia*) - Grows in variable conditions.

Rhododendrons, azaleas (*Rhododendron* spp.) - Variable; *R. viscosum* tolerates inundation; all species have attractive flowers; deciduous or coniferous.

Witch hazel (*Hamamelis virginiana*) - Grows in moist to moderate, shady conditions; attractive blooming in late fall.

Other trees

American holly (*Ilex opaca*) - Grows in upland areas; attractive.

Black gum (tupelo) (*Nyssa sylvatica*) - Grows in wet to moderate soils; attractive.

Green ash (*Fraxinus pennsylvanica*) - Grows in variable conditions, good for bank stabilization, may require seed clean-up

Shadbush/serviceberry (*Amelanchier arborea*) - Grows in variable conditions; small and shrubby tree; high wildlife value (see detailed description above under Shrubs).

Silver maple (*Acer saccharinum*) - Grows in moist floodplain and upland areas; attractive.

Swamp white oak (*Quercus bicolor*) - Grows well in wet areas; not commercially available

Sycamore (*Platanus occidentalis*) - Grows best in upland areas; grows rapidly.

Tulip tree (*Liriodendron tulipifera*) - Grows in moist to moderate soils; grows rapidly.

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