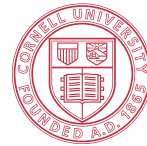


Woody Shrubs for Stormwater Retention Practices

Northeast and Mid-Atlantic Regions

Second Edition



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School of Integrative Plant Science,
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Woody shrubs provide low-maintenance, attractive cover for stormwater retention and infiltration practices.

Planted stormwater retention and infiltration practices are important for reducing runoff and maximizing green space in urban areas. While a wide variety of herbaceous plants such as Soft Rush (*Juncus effusus*), Swamp Milkweed (*Asclepias incarnata*), and Joe-Pye Weed (*Eutrochium* spp., formerly *Eupatorium* spp.) are often successfully used in these spaces, they can present maintenance issues because of the need to annually cut back dead foliage and stems. Utilizing woody plants decreases the need for additional seasonal maintenance while successfully adding aesthetic and functional vegetation to stormwater retention practices.

What is Stormwater?

Stormwater is rain or snowmelt which flows over the ground and does not directly infiltrate into the soil. Historically stormwater runoff only occurred during large storm events when the rate of rainfall or snowmelt was greater than the rate at which water could be absorbed into the soil. With the advent of wide-scale development and urbanization, the area of impervious surface in the US is approximately 40,005 sq. mi. with an additional 316 sq. mi. being added each year (Xian et al., 2011). Increases in artificial impervious surfaces like roads, roofs, sidewalks and parking lots have created a corresponding increase in stormwater runoff. In addition to an increase in impervious surfaces, soils, which can become compacted due to human impacts, also experience a significant drop in their ability to absorb runoff during storm events (Gregory, 2006). Increases in stormwater tax the capacity of our sewage treatment systems, especially in cities that have combined stormwater and sanitary sewers. This can create a host of other stormwater related issues.



The Study

A portion of the information here is based on a three-month study in Ithaca, N.Y. conducted by Horticulture Masters of Professional Studies student Ethan M. Dropkin under the guidance of Cornell University's Urban Horticulture Institute director, Dr. Nina Bassuk.

The study focused on testing the flood and drought tolerances of six shrub species, all included in this pamphlet. The species (*Amorpha fruticosa*, *Hippophae rhamnoides*, *Salix arenaria*, *Salix purpurea*, *Shepherdia argentea*, *Spiraea tomentosa*) showed tolerance of both

Stormwater Issues

Increased volumes of stormwater runoff caused by an increase in impervious surface area and compacted soils have resulted in a variety of issues including:

- Sedimentation of water sources, which reduces light penetration of the water column, warms water by absorbing solar radiation, and negatively homogenizes stream bottom habitats
- Streambank erosion
- Excess nutrient and organic carbon loading resulting in anoxic (low-oxygen) water conditions, which is detrimental to aquatic life
- Bacterial contamination of water sources especially in conditions where sanitary sewer is combined with stormwater
- Hydrocarbon pollution of rivers, lakes and oceans
- Pesticide poisoning of aquatic habitats when excess pesticides are washed into water systems
- Chloride contamination of freshwater systems from de-icing salts used in winter
- Thermal impacts from warmer stormwater heating aquatic habitats of cool water species
- Terrestrial trash and debris collecting in aquatic systems

Generally some or all of these problems can be found in the watersheds of urban and suburban areas, and anywhere downstream of these areas. Usually these issues and contaminants result in poor water quality for human use, degradation of wetland habitats and extirpation of aquatic species (Karimipour, 2010).

Combined Sewer Overflow

Of particular concern in large cities like New York, Chicago, and Washington D.C. is the issue of bacterial contamination. These cities and many other municipalities across the country operate combined sewer systems. These systems were designed to collect stormwater runoff,

long-term flooding and drought which makes them good candidates for use in stormwater retention/infiltration plantings.

These species were chosen for their hardiness and known or suspected tolerances to flood, drought, and urban conditions.

More information, publications and other resources can be found at: <http://www.hort.cornell.edu/uhi/>

Cover photographs: bioswales on Cornell University campus



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Water Column sedimentation of an Urban Stream

sewage, industrial wastewater, etc. in one system which would ideally all go to a treatment plant to be cleaned. However, during large storm events the stormwater load often becomes too much for the system to process and combined sewer overflow (CSO) is released into the nearest convenient water body to avoid a back up in the system (Billah, 2012). In New York City for example, over 27 billion gallons of contaminated stormwater are emptied into New York Harbor each year and only one-tenth of an inch of rain is needed to overtax this system and cause a CSO event (PlaNYC, 2007).

Municipal, State and Federal Stormwater Regulation

Although many of the systems and practices which contribute to this problem are outdated, the regulations in place to mitigate them are increasingly concerned with the future health of our aquatic systems. At all levels of government the impacts of past mishandling of stormwater management have resulted in broad scale initiatives to improve our practices, and as a result, improve water quality.

At the federal level, the Environmental Protection Agency (EPA) has created the National Pollutant Discharge Elimination System (NPDES), which includes requirements for Best Management Practices (BMPs) for stormwater. Their program is targeted at everyone from states and municipalities to contractors and individuals (EPA-NPDES, 2012).

In New York State, the Department of Environmental Conservation (DEC) has created the New York Stormwater Management Design Manual which dovetails with the EPA requirements and provides regionally specific information to help create BMPs for New York State (Karimipour, 2010).

At the municipal and watershed levels, stormwater infiltration issues are also being addressed. Two of the best examples are in New York City and Syracuse. In New York City, a comprehensive Sustainable Stormwater Management Plan has been created, nested within the larger plaNYC sustainability initiative (Strickland, 2009). In the Onondaga Lake watershed, efforts to mitigate the severe pollution of Onondaga Lake have resulted in the Save the Rain program (savetherain, 2013). This set of combined initiatives, which includes broad scale creation of green infrastructure; rain barrel programs and increases urban canopy, are all targeted at the reduction of contaminated stormwater runoff entering aquatic systems.

Stormwater Infiltration Practices

A large part of each of the previously mentioned regulatory plans, and essentially any stormwater runoff reduction plan, is the creation of stormwater infiltration practices. Stormwater infiltration practices come in a variety of forms but their overall goal is to slow, retain and in certain cases detain stormwater during and after a storm event. In some



cases this is used to reduce the occurrence of CSOs but often the goal is to capture pollutants before they enter the larger watershed, and to improve water quality overall. Of particular interest are a number of the planted stormwater infiltration practices that have developed recently. Below are some specific terms currently used to describe these practices.

(Vegetated) Filter Strip

Vegetated strips (usually of mown lawn grass) are used to slow and treat sheet (surface) water runoff and direct it towards riparian buffers or other undisturbed natural areas where the water can be absorbed into the soil. Filter strips are generally used in conjunction with existing or restored riparian buffers.

Vegetated Swale

Maintained (mowed) turf-lined swales are designed to slow stormwater and assist with treatment and infiltration, while keeping runoff flowing towards existing drainage systems. Generally these are used as an alternative to conventional subsurface stormwater pipes or artificial hard-sided channels.

Tree planting/Tree pit

Designated tree planting areas which can reduce runoff and erosion by channeling water into the soil surrounding planted trees. Tree canopies temporarily catch and slow or stop water from reaching the ground. In addition, trees will uptake some of the water in this area through their roots.

Rain Garden

A constructed vegetated depression used to temporarily retain stormwater runoff from impervious surfaces during storm events typically of 1-inch or less. Using plants and distinct engineered substrates, pollutants are filtered and water infiltrates into the soil over the period of 1 to 2 days.

Stormwater Planters

Surface or subsurface planters designed to slow, filter, and possibly retain stormwater runoff. There are generally three types of stormwater planters: contained planters, infiltration planters, and flow-through planters. Contained planters are impervious boxes designed to hold a finite amount of water which is then slowly released through evaporation and transpiration. Infiltration planters have open bottoms and allow runoff to slowly infiltrate into the soil below the planter. Flow-through planters have built-in drains that allow water to move out of the planters after it has been slowed and

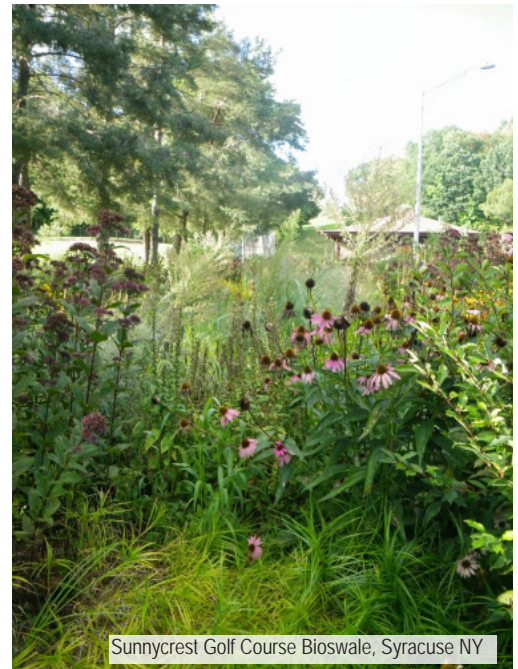


cleaned by the planting media in the planter (Karimipour, 2010).

Bioswale

This is a term used by many municipalities and government bodies. Filter strips, vegetated swales, and rain gardens could all be considered bioswales if constructed correctly. Bioswales are essentially stormwater runoff conveyance and infiltration systems which slow, direct, clean and help infiltrate runoff. Plants assist with stormwater infiltration and provide ecological value such as creating habitat and reducing urban heat island effects (USDA-NRCS, 2007).

All of the above practices can be used to reduce, clean and slow stormwater runoff. Used in conjunction with each other and with a variety of additional practices not covered here (such as green roofs, parking area reduction, stream daylighting, etc.) stormwater runoff can be significantly reduced in urbanized watersheds.



Why Use Plants?

Plants are an integral part of all of the stormwater infiltration practices listed above. They play a variety of important roles in the success of these practices. Plants:

- provide infiltration channels for water to move through via their roots (Bartens, 2008)
- assist in the removal of pollutants like heavy metals from retained stormwater, in conjunction with soil microorganisms (Jurries, 2003)
- help to hold soils together, reducing erosion by stormwater (Caltrans, 2008)
- slow runoff which in turn may cause some suspended solids, sediment, etc. to settle out of the water (Jurries, 2008)
- add aesthetic value and educational potential (Echols and Pennypacker, 2008)
- improve air quality through uptake of gaseous pollutants
- reduce the urban heat island effect through evaporative cooling and shading
- can sequester atmospheric carbon
- increase biodiversity and create wildlife habitat (Wise, 2010)

Given all of these benefits, it is critical to include plants in stormwater practices whenever possible.

What Plants are Best?

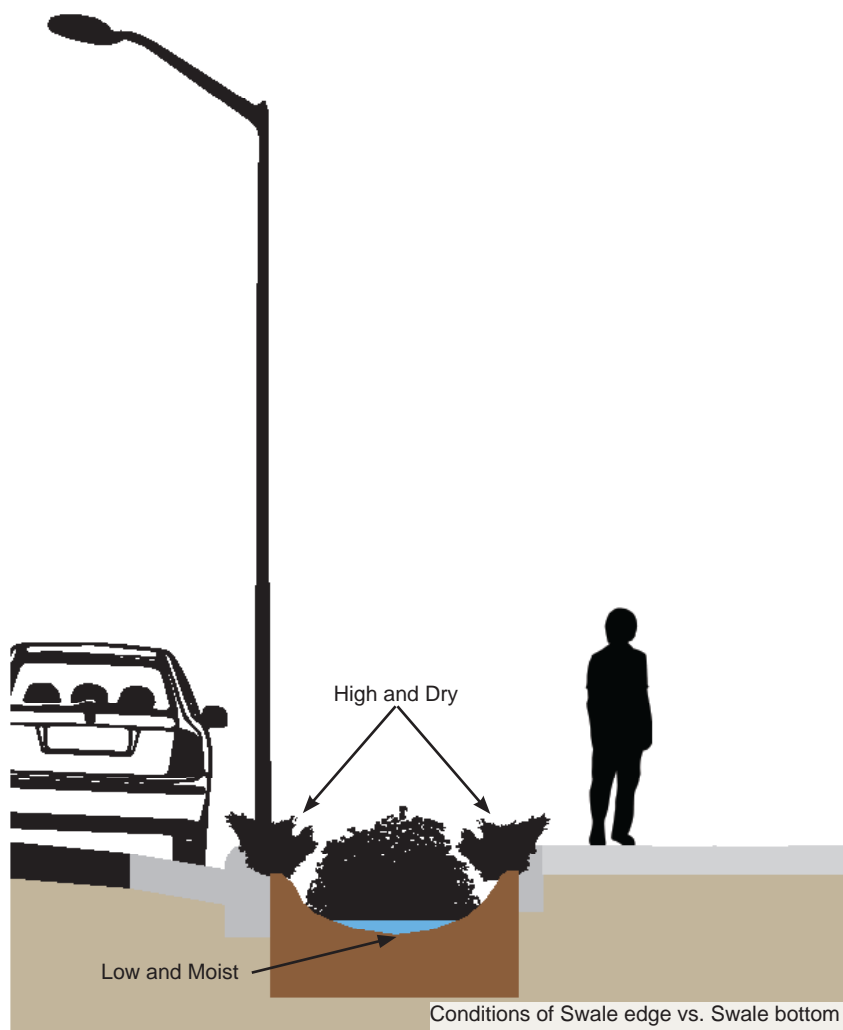
When selecting plants for stormwater infiltration, common sense would seem to dictate the use of wetland plants. However, due to the rate at which most of these practices allow water

to infiltrate, the majority of planted stormwater practices will likely only be inundated for a few minutes after a small storm event, and up to a day or two for a larger event. Unlike most permanent or semi-permanent wetlands, these areas remain relatively dry most of the time. Because of this characteristic, plants that can handle both temporary inundation and relatively protracted drought are the best choices for a low-maintenance planting.

The location within the stormwater practice that plants are installed is also significant. Generally these practices will have high points around their edges, which are relatively level to the surrounding topography, and low points towards their center which will be several inches or feet (depending on the size of the practice and its intended water holding capacity) lower than the rim. As a result, the wettest parts of these plantings will be their lowest point. This report deals exclusively with plants appropriate for these low lying, periodically saturated areas. Soil moisture levels at the upper edge of retention and infiltration practices are generally average to dry. Therefore many plants which are appropriate for average to dry soils can be used there. Appropriate plant selections for these drier areas include (but are not limited to): *Juniperus spp.*, *Rosa spp.*, *Cotinus spp.*, *Callicarpa spp.*, etc. However, many of these plants might be unlikely to thrive in the periodically saturated conditions found at the lower elevations of these practices.

Most stormwater treatment planting guidelines suggest the use of native plants exclusively. However due to the unique moisture/drought tolerances required for successful growth in these sorts of practices, it would be imprudent to exclude non-native plants. Because of the growth limitations associated with these planting areas, as long as a plant can succeed on site, and is not invasive, any plant that can grow here should be considered.

To promote plantings with reduced maintenance costs, the value of woody plants, specifically shrubs, should be considered. While herbaceous plants may establish more quickly and fill a site, they require at least yearly pruning post-establishment to remove dead foliage and seasonal die-back. Woody plants however—due to their generally slower growth rate and more permanent growth habit—require far less pruning, potentially only once every three years, reducing the overall amount of maintenance significantly (Russ and



Site Assessment

Assessing your site and its surroundings is important for a successful stormwater landscape installation. In the case of most stormwater retention/infiltration practices, significant engineering below ground will be necessary to control the amount and rate of stormwater retention/infiltration. While these considerations are important when preparing the site for stormwater practices, plant have factors which are specific to their success. These include:

Exposure - All plants require some amount of sun to thrive. It is important to understand your site's light conditions. Take into account both the shadows cast by surrounding structures as well as any nearby trees or trees used in your installation. It is important to consider the shade produced by growing vegetation over time. Have the mature size of all plants in mind during the planning stages.

Hardiness - Make sure the chosen plants are appropriate to the USDA Hardiness Zone of the site. Hardiness Zone is a measure of the average minimum winter temperature your area is likely to receive (USDA, 2012).

Microclimates - These are highly localized areas which have growing conditions different from the larger area surrounding them. Cities are often warmer than surrounding areas (in summer and winter) because of the prevalence of absorptive and reflective construction materials used there. Additionally, particularly in urban areas with large-scale buildings and narrow streets, wind patterns may be calm or turbulent due to the channelization of air currents. Almost by definition, stormwater plantings are microclimates. Since they are designed to capture stormwater, the bottoms of these installations will likely be wetter than their surroundings, at least for short periods of time following storm events. In addition, the sides

Importance of Soil pH

The pH of a soil is a measure of how acidic or basic (alkaline) the chemistry of that soil is. pH is expressed as a scale from 0-14, with 7 being neutral. Soil with a pH below 7 is considered acidic. Likewise soil with a pH above 7 is considered basic. Most nutrients are at their greatest availability in soils with a pH of around 6.0-7.0. However, many plants can tolerate a wide range of acidity or alkalinity while some are specialists that will only grow successfully in soils of very low (acid) or high (basic) pH. Acid soils have a higher concentration of hydrogen ions, while basic soils have more hydroxide ions. The concentrations of these respective ions help to determine the type of chemical reactions that can occur in the soil. In particular, they can control soil nutrient availability for plants. If plant nutrients are limited, some types of plants will either grow poorly or die. For example, plants in the family Ericaceae (Rhododendrons, Blueberries, Heaths) exhibit **chlorosis** (a yellowing of their leaves) and will grow weakly and even die if



Chlorosis on *Rhododendron* spp.

of stormwater infiltration/retention practices will generally be drier than their lowest points which creates a subtle moisture gradient.

Soil Fertility and pH- Test the soil on site to determine its pH levels, nutrient concentration, and salt content. All of these factors will help determine which plants are most appropriate for the site and indicate necessary additives for a future planting mix. Soil testing should reveal any potential nutrient deficiencies which will likely be addressed at installation. In addition, using nitrogen-fixing plants could help mitigate many long term nutrient replacement issues. Sometimes additional fertilization may become necessary as plants mature. Never fertilize newly planted materials to avoid nutrient burn to roots and foliage. If soil and foliar tests at any point show that nutrient deficiencies are developing, it is best to use a time-released granular fertilizer with slow-release water-insoluble nitrogen (WIN), or an appropriate micronutrient fertilizer as directed.

Soil Conditions - Although soil texture, compaction, and drainage rates will likely change based on the site design, knowing the initial soil conditions will be important in creating the specification of what should be installed on site. In addition understanding the final conditions will be of utmost importance in selecting and siting plants.

Salt Inputs - This can be an important factor in determining appropriate plants for any urban planting, but is particularly important for stormwater plantings. In areas of the country that receive ice and snow in the winter, large amounts of de-icing salts may be used to keep roads and sidewalks clear and safe. It is possible that for three to six months of the year, much of the runoff entering stormwater practices will be highly saline. In addition to saline runoff, roadside plants often have to deal with salt spray from cars. While this may not be an issue for some plants, for others it can be highly detrimental. It is therefore very important to determine how much salt will be entering your planting, how quickly it will leach out

grown in alkaline soils.

Importance of Iron in Soils

One of the main reasons that acid loving plants become chlorotic in basic soils is because of the limited availability of accessible iron, an important plant nutrient. Iron is found in two forms in the soil: ferric and ferrous. Ferric iron is insoluble and therefore impossible for plants to take up unless they have mechanisms for solubilizing the iron near their root zone. Fortunately many plants are able to do this. In high pH soils, iron is present in the ferric form. As pH lowers (below 6.2), iron converts into its ferrous form and is more readily available for uptake by plants. In addition, in anaerobic (oxygen limited) soils ferric iron also converts to its ferrous form. This is one of the reasons why many wetland plants require acidic soils, even when planted in well drained sites.

Urban Soils

In urban environments the soils are almost always heavily disturbed. In addition, they tend to be fairly alkaline due to the leaching of basic elements from concrete-based construction materials. Basic leachate comes not only from building and sidewalks but often high pH rubble is turned into the soil during demolition and construction. As a result, most urban landscapes have high pH soils, even in areas where the parent soil may be acidic or

of the root zone and what plants can withstand salt spray and/or salt soils.

Irrigation Access - Despite the fact that these plants will receive water throughout the year in the form of runoff, they will need supplemental watering to keep them growing and thriving until their roots are established. Even after initial establishment these plants may need irrigation during periods of prolonged drought, as is the case with any planting.

Site Assessment Checklist

The following is a checklist for use during a typical site assessment. The information from this checklist acts as a basic guide for the selection of sub-structural layers, soil mix, planting selections, and drainage regime necessary for creating a successful and sustainable stormwater retention/infiltration practice. This checklist is by no means exhaustive and there may be other factors worth recording at specific sites.

neutral. When selecting plants for urban areas, it is generally wisest to focus on those that can tolerate soils in the range of 7.0 and up. However, when dealing with stormwater plantings, wetland plants which are often acid soil dependent are often used. It is important to remember that most stormwater infiltration and retention plantings will likely be dry fairly regularly. Therefore they will not provide wetland plants with the anaerobic, ferrous iron-rich soils they require to grow with vigor and longevity. Thus knowing the soil pH is one of the most important factors for choosing plants that will flourish on a particular site and help a new installation succeed in the long term. Fortunately, there are many plants that tolerate a wide soil moisture gradient and a wide pH gradient.



Successful Bioswale at Cornell Plantations

1. Site Location _____

2. Site Description _____

3. Climate

a. USDA Hardiness Zone

__7b __6b __5b __4b __3b

__7a __6a __5a __4a __3a

b. Microclimate Factors

__Re-reflected heat load

__Frost pocket

__Wind

Other _____

c. Sunlight Levels

__Full sun (6 hrs. or more)

__Partial sun or filtered light

__Shade

d. Irrigation Levels

__No supplemental irrigation

__Automatic irrigation system

Irrigation amount and rate:

4. Soil Factors

a. Range of pH Levels _____

(Note actual readings on sketch)

b. Texture

__Clayey

__Loamy

__Sandy

c. Compaction Levels

__Severely compacted

__Moderately compacted

__Somewhat compacted

__Uncompacted

d. Drainage Characteristics

__Presence of mottled soil

__Low-lying topography

Indicator plants suggest site drainage:

__wet__well-drained__dry

Percolation test results (in./hr.)

__poorly drained (< 4"/hr.)

__moderately drained (4"- 8"/hr.)

__excessively drained (> 8"/hr.)

e. Other Soil Considerations

__Indications of soil layer disturbance

__Evidence of recent construction

__Presence of construction debris

__Noxious weeds present:

__Evidence of excessive salt usage

__Erosion of soil evident

__Evidence of soil contamination

__Usage that compacts soil

f. Specific Soil Problems

5. Structural Factors

a. Limitations to above-ground space

__Overhead wires (height: _____)

Proximity to buildings/structures:

Other _____

b. Limitations to below-ground space

__Utilities marked and noted on sketch

Approximate rooting volume for site

Length: _ Width: _ Depth: _

6. Visual Assessment of Existing Plants

a. Species

b. Size

c. Growth Rate

d. Visual Assessment

Sketch of Site

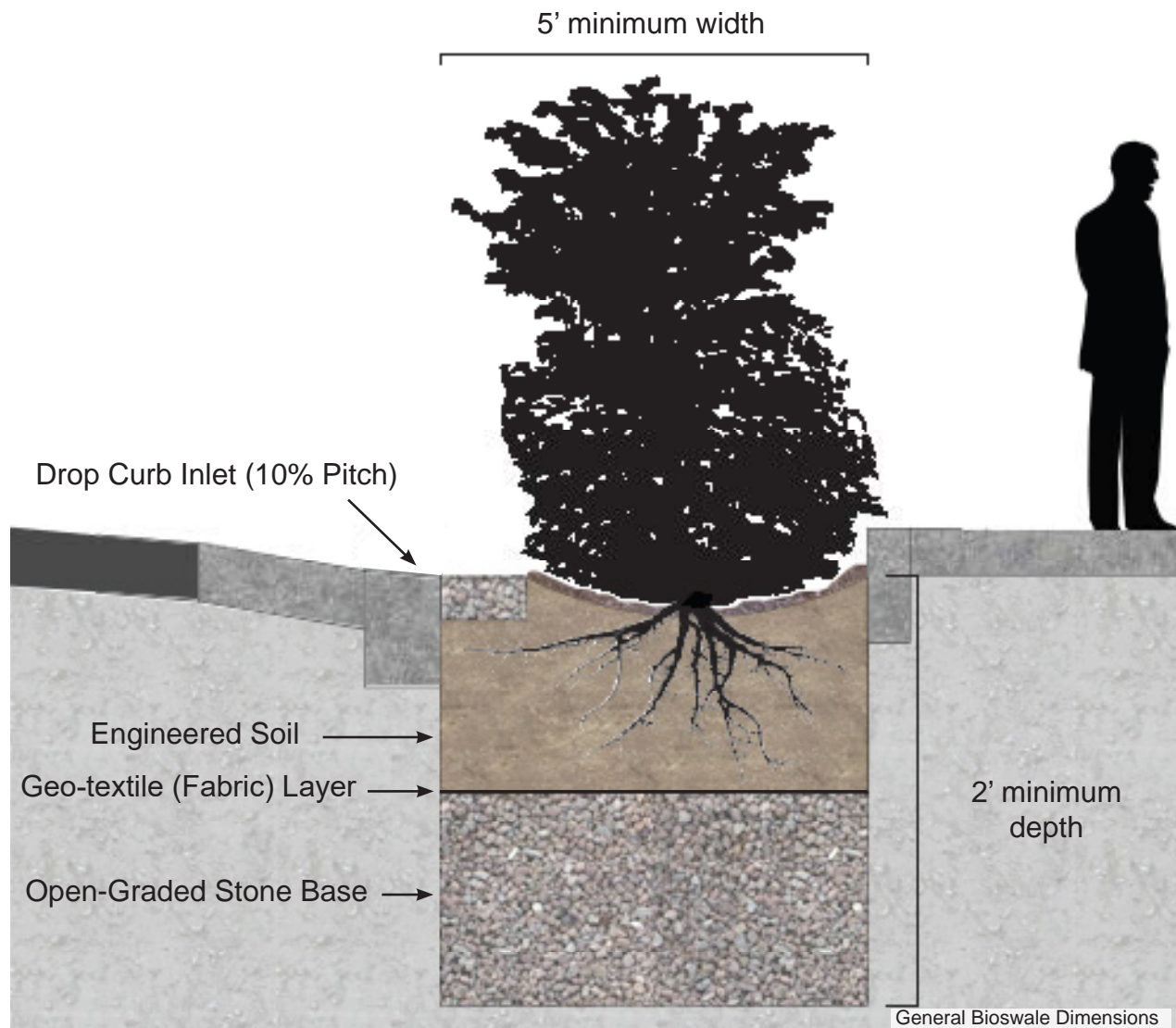
Note north arrow; circulation patterns; pH readings; location of overhead wires; underground utilities, buildings and pavement, as well as problem drainage areas.

Design Considerations Prior to Plant Selection

Site design requirements will vary greatly depending on the type of stormwater collection practice intended for the site. However, some factors will be a part of any design, including:

- regrading of the surrounding site to direct stormwater into the collection basin
- creation of a basin sized large enough to handle the volume of water it is intended to hold
- installation of planting substrate and sub-surface soil layers which may include but are not limited to mulch, an engineered soil mix, geotextile fabric, and an open-graded stone base course
- selection of hi-hat drains, perforated piping, stone filled drainage columns, and/or conventional storm sewer connections to assist with drainage/remove excess water from the site during severe storm events
- installation of fencing or tree-pit guards depending on the drop from sidewalk/street level which is created

These and other site design criteria may impact plant selection, location, installation, and

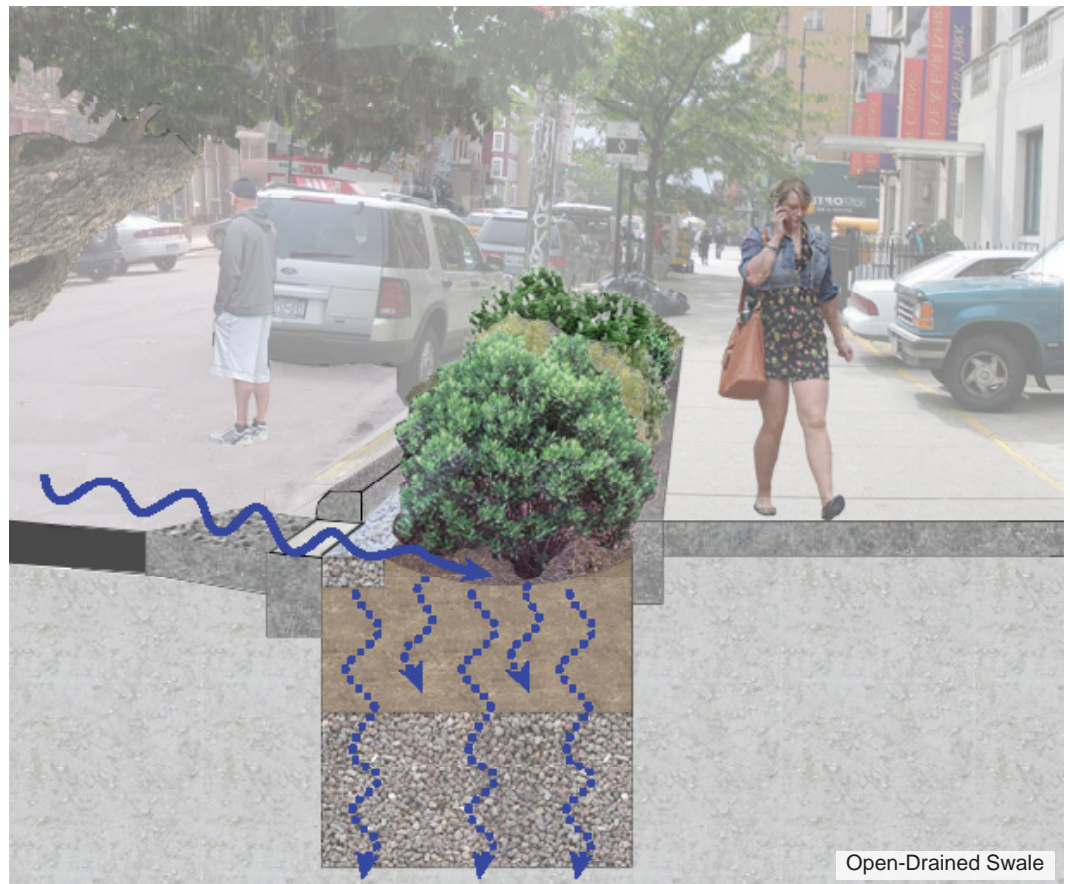


maintenance requirements. Early stage planning to create plantings which assist rather than impair the long-term function of stormwater practices are integral in the success of a project.

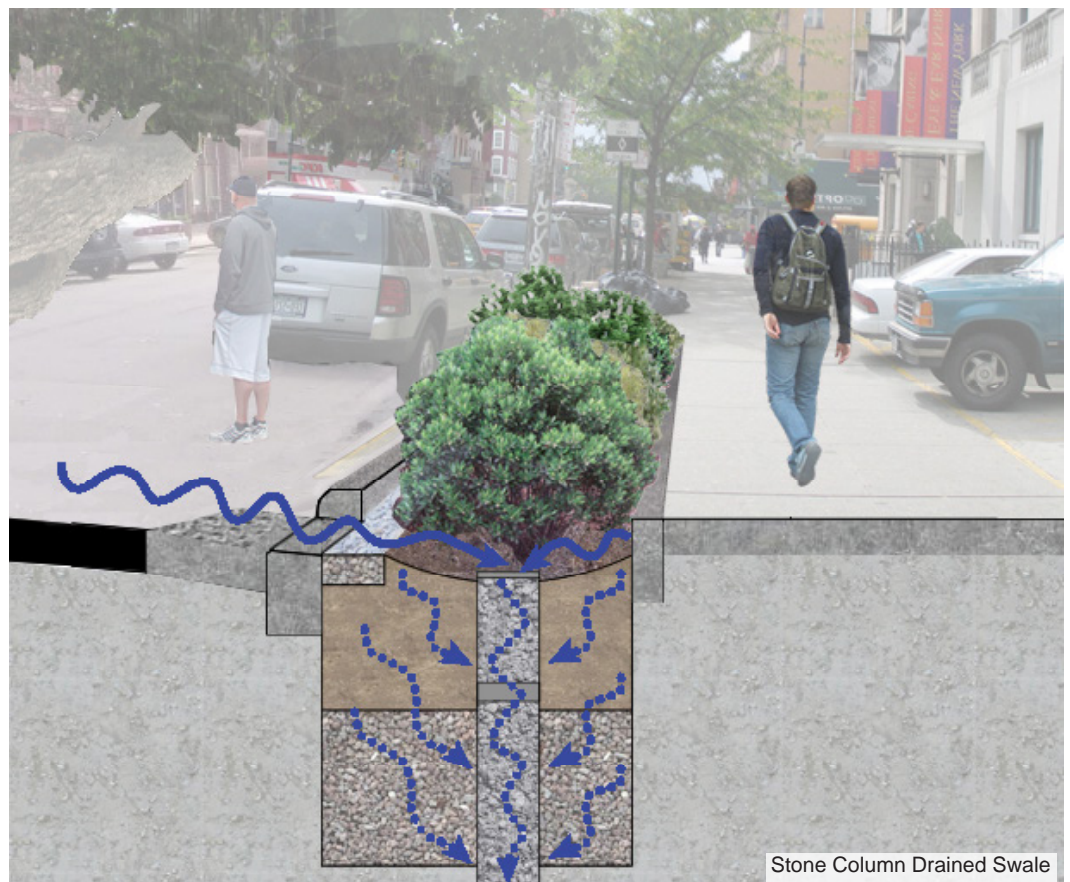
The accompanying images of the Open-Drained Swale, Stone Column Drained Swale, and Hi-Hat Drained Swale while typical are not to scale and all requisite site features may not be identified or located on them. Always check local regulations for specific design and construction requirements.

Establishment

Particularly in cooler climates, installing plants in spring will give them the best chance of survival. Summer plantings expose new plants to the likelihood of prolonged drought and high temperatures, conditions which can quickly kill plants which have not rooted into their surrounding

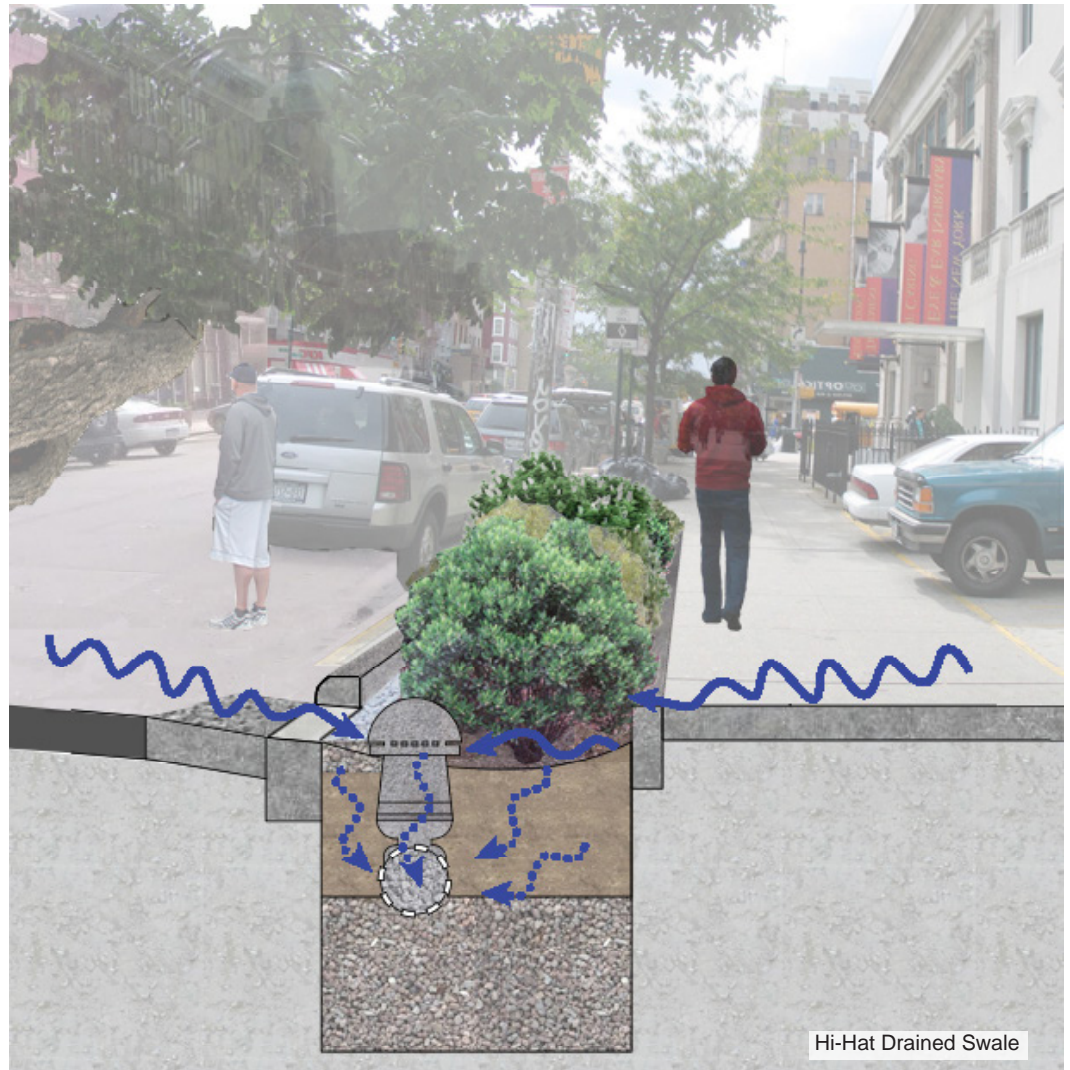


Open-Drained Swale



Stone Column Drained Swale

soil media. Fall plantings are better than summer ones, however plants are given little time to establish before winter and as a result are more likely to be damaged or killed by low temperatures and drought. Spring plantings give plants the longest establishment time before winter. Rainfall is usually relatively regular in spring, temperatures are at their most moderate, and soils are at their most friable. These are all factors which are particularly beneficial for plant establishment.



Hi-Hat Drained Swale

Maintenance

Maintenance requirements for stormwater infiltration/retention vary depending on whether the desired aesthetic is formal or more naturalistic. As mentioned previously, one way to decrease overall maintenance is to use woody plants, which generally require less annual maintenance than herbaceous plants. Regardless, it is important to create a regular maintenance plan for these sites so that they do not become unsightly, unsafe, or non-functional.

Regular maintenance tasks will likely include:

- regular weeding throughout the establishment period, with a likely reduction in weeding frequency once shrubs establish and form a closed canopy

Soil Nitrogen

Of the many nutrients important for healthy plant growth, none is more important than nitrogen. Nitrogen is one of the essential cellular building-blocks for all life, plants included. Most nitrogen on the planet is found in its gaseous form. In fact, the earth's atmosphere is approximately 79% nitrogen. However this form of nitrogen is largely inaccessible to plants. Atmospheric nitrogen (N_2) is made available for plant use by converting it to either ammonium (NH_4^+) or nitrate (NO_3^-). This process of converting nitrogen from its

- yearly mulching of established plantings
- watering during dry periods, especially during the first two years of establishment
- pruning and thinning on a rolling three-year cycle; this will be important for some plants to improve ornamental characteristics, encourage new growth, and to control form and size
- pruning of dead, damaged, diseased, and hazard branches/foliage
- periodic flushing of trapped sediments from catch basins, pipes, or gravel to maintain drainage and remove flow obstructions
- replacement of dead plants



(Vincentz, 2007)

Rhizobium nodules



Frankia nodules on *H. rhamnoides*

inert form to a usable form is called nitrogen fixation. Some fixed nitrogen is also added to the soil when the extreme energy of a lightning strike causes atmospheric nitrogen and oxygen to bond forming nitrous oxides. When these oxides come in contact with rain they create nitrates which are carried to the soil by precipitation. Other than man-made fertilizers, another way nitrogen becomes available to plants is through bacterial nitrogen fixation. When bacteria digest surface organic matter, animal droppings or slowly decomposing soil organic matter (humus), the byproduct is ammonium or nitrate, which becomes available to plants.

Nitrogen Fixation

Many types of microorganisms in the soil can fix nitrogen, however of particular interest are rhizobia and frankia. These groups of soil bacteria have formed symbiotic relationships with certain plant species; the plants provide the bacteria with food created during photosynthesis and the bacteria provide the plants with ammonium. These bacteria, in concert with the plants, help create nodules on roots of a host of species and genera in the family of Fabaceae (the Pea Family). Frankia has associations with many disparate plant families, genera, and species. Frankia associates of particular interest in the northeast include:

- plants in the genus *Alnus* (Alders)
- all species in Elaeagnaceae: *Elaeagnus* (Silverberries),

Plant Selection

The following list identifies a variety of evergreen and deciduous shrubs for use in planted stormwater retention and infiltration practices. These plants have been selected because of their performance in our experimental trials, their proven use in New York City and/or Syracuse's stormwater planting practices, or their documented cultural tolerances. All have been proven hardy in the Northeast. This list is by no means comprehensive. Rather, it is a tested or observed sample of the large array of shrubs suited for use in the periodically saturated locations often encountered at the bottom of stormwater practices.

Personal aesthetics and specific site conditions will vary but the plant characteristics provided will help to select viable plants for any site. Keep in mind that any listed cultural tolerances—soil texture, pH, flood, drought and salinity—have rarely been empirically quantified for many species. Likewise, native range and distribution notes are contested for many plants. They are merely offered here to suggest the likelihood of where a plant may be successfully grown. These caveats aside, sticking to the guidelines below should result in largely successful plantings.

- *Shepherdia* (Buffaloberries), and *Hippophae* (Sea Buckthorns)
- three genera in the family of Myricaceae: *Myrica* (Sweet Gales), *Morella* (Bayberries), and *Comptonia* (Sweetfern)
- plants in the genus *Ceanothus* (New Jersey Tea)

Luckily, many of these species are suitable for use in planted stormwater practices.

Nitrogen Importance in Stormwater Management Plantings

One of the ways nitrogen can be lost from soils is by leaching. This is a physical process whereby usable forms of nitrogen can be washed out of the root zone by excessive drainage. This can be particularly problematic in coarse soils. As coarse materials like sand and crushed stone are sometimes used in planted stormwater practices, it is important to consider ways to reduce the impact of nitrogen leaching. One of the easiest ways to combat this phenomenon is to utilize nitrogen-fixing plants in your palette which can replace leached nitrogen.



Pass Arboretum Rain Garden, Syracuse NY



Emerging Foliage

Description

False Indigo is a large woody shrub from the southeastern United States which has naturalized (mainly along watercourses) throughout much of the U.S. and eastern Canada. This plant is particularly useful in nutrient deficient soils as it fixes nitrogen and is tolerant of both flooding and drought and is resistant to herbivory from deer and other browsers. To control height, the plant may be cut back early spring to just above soil level.



Flower



Full Plant



In Stormwater Retention Swale

- **Family:** Fabaceae
- **Native Range:** From Quebec west to Manitoba, all continental states barring Montana and Nevada
- **USDA Hardiness Zone:** 4 to 9
- **Height:** 4 to 12 feet
- **Spread:** 6 to 15 feet
- **Growth Habit:** Tall, upright, multi-stem shrub; suckers to form thickets
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Prefers moist soils. Extremely tolerant of both prolonged flooding and drought. Tolerates high pH soil.
- **Ornamental Characteristics:** Bears long compound leaves with small oval leaflets. Produces tall spikes of pale to dark purple flowers with orange anthers, from mid-Spring to early summer. Flower mature into to spike of small rusty seed pods which are held through the winter. All plant parts (but particularly the fruits) exude a spicy, citrus-like fragrance when crushed or rubbed.

- **Pests and Diseases:** No serious pests or diseases. Occasionally susceptible to leaf spot, powdery mildew, twig canker and rust. Can spread aggressively in some areas.
- **Deer Resistance:** Rarely Damaged
- **Ecological Effects:** Flowers are utilized by several pollinators. As with many plant in the Fabaceae family this plant fixes nitrogen and can improve soils for surrounding plants.

Cultivars/Relatives:

- **'Albiflora'** - a white flowering form
- **'Crispa'** - curly-leaved form
- **'Lewisii'** - narrow leaved variety
- This plant is rife for further selection for improve flowers, height variation, and other ornamental characteristics



Fall Foliage



Flower



Full Plant



Fruit

Description

Red Chokeberry is a vase-shaped shrub related to apples, cherries, and roses. Preferring moist acid soils, it has surprising tolerance to high pH and drought. Its bright red, edible fruits are high in antioxidants, though not as nutritive as the fruits of the related Black Chokeberry (*Aronia melanocarpa*). Its fruits are extremely tart when eaten raw, but can be used to make jellies, jams, preserves or in baking.

- **Family:** Rosaceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 4 to 9
- **Height:** 6 to 8 feet
- **Spread:** 3 to 4 feet
- **Growth Habit:** Deciduous, upright, vase-shaped shrub; suckers to form colonies
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Prefers moist well-drained soils, extremely flood tolerant, somewhat drought tolerant. Grows best in acid soils but can tolerate soil pH up to 8.0.
- **Ornamental Characteristics:** Bears glossy green leaves which turn a showy scarlet in fall. Produces clusters of white to light pink flowers in early spring that mature into glossy, bright red berries.
- **Pests and Diseases:** No serious pests or diseases. Occasionally susceptible to leaf spots and twig/fruit blight.
- **Deer Resistance:** Occasionally Severely Damaged

- **Ecological Effects:** Flowers are utilized by several pollinator species. Fruits of this plant are eaten by several species of birds and some small mammals.

Cultivars/Relatives:

- ***A. x prunifolia*** - a naturally occurring hybrid between *A. arbutifolia* and *A. melanocarpa*
- **'Brilliantissima'** - probably more commonly found in nurseries than the straight species. Improved flowering, fruiting, and foliage luster and color.



Emerging Foliage



Flower



Full Plant



Fruit

Description

Black Chokeberry is a rounded shrub most often found in acid soils. It bears large clusters of purple-black berries which have recently become an agricultural crop prized for their high anti-oxidant levels. Due to the high levels of anti-oxidants, these fruits are unpalatably tart when raw but can be made into juices, preserves or baked goods when mixed with other sweet fruits or sweeteners.

- **Family:** Rosaceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 3 to 8
- **Height:** 3 to 6 feet
- **Spread:** 3 to 6 feet
- **Growth Habit:** Deciduous, upright, rounded shrub; suckers to form colonies
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Prefers moist well-drained soils, extremely flood tolerant, somewhat drought tolerant. Grows best in acid soils but can tolerate soil pH up to 8.0.
- **Ornamental Characteristics:** Bears glossy green leaves which turn a showy scarlet in fall. Produces clusters of white to light pink flowers in early spring that mature into glossy, dark purple-black berries.
- **Pests and Diseases:** No serious pests or diseases. Occasionally susceptible to leaf spots and twig/fruit blight.
- **Deer Resistance:** Occasionally Severely Damaged

- **Ecological Effects:** Flowers are utilized by several pollinator species. Fruits of this plant are eaten by several species of birds and some small mammals.

Cultivars/Relatives:

- **var. *elata*** - a larger plant overall and with larger individual parts (leaves, flowers, fruits).
- **'Autumn Magic'** - more compact than the species (3'-5' tall) with improved fruit set and bright red-purple fall color.
- **'Morton' (Iroquois Beauty™)** - dwarf form (2' to 3' tall)
- **'Viking'** - like 'Autumn Magic' mid-sized cultivar (3' - 6' tall)



Foliage

Description

Eastern Baccharis (also known as Saltbush, Groundsel Bush, or Sea Myrtle) is a large shrub. While woody plants of the aster sunflower family are common in other parts of the world, this is the only one native to northeastern North America. This plant is an important component of coastal habitats where its ability to withstand inundation with saltwater and salt spray makes it perfectly adapted for life along the ocean's edge. It also make it an ideal plant for use in roadside plantings. As this plant is dioecious, planting one male to every seven or so females will ensure an ornamental show of seed heads in the late fall. May be cut back to ground level in early spring to control size.



Male Flower

(Porse, 2006)



Full Plant



Fruit

- **Family:** Asteraceae
- **Native Range:** Coastal eastern and southeastern North America
- **USDA Hardiness Zone:** 4 to 11
- **Height:** 6 to 12 feet
- **Spread:** 6 to 12 feet
- **Growth Habit:** Deciduous, rangy, soft-wooded shrub with an open habit dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Extremely tolerant of both flood and drought. Grows well in both sand and clay. Tolerates both salt spray and saltwater inundation. Tolerates high pH soil.
- **Ornamental Characteristics:** Bears succulent green leaves with coarsely toothed edges. Female plant produce large amounts of small achene clusters of seeds with plumes of white pappus attached. Pappus (clusters of small hairs) assist in spreading the seeds via wind, but also are a reflective, showy white in fall and make for a very ornamental feature.

- **Pests and Diseases:** No serious pests or diseases.
- **Deer Resistance:** Rarely Damaged
- **Ecological Effects:** This shrub is particularly valuable as cover for wildlife and as a stabilization plant for high salt marsh and other infrequently inundated coasted areas. Its insignificant flowers do act as nectaries for several insect pollinators and its seeds are eaten by birds as well.

Cultivars/Relatives:

- ***B. glomeruliflora*** - a more southern relative, hardy from Zone 8 -10
- **'White Caps'** - compact, upright form; bluish foliage; heavier fruit production



Full Plant

Description

Buttonbush is a medium to large upright to arching shrub with a coarse texture derived from its simple, shiny leaves that are 4-6" long. Native to wetlands in Eastern North America, it nevertheless can survive in dry habitats as well. In addition, it is tolerant of salty soils and salt spray. Buttonbush is late to leaf out and may be cut back in early spring to keep it in a more compact habit. 'Sugar Shack' is a smaller more compact form of Buttonbush.



Foliage



Flowers

- **Family:** Rubiaceae
- **Native Range:** North America except for the Northwest
- **USDA Hardiness Zone:** 3 to 9
- **Height:** 5 to 12 feet
- **Spread:** 4 to 8 feet
- **Growth Habit:** Deciduous, open, rounded shrub; fairly coarse but not unattractive
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Drought tolerant; can handle extreme flooding to average moisture soils; tolerant of a variety of soil textures. Prefers acid soil, but will tolerate alkaline soil after establishment.
- **Ornamental Characteristics:** Very glossy green leaves; unique round clusters of buds that bloom white to pinkish-white
- **Pests and Diseases:** No serious pests or diseases.
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** The flowers provide nectar for butterflies, bees and other insects, while the fruit attracts birds. In its native wetland habitat, this plant is important to some species for brood rearing and shelter.

Cultivars/Relatives:

- **'Sputnik'** - larger blooms and longer bloom period than species; pinkish flowers
- **'Sugar Shack'** - semi-dwarf to 4 feet; bright red fruits



Habit



White Flowering form



Pink Flowering form



Full Plant



Fall color and immature fruit

Description

Summersweet is an upright shrub of acid soils in eastern North America. It mainly prefers moist to saturated soils. This shrub is prized for its highly ornamental and fragrant flowers and many cultivars have been selected for improved flowering.

- **Family:** Clethraceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 3 to 9
- **Height:** 4 to 8 feet
- **Spread:** 4 to 8 feet
- **Growth Habit:** Dense oval to upright deciduous shrub spreads slowly by stolons
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Very tolerant of flooding, somewhat tolerant of drought. Resistant to salt spray. Requires low pH soils, will tolerate up to neutral range.
- **Ornamental Characteristics:** Bears glossy green leaves that turn to bright golden-yellow in autumn. Produces spicily fragrant racemes of white or pink flowers in mid-summer.
- **Pests and Diseases:** No serious pests or diseases. May contract mites under extreme drought and can become chlorotic in high pH soils.
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** This plant is prized by many pollinators for its nectar-rich blossoms. The plant can form dense thickets that can suppress the development of a canopy-layer and provide excellent habitat for many bird species.

Cultivars/Relatives:

- **'Hummingbird'** - low spreading variety with large, white flowers
- **'Pink Spires'** - rose pink buds that fade to white as they bloom
- **'Rosea'** - Pink buds and light pink flowers
- **'Ruby Spice'** - rose pink flowers that do not lose color
- **'September Beauty'** - Slightly more compact than species; late white flowers
- **'Sixteen Candles'** - particularly fragrant flowers, golden fall color



Fruit



Flowers



Full Plant



Stem color in winter

Description

Red-twig Dogwood is a medium-sized shrub from northern Eurasia and North America. Best known for its bright red bark, this plant is prized for its value in adding winter interest to the landscape.

- **Family:** Cornaceae
- **Native Range:** Northeastern North America and Northeastern Asia
- respectively
- **USDA Hardiness Zone:** 3 to 8
- **Height:** 6 to 9 feet
- **Spread:** 8 to 12 feet
- **Growth Habit:** A large spreading deciduous shrub; will form stoloniferous colonies; rejuvenative pruning of older stems every three years will help keep stem color vibrant.
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Prefers moist, well-drained soils in full sun. Tolerates wide range of soil moisture, pH, and textures. Tolerant of prolonged saturation.
- **Ornamental Characteristics:** Bears clusters of creamy white flowers that mature to pearly-like white fruits. In high pH soils the plant develops. Stems display bright red (sometimes yellow) bark.
- **Pests and Diseases:** Susceptible to leaf and twig blights. Scale, leaf miners and bagworms are occasional insect pests. Deer browse can be problematic on new growth.
- **Deer Resistance:** Seldom to Occasionally Severely Damaged
- **Ecological Effects:** This plant is used as a nectary and food plant by many of the insects and animals.

Cultivars/Relatives:

- *C. sericea* Cultivars/Relatives:
 - **'Baileyi'** - good stem color, superior flowering and fruiting to species
 - **'Cardinal'** - superior stem color
 - **'Flaviramea'** - Bright yellow bark, susceptible to canker
 - **'Isanti'** - relatively dwarf form, 5-6 feet tall, low, dense, mounding; heavy fruiting
 - **'Kelseyi'** - dwarf form, to 3 feet
 - **'Silver and Gold'** - yellow bark form with variegated leaves
- *C. alba* Cultivars/Relatives:
 - **'Alleman's Compact'** - relatively dwarf form, to 6' tall
 - **'Elegantissima'** - white variegated foliage
 - **'Ivory Halo'** - white variegated foliage with more dense, compact habit than 'Elegantissima'
 - **'Bloodgood'** - markedly showy red stems
 - **'Bud's Yellow'** - bright yellow stems, a good substitute for the disease-prone *C. sericea* 'Flaviramea'
 - **'Gouchaultii'** - yellow, pink, and white variegated leaves
 - **'Siberian Pearls'** - superior flowers and fruits; white fruits mature to blue
 - **'Sibirica'** - superior coral-red stems and bluish fruits
 - **'Spaethii'** - yellow variegated leaves



Foliage

R. H. Mohlenbrock, 1991

Description

Silky Dogwood is a medium to large shrub native to eastern North America. Superficially similar to its close relatives *C. sericea* and *C. racemosa* it bears dark blue fruits where the two other species both bear white fruits. Historically the dried bark of this plant was used as a tobacco substitute by some Native American tribes.



Flowers

(SB Flowers, 2007)



Full Plant

(SB Flowers, 2007)

- **Family:** Cornaceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 4 to 8
- **Height:** 6 to 12 feet
- **Spread:** 6 to 12 feet
- **Growth Habit:** Large, irregularly formed shrub, branches will layer where they touch the ground, may sucker to form small colonies.
- **Sun/Shade Requirements:** Full Sun to Full Shade
- **Cultural Tolerances:** Prefers moist, well-drained soils in full sun to part shade. Tolerates nearly full shade and prolonged irrigation as well as some drought. pH adaptable.
- **Ornamental Characteristics:** Twigs appear purplish-brown in spring but fade to brownish-grey as they mature. Clusters of white flowers in mid-summer mature to midnight blue berries in late-summer to fall.
- **Pests and Diseases:** No serious pests or diseases; occasionally susceptible to scale, borers, leaf miners, leaf spot, crown canker, blights, root rot, and powdery mildew.

- **Deer Resistance:** Seldom to Occasionally Severely Damaged
- **Ecological Effects:** This shrub of swamps and riparian areas suckers to form thickets and can assist in bank stabilization and erosion control. Flowers are used as nectaries by several species of insect pollinators. This shrub's fruit is eaten by several species of birds.

Cultivars/Relatives:

- ***C. rugosa*** - native to the Northeastern US; large, rough, oval leaves; difficult to find in the trade, but recognized for its tolerance of high pH soils.
- **'Blue Cloud'** - bluish foliage; particularly blue fruit
- **'Cinderella'** - ivory variegated foliage



Mature Fruit



Foliage



Flowers



Full Plant



Mature Fruit

Description

Gray Dogwood is a stand-forming native shrub of northeastern North America. It is best recognized in late-summer when its pearl-like white fruits are produced in abundance. This plant is a familiar sight along highway verges and in old fields and hedgerows where it suckers to form dense stands. Historically the Iroquois and Ojibwa Native American tribes used this plant for a variety of medicinal purposes.

- **Family:** Cornaceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 4 to 8
- **Height:** 4 to 15 feet
- **Spread:** 10 to 15 feet
- **Growth Habit:** Deciduous, upright suckering shrub; readily forms spreading clonal stands.
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Prefers moist, well-drained soils in full sun. Tolerates wide range of soil moisture, pH, and textures particularly poor and droughty soils.
- **Ornamental Characteristics:** Clusters of white flowers mature into white fruits borne on showy red peduncles. Varied but generally ornamental fall color running from yellow, orange, red, maroon, to dark purple.
- **Pests and Diseases:** No serious pests or diseases. Dogwood bud gall very occasionally a problem.
- **Deer Resistance:** Occasionally Severely Damaged

- **Ecological Effects:** This shrub of old-fields and wood-edges suckers to form thickets. Flowers are used as nectaries by several species of insect pollinators. Larval host for the Spring Azure butterfly. This shrub's fruit is eaten by several species of birds.

Cultivars/Relatives:

- **'Emerald'** - Glossy green leaves, superior form, pinkish fruits
- **'Cuyahoga'** - Pyramidal tree form
- **'Geauga'** - A dense multi-stemmed with dark-green foliage and reddish new growth
- **'Huron'** - rounded, globular form; 4' tall and wide; notable red fall color
- **'Mahoning'** - a stoloniferous spreader to 10' tall; notable grey winter stem color
- **'Muskingum'** - a dwarf form; 2' tall and 4' wide
- **'Ottawa'** - Fastigiate tree form; 12' tall and 6' wide



Fruit

Description

Blood-twíg Dogwood is a low shrub from northern Eurasia. Best known for its bright yellow to deep orange bark, usually appearing as a gradient from stem tips to base. This highly ornamental bark is particularly noticeable in winter, and has led to the propagation and use of this plant as an ornamental well outside of its native range.



Flowers



Full Plant

- **Family:** Cornaceae
- **Native Range:** Europe and southwestern Asia
- **USDA Hardiness Zone:** 5 to 7
- **Height:** 5 to 8 feet
- **Spread:** 5 to 6 feet
- **Growth Habit:** A deciduous, rounded, high, mounding shrub; may sucker to form colonies. Rejuvenative pruning of older stems every three years will help keep stem color vibrant.
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Prefers moist, well-drained soils in full sun. Tolerates wide range of soil moisture, pH, and textures particularly poor and droughty soils.
- **Ornamental Characteristics:** Bears clusters of creamy white flowers that mature to midnight blue fruits. In high pH soils the plant develops a unique pale greenish yellow fall color but in other soils can bear red fall color. Stems display a spectacular gradient of red, yellow, and orange colored bark all on an individual plant.

- **Pests and Diseases:** No serious pests or diseases.
- **Deer Resistance:** Occasionally Severely Damaged
- **Ecological Effects:** This plant is used as a nectary and food plant by many of the insects and animals that utilize similar native species (*C. sericea*, *C. racemosa*, etc.). In appropriate habitat, this plant has been known to naturalize but has not shown particularly aggressive tendencies.

Cultivars/Relatives:

- **'Arctic Sun'** - dwarf; 3-4 feet high and wide
- **'Compressa'** - Fastigate; dark green, deeply veined leaves; short internodes; few branches
- **'Midwinter Fire'** - improved winter stem color
- **'Winter Flame'** - improved winter color and smaller than species (3 to 4 feet)
- **'Viridissima'** - yellow-green bark



Stem color in winter



Flowers

Description

Shrubby Cinquefoil is a low, mounded shrub, native to the northern parts of the U.S., that usually reaches 2-4' in height. It prefers moist, well-drained soils in full sun, but is exceptionally tolerant of drought and very winter hardy. This plant would be best suited for the edges of bioswales, where the soil is less saturated. It performs better in cooler summer climates. Pruning can be done in late winter, if needed, to promote dense foliage.



Flowers



Full Plant



Foliage

- **Family:** Rosaceae
- **Native Range:** Two sub-species, scattered across the Northern Hemisphere
- **USDA Hardiness Zone:** 2 to 7
- **Height:** 2 to 4 feet
- **Spread:** 3 to 5 feet
- **Growth Habit:** Dense, low-mounding shrub; dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Tolerant of drought and high pH; reputedly tolerant of flooding; very winter hardy
- **Ornamental Characteristics:** extremely cultivar dependent; pale green to bluish foliage color; bloom color: white, pink, peach, yellow, orange
- **Pests and Diseases:** No serious pests or diseases. Powdery mildew may occur in humid climates. Susceptible to fungal leaf spots and spider mites, aphids, Japanese beetles, etc.
- **Deer Resistance:** Rarely Damaged

- **Ecological Effects:** Flowers attract butterflies and other pollinator species for a long bloom period lasting from June to November.

Cultivars/Relatives:

Over 130 named cultivars; below are a few of the most noteworthy.

- **'Abbotswood'** - prolific white flowers; bluish foliage
- **'Abbotswood Silber'** - same as above but with white variegated leaves
- **'Gold Drop'** - rounded plant to 3 feet; yellow flowers; long-blooming
- **'Pink Beauty'** - clear pink blossoms, semi-dwarf to 2 feet
- **'Snowbird'** - white blossoms; double-flowering; lustrous foliage
- **'Mango Tango'** - bicolor flowers; orange-red radiating to yellow
- **'Red Robin'** - red flowers that fade slightly to orange
- **'Sundance'** - double, yellow flowers
- **'Yellow Gem'** - yellow flowers with ruffled petals



Flowers

Description

Bush Honeysuckle is a low growing, suckering shrub with small, yellow flowers. Native to dry woods and sandy sites, it is especially tolerant of drought. It can be pruned back to remove dead or older growth. These species will create colonies and are good plants for erosion control. The two species are very similar, but *Diervilla lonicera* is not quite as vigorous as *D. sessilifolia*.



Habit



Foliage

- **Family:** Caprifoliaceae
- **Native Range:** *D. lonicera*: Northeastern North America, *D. sessilifolia*: Southeastern North America
- **USDA Hardiness Zone:** 3 to 10
- **Height:** 3 to 4 feet
- **Spread:** 3 to 4 feet
- **Growth Habit:** Low mounding, deciduous shrub; suckers to form broad clonal thickets
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Drought tolerant; tolerates soil textures from sand to clay; particularly tolerant of dry soils; tolerates low and high pH
- **Ornamental Characteristics:** Exfoliating bark; glossy green leaves; new grow may have attractive pale red stems; clusters of yellow flowers; red to purple fall foliage
- **Pests and Diseases:** No serious pests or diseases. May occasionally get powdery mildew.
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** Flowers attract butterflies and hummingbirds. This plant has a special value to Bumble bees.

Cultivars/Relatives:

- ***D. lonicera* 'Copper'** - emerging leaves copper-red; superior fall color to species
- ***D. sessilifolia* 'Butterfly'** - excellent red fall color
- ***D. sessilifolia* 'Cool Splash'** - white variegated foliage



Mass planting



Full Plant

Description

Dwarf Sea Buckthorn has an irregular, dense, compact habit, only reaching about 2' in height. The species is native to Europe, Northern Asia and China, often growing in coastal areas. Therefore, *Hippophae* can tolerate salt spray and salty soils. 'Sprite' is a sterile male cultivar that should be used due to the potential for this species to become invasive. Female plants have fruits that are cultivated and used to make teas, jams, sauces, and beverages. It may be cut back to a more compact or desired shape.



Foliage



Habit

- **Family:** Elaeagnaceae
- **Native Range:** North and Central Eurasia
- **USDA Hardiness Zone:** 3 to 8
- **Height:** 2 to 5 feet
- **Spread:** 2 to 4 feet
- **Growth Habit:** Dense and compact, male cultivar that produces no fruit; although fruits have great edible and medicinal properties, *Hippophae* has invasive potential and fruiting varieties should be avoided; can fix its own nitrogen; dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Tolerates sandy soils, extreme flood and drought tolerance, tolerant of salt. Tolerates acid to alkaline pH.
- **Ornamental Characteristics:** Silvery-bluish foliage
- **Pests and Diseases:** No serious pests or diseases.
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** This plant can be used as a coastal windbreak or to stabilize dunes. The sterile cultivar bears no fruit, therefore is of little interest to birds and pollinator species.

Cultivars/Relatives:

- **'Sprite'** - a sterile, male cultivar



Full plant

Description

These two species of St. Johnswort grow in small dense mounds. They are native in the Great Lakes region, growing in both dry and moist sites. Leaves are evergreen, but some may drop in winter. 'Ames' is the most cold hardy cultivar. Pruning can be done after they bloom in late summer. This plant would be best suited for the edges of bioswales, where the soil is less saturated. There are several other *Hypericum* species that may work as stormwater management plants in warmer climates only.



Flower



Foliage



Habit

- **Family:** Clusiaceae
- **Native Range:** Northeastern North America
- **USDA Hardiness Zone:** 4 to 9
- **Height:** 2 to 3 feet
- **Spread:** 2 to 3 feet
- **Growth Habit:** Dense, mounding, semievergreen to evergreen shrub
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Tolerant of drought and flooding, flowers best in full sun. Tolerant of high pH soils.
- **Ornamental Characteristics:** Bluish foliage, clusters of relatively large, golden flowers
- **Pests and Diseases:** No serious pests or diseases.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** Flowers attract several pollinator species.

Cultivars/Relatives:

- ***H. kalmianum* 'Ames'** - hardier than species
- ***H. kalmianum* 'Blue Velvet'** - superior blue foliage
- ***H. kalmianum* 'Gemo'** - prolonged bloom period
- ***H. kalmianum* 'Sunny Boulevard'** - compact, mounding form with dark green leaves
- ***H. kalmianum* 'Blues Festival'** - compact habit, blue-green foliage, long-blooming yellow flowers



Full Plant

Description

Native to the Eastern coast of the US, Inkberry can tolerate a wide range of soil and site conditions, including wet soils and shade. However, an acidic soil is necessary. *Ilex glabra* is a slow-growing, colony-forming evergreen shrub that can reach 5-8' in height and width. Unless a hedge is desired, minimal pruning is necessary. Inkberry leaves were once used by Native Americans to brew a tea-like drink, but the berries are usually quickly consumed by local bird species.



Foliage



Fruit



Flowers

- **Family:** Aquifoliaceae
- **Native Range:** Southeastern North America
- **USDA Hardiness Zone:** 4 to 9
- **Height:** 5 to 8 feet
- **Spread:** 5 to 8 feet
- **Growth Habit:** Dense to loose evergreen shrub; suckers to form colonies; dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Tolerant of a variety of soil textures and moistures; prefers acid to neutral soil pH
- **Ornamental Characteristics:** Glossy evergreen foliage, white flowers that mature to black berries; dioecious
- **Pests and Diseases:** No serious pests or diseases. Occasionally susceptible to spider mites in dry conditions; may become chlorotic in high pH conditions; leaf spot can occasionally be problematic
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** If both male and female plants are present and berries are produced, then they are eaten by several wildlife species. This plant also attracts birds and honeybees. The honey produced from the plant is highly rated.

Cultivars/Relatives:

- **'Compacta'** - dense, oval habit
- **'Ivory Queen'** - white fruited instead of black fruited
- **'Nordic'** - extremely cold hardy form; notable for its broad growth habit and dark green lustrous foliage, a male selection
- **'Shamrock'** - best dwarf form with glossy deep green, rounded, 3 to 5 feet high.



Full Plant



Foliage and Fruit



Fruit



Female Flower

Description

Winterberry is best known for the spectacular show of persistent red berries in late fall and winter. There must be at least one male plant to every 6-10 female plants in order to have berries. This plant can be an adaptable naturalizer due to its ability to grow in both wet and dry sites. Pruning should be done in early spring before there is any new growth.

- **Family:** Aquifoliaceae
 - **Native Range:** Northeastern North America
 - **USDA Hardiness Zone:** 3 to 9
 - **Height:** 3 to 12 feet
 - **Spread:** 3 to 12 feet
 - **Growth Habit:** Upright, rounded, deciduous shrub
 - **Sun/Shade Requirements:** Full Sun to Part Shade
 - **Cultural Tolerances:** Prefers wet, acid soil but can handle relatively dry soils as well
 - **Ornamental Characteristics:** White flowers mature to dense crops of bright red or orange berries; dark grey-brown bark covered with white lenticels; dioecious, needs pollinator the flowers simultaneously to set fruit
 - **Pests and Diseases:** No serious pests or diseases. Occasionally contracts leaf spot or powdery mildew. Plants become chlorotic and sometimes die in high pH soils
 - **Deer Resistance:** Seldom Severely Damaged
 - **Ecological Effects:** This plant is used by some species as cover or a nesting site. It is of special value to honey bees and also provides nectar for insects and fruit for birds.
- Cultivars/Relatives:
- **'Afterglow'** - reddish orange fruits; very glossy leaves; compact habit
 - **'Aurantiaca'** - slightly dwarf to 5 feet; orange-red fruit that fades to orange-yellow; early flowering
 - **'Cacapon'** - slightly dwarf to 5 feet; heavy fruiting; glossy green leaves
 - **'Chrysocarpa'** - yellow-fruited form
 - **'Jim Dandy'** - slightly dwarf to 5

- feet; early flowering male clone for pollinating early flowering female cultivars ('Afterglow', 'Aurantiaca', 'Red Sprite', etc.)
- **'Red Sprite'** - dwarf female clone to 4' tall; low, mounding habit; early bloomer; very large, persistent red fruits
- **'Shaver'** - an early-flowering form, slightly dwarf to 5 feet; produces orange-red fruit and glossy leaves
- **'Southern Gentlemen'** - late flowering male clone for pollinating late flowering female cultivars ('Cacapon', 'Sparkleberry', 'Shaver', 'Winter Gold', 'Winter Red', etc.)
- **'Stoptlight'** - newer late flowering selection with large deep red fruit and glossy foliage; to 8 feet
- **'Sunsplash'** - female selection with splotchy yellow variegated leaves
- **'Winter Gold'** - late flowering male selection; pinkish or golden-orange fruit; light green leaves
- **'Winter Red'** - one of the most popular cultivars; profuse bright red fruits; rounded; to 8 feet
- *Ilex verticillata x serrata* hybrids:
- **'Apollo'** - late flowering male clone with new growth emerging red
- **'Autumn Glow'** - dense growth to 10'
- **'Bonfire'** - profusion of early season fruits; fruit at an early age; mounding habit to 10 feet
- **'Raritan Chief'** - male clone useful for its long flowering period; to 12 feet; glossy green foliage
- **'Sparkleberry'** - popular cultivar; to 12 feet; long-persisting medium-sized fruit



Full Plant

Description

Virginia Sweetspire is a broad shrub with arching branches, with its native habitat being floodplain woodlands, or along rivers, lakes, and swamps. Drooping flower racemes are mildly fragrant. The plant is most successful if planted in masses, because single plants can look a bit scraggly. If dense colonies are not desired, root suckering must be kept in check, to prevent colonies from forming.



Fall Foliage



Flowers



Winter Fruit

- **Family:** Iteaceae
- **Native Range:** Southeastern North America
- **USDA Hardiness Zone:** 5 to 9
- **Height:** 3 to 4 feet
- **Spread:** 4 to 6 feet
- **Growth Habit:** Low to medium, deciduous, rounded shrub
- **Sun/Shade Requirements:** Full Sun to Part Shade to Shade
- **Cultural Tolerances:** Generally requires acid to neutral soil; tolerates a wide variety of soil texture and moisture; forms colonies by sucking
- **Ornamental Characteristics:** Long, drooping, fragrant racemes of white flower; spectacular red fall color; red to red-brown bark
- **Pests and Diseases:** No serious pests or diseases. May become chlorotic in high pH soil.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** This plant provides cover for wildlife, nectar for insects and attracts some bird species.

Cultivars/Relatives:

- **'Henry's Garnet'** - more cold-tolerant with flowers and fall color superior to species
- **'Little Henry'** - dwarf form to 4 feet
- **'Long Spire'** - notably long racemes
- **'Merlot'** - compact habit with red fall foliage
- **'Morton'** - best high pH tolerance, to 7.0 approximately
- **'Sara Eve'** - pale pink flowering
- **'Saturnalia'** - matures to a smaller size than species, comparable to 'Henry's Garnet'



Full Plant

Description

Northern Bayberry is a dense deciduous, rounded shrub native to the eastern coast, able to tolerate a wide range of soil conditions. It grows best in groups and may sucker to form large colonies. This is a dioecious plant, so clusters of grayish fruit will grow on female plants if there is a male plant nearby. Fruits are covered in fragrant waxy substance that is used to make candles and soaps. *Morella* is also able to fix its own nitrogen.



Fruit



Foliage



Flowers

- **Family:** Myricaceae
- **Native Range:** Northeastern North America
- **USDA Hardiness Zone:** 2 to 9
- **Height:** 5 to 10 feet
- **Spread:** 5 to 10 feet
- **Growth Habit:** Medium to large rounded shrub; deciduous to semi-evergreen; suckers readily to form colonies
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Extremely tolerant of a variety of soils especially sandy soils; tolerant of salt spray/soils; tolerant of flooding and drought; capable of nitrogen fixation; dioecious; tolerant of high pH soil.
- **Ornamental Characteristics:** Glossy green leaves; persistent gray-blue fruits
- **Pests and Diseases:** No serious pests or diseases.
- **Deer Resistance:** Rarely Damaged

- **Ecological Effects:** Berries are eaten by many winter birds. The plant attracts several birds and butterflies.

Cultivars/Relatives:

- **'Bobbee'** - female clone; dense growth; 6 to 8 feet high and wide
- **'Silver Sprite'** - female clone; broadly mounding; silver-grey leaves; semi-dwarf to 5 feet



Full Plant

Description

Common Ninebark is a coarse, upright shrub that can adapt to a variety of site conditions, but is native to bluffs, cliffs, rocky banks of streams, with dry to moist, slightly acidic soil. Mature, exfoliating, orange-brown bark provides some winter interest. Pruning should be done immediately after blooming where needed, or cut close to the ground in winter to rejuvenate the plant.



Flowers



Bark



Foliage

- **Family:** Rosaceae
- **Native Range:** Eastern and Central North America
- **USDA Hardiness Zone:** 2 to 8
- **Height:** 5 to 8 feet
- **Spread:** 4 to 6 feet
- **Growth Habit:** Medium to large, multi-stem, arching, deciduous shrub
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Tolerant of a variety of soil types; tolerates flooding and drought; tolerates high pH soils
- **Ornamental Characteristics:** Clusters of pale pink or white flowers; foliage color and size varies by cultivar, exfoliating bark
- **Pests and Diseases:** No serious insect or disease problems. Fireblight, leaf spots, and powdery mildew occasionally an issue.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** This plant attracts birds and is of special value to native bees and honey bees.

Cultivars/Relatives:

- **'Center Glow'** - foliage emerges green and gold and slowly fades to burgundy as they mature
- **'Dart's Gold'** - semi-dwarf to 5 feet; chartreuse foliage turns orange in fall
- **'Diablo'** - deep purple foliage
- **'Lady in Red'** - compact habit; burgundy foliage; pink flowers
- **'Little Devil'** - semi-dwarf to 4 feet; compact habit; white-pink flowers, deep burgundy foliage
- **'Nugget'** - chartreuse foliage; dense habit; 6 feet tall and wide; superior to 'Dart's Gold'
- **'Snowfall'** - green foliage; dense habit to 7 feet; showier flowers and foliage than species
- **'Summer Wine'** - deeply cut, wine-red foliage; dense, mounding growth habit
- **'Tiny Wine'** - dwarf, 3 to 4 feet tall and wide; dark maroon to bronze leaves; white-pink flowers



Full Plant

Description

Winged Sumac, or Flameleaf Sumac, is a large open shrub that grows on dry hillsides, in open woods and on roadsides. The leaves turn an attractive flame-red in autumn, hence the common name. It works well when massed on slopes for erosion control, and can sometimes become too weedy for some areas, as it spreads by root suckers. May be cut back in early spring to reduce size.



Foliage



Habit



Fall Foliage

- **Family:** Anacardiaceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 4 to 9
- **Height:** 7 to 15 feet
- **Spread:** 7 to 20 feet
- **Growth Habit:** Deciduous shrub to small tree; root suckers to form large colonies. sometimes aggressively
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Tolerant of drought and salt; relatively flood tolerant; tolerant of a wide range of soil textures and poor soils; tolerant of high pH soils
- **Ornamental Characteristics:** Spectacular red and orange fall color; yellow-green flower spikes that mature to persistent red fruits
- **Pests and Diseases:** No serious pest or disease problems. Occasionally susceptible to leaf spot, rusts, scale, aphids and mites.
- **Deer Resistance:** Rarely Damaged

- **Ecological Effects:** This plant is used as winter food for many gamebirds, songbirds and mammals. Wildlife eat the fruit and deer browse the twigs. It provides nesting material and structures for native bees, and is valued by honey bees as well.

Cultivars/Relatives:

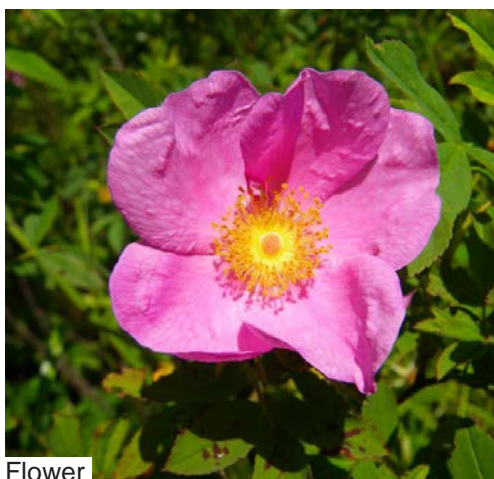
- **'Prairie Flame'** - semi-dwarf to 7 feet; glossy green foliage; even better fall color than species
- **'Lanham's Purple'** - bright purple emergent foliage that fades to glossy red-green through the growing season; more colorful flowers than species; excellent fall color



Full Plant

Description

Swamp Rose is an upright shrub with arching branches. It is native to wet soil conditions, and is very tolerant of standing water. Pruning should be done in late winter, as needed. Leaves often provide an attractive show of red in fall, along with prominent red fruit (hips).



Flower



Habit



Hips

- **Family:** Rosaceae
- **Native Range:** Eastern and Central North America
- **USDA Hardiness Zone:** 4 to 9
- **Height:** 3 to 6 feet
- **Spread:** 3 to 6 feet
- **Growth Habit:** Deciduous, thorny, multi-stem shrub; spreads slowly by suckers
- **Sun/Shade Requirements:** Full Sun
- **Cultural Tolerances:** Prefers acid soil but tolerates neutral pH; very tolerant of flooding; tolerant of drought
- **Ornamental Characteristics:** Glossy green foliage; large, fragrant pink flowers throughout summer; glossy, red, persistent hips
- **Pests and Diseases:** Not generally susceptible to the diseases and pests that attack many of the hybrid roses. Pest and disease problems associated with other roses which might rarely affect this species could include: black spot, powdery mildew, rust, aphids, beetles, borers, scale, thrips, rose midges and leafhoppers.

- **Deer Resistance:** Seldom Severely Damaged
 - **Ecological Effects:** This plant attracts birds and provides nesting materials and structure for native bees and bumble bees.
- Cultivars/Relatives:
- **var. scandens** - more graceful and arching than species



S. discolor catkins

Description

Pussy Willow is a large shrub or small multi-stemmed tree, native to marshy low ground, stream banks, and other wet sites. Their best known characteristic, the catkins, are larger on male plants. Prune as needed in late winter or early spring. It can be cut back to the ground every 3 to 5 years to maintain a smaller shrub shape. *S. discolor*, the true pussy willow, native to Eastern North America is considered the inferior species for landscape use. *S. caprea* is the northern European species with larger catkins, and several cultivars, including 'Pendula' with a weeping habit.



Full Plant



Foliage & Buds



S. gracilistyla 'Melanostachys' catkin

- **Family:** Salicaceae
- **Native Range:** *S. discolor*: Northern North America, *S. caprea*: Eurasia
- **USDA Hardiness Zone:** 2 to 7
- **Height:** 6 to 15 feet
- **Spread:** 4 to 12 feet
- **Growth Habit:** Large deciduous multi-stem shrub; dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Prefers full sun and moist soils but can tolerate some drought; tolerates high pH soil
- **Ornamental Characteristics:** Silky, pearl-grey then yellow-green catkins emerge in early spring
- **Pests and Diseases:** Susceptible to numerous pests and diseases including: blights, powdery mildew, leaf spots, gray scab, cankers, aphids, scale, borers, lacebugs and caterpillars.
- **Deer Resistance:** Occasionally Severely Damaged

- **Ecological Effects:** Provides early season resources for songbirds, waterfowl and small mammals. It attracts butterflies and is of special value to native, honey and bumble bees.

Cultivars/Relatives:

- **'Rosea'** - pale rosy catkins
- ***S. caprea*** - northern European species; larger catkins, several cultivars, including 'Pendula' with a weeping habit.
- ***Salix gracilistyla* 'Melanostachys'** - native to China, Korea and Japan; 6 to 10 feet tall; showy black catkins with red anthers



Full Plant

Description

Purple Willow is a multi-stemmed, fine-branched shrub with an upright bushy or weeping ('Pendula') appearance. It is native to low ground areas along bodies of water, thickets, swamps and often disturbed areas. Purple Willow can be a good plant for stabilizing eroding stream banks. This plant develops very quickly and has a tendency to spread, therefore cutting back to the ground every few years will keep it from becoming overgrown. It is important to choose a cultivar, as heights can vary greatly. Purple Willow is less susceptible to insect pests than other willows.



Catkins



Habit



Foliage

- **Family:** Salicaceae
- **Native Range:** Europe and Western Asia
- **USDA Hardiness Zone:** 4 to 8
- **Height:** 3 to 10 feet
- **Spread:** 4 to 10 feet
- **Growth Habit:** Deciduous; full, multi-stem shrub; upright to mounding (cultivar dependent), dioecious
- **Sun/Shade Requirements:** Full Sun
- **Cultural Tolerances:** Prefers moist soils but can handle some drought as well; tolerant of clay soils and high pH
- **Ornamental Characteristics:** Attractive leathery, bluish foliage on handsome purple stems
- **Pests and Diseases:** No serious insect or disease problems. Occasionally susceptible to numerous foliar diseases, blights and cankers and many insect pests including aphids, scale and borers.
- **Deer Resistance:** Occasionally Severely Damaged

- **Ecological Effects:** Florets attract insects and several bee species. Deer browse on the twigs and foliage. The dense bushy habit provides cover for wildlife and nesting for birds.

Cultivars/Relatives:

- **'Canyon Blue'** - semi-dwarf to 5 feet; steely blue-gray foliage; low and rounded
- **'Gracilis'** - medium height to 6 feet; slender upright stems
- **'Pendula'** - spreading, pendant growth habit
- **'Nana'** - semi-dwarf to 6 feet; striking blue-green foliage
- **'Nancy Saunders'** - female clone; silvery-grey leaves on glossy, maroon-red stems
- **'Streamco'** - very vigorous growth; readily suckers and self layers; selected



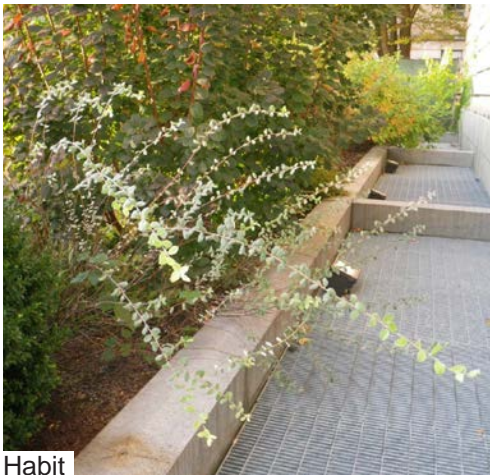
Full Plant

Description

Creeping Silver Willow is a low shrub, 2'-3' tall with thin upright branches. This characteristic is prominent in the second year after planting. Small pubescent gray leaves give it a fine texture. Easily grown in wet or dry soil once established. It can be cut back yearly to reduce size and maintain dense foliage. Best grown in full sun.



Foliage



Habit

- **Family:** Salicaceae
- **Native Range:** Coastal Northwestern Europe
- **USDA Hardiness Zone:** 4 to 6
- **Height:** 2 to 3 feet
- **Spread:** 5 to 6 feet
- **Growth Habit:** Low, mounding canes
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Extremely high drought tolerance for a willow, flood tolerant as well; tolerant of a variety of soils especially sand, tolerant of salt spray and high pH
- **Ornamental Characteristics:** Small, downy, silvery leaves, forms a dense groundcover with regular pruning
- **Pests and Diseases:** No serious pests or diseases. Potentially susceptible to aphids, rust, and scale
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** Provides food, cover and nesting to several bird and animal species

Cultivars/Relatives: N/A



Foliage

Sageleaf Willow, Hoary Willow - *Salix candida*



Full Plant



Foliage

Description

Sageleaf Willow is a small shrub with silver-grey foliage that bears yellow catkins in spring. Native to northern swamps and bogs, this plant is extremely tolerant of both cold and saturated soils. It will grow and seems to thrive in several soil and moisture conditions.

- **Family:** Salicaceae
- **Native Range:** Northern North America
- **USDA Hardiness Zone:** 1 to 6
- **Height:** 3 to 4 feet
- **Spread:** 3 to 4 feet
- **Growth Habit:** Small to medium sized upright shrub; deciduous; dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Drought tolerance untested; tolerant of flood and high pH; extremely cold hardy

- **Ornamental Characteristics:** Foliage can be leathery and glossy green on top and felted silver-grey beneath or silvery-grey and pubescent on top and bottom; yellow catkins
- **Pests and Diseases:** No serious known pests or diseases.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** Special value to native bee species.

Cultivars/Relatives:

- **'Silver Fox'** - dwarf to 3 feet; felted silvery leaves

Rosemary Willow - *Salix elaeagnos*



Full Plant



Foliage

Description

Rosemary Willow is a shrub with long upright branches that have a distinctive fine texture from its rosemary-like willow leaves. This willow will grow quite successfully in wet areas, its native habitat, where other shrubs are not successful. It benefits from cutting back every year or two to encourage dense growth and control height.

- **Family:** Salicaceae
- **Native Range:** Central and Southern Europe
- **USDA Hardiness Zone:** 4 to 7
- **Height:** 4 to 15 feet
- **Spread:** 4 to 15 feet
- **Growth Habit:** Dense, medium-sized shrub; deciduous; dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Drought tolerance untested; tolerant of high pH; very tolerant of wet sites

- **Ornamental Characteristics:** Long, "rosemary-like" leaves, grey/green foliage; mature stems are a reddish brown; catkins appear before leaves
- **Pests and Diseases:** No serious known pests or diseases.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** Provides food, cover and nesting to many small bird and animal species.

Cultivars/Relatives: N/A

Nishiki Willow - *Salix integra* 'Hakuro Nishiki'



Full Plant



Foliage

Description

Nishiki Willow is a potentially large shrub, native to riverbanks and moist meadows. It can tolerate drier soils better than other willows. Severe pruning in early spring or late winter will help control height and encourage new, more vigorous growth. The best foliage color will occur in cool summer climates.

- **Family:** Salicaceae
- **Native Range:** China, Japan, Korea and Southeastern Siberia
- **USDA Hardiness Zone:** 5 to 7
- **Height:** 4 to 10 feet
- **Spread:** 4 to 8 feet
- **Growth Habit:** medium to large, upright shrub; deciduous; dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Drought tolerance untested; tolerant of flood and high pH
- **Ornamental Characteristics:** Narrow, pale leaves emerge as salmon pink

and age to white variegation, then green; stems turn red in fall

- **Pests and Diseases:** Susceptible to numerous disease problems and insect pests, such as bacterial twig light; crown gall; leaf blight; black canker
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** Provides food, cover and nesting to several bird and animal species

Cultivars/Relatives:

- **'Hakuro Nishiki'** - more compact than species, variegated shades on leaves

Blue-stem Willow - *Salix irrorata*



Foliage



Full Plant

Description

Blue-stem Willow is a very upright shrub, with dark red stems coated in a powdery white bloom causing the stems to appear blue. It is often found by streams in the sun at high elevations, but can also be found in moist soils at sea level. The stems make it a great plant for winter interest. This plant benefits from being cut back to the ground every couple of years.

- **Family:** Salicaceae
- **Native Range:** Western North America
- **USDA Hardiness Zone:** 5 to 8
- **Height:** 8 to 10 feet
- **Spread:** 4 to 10 feet
- **Growth Habit:** Dense, upright form; deciduous; dioecious
- **Sun/Shade Requirements:** Full Sun
- **Cultural Tolerances:** Drought tolerance untested; prefers moist to wet soils; tolerates high pH
- **Ornamental Characteristics:** Stems are bluish-white to blue-purple that

contrasts with yellow spring catkins and yellow fall foliage; leaves are glossy green with grey undersides

- **Pests and Diseases:** No serious known pests or diseases.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** Special value to native bee species. Provides food, nesting and shelter to several bird and animal species.

Cultivars/Relatives: N/A



Full Plant



Foliage

Description

Bayberry Willow is a tough, compact shrub rarely exceeding 5 feet. It grows in a variety of site conditions, including lake shores, swamps, and sand dunes.

- **Family:** Salicaceae
- **Native Range:** Northeastern North America
- **USDA Hardiness Zone:** 2 to 7
- **Height:** 5 to 18 feet
- **Spread:** 4 to 10 feet
- **Growth Habit:** compact, deciduous; dioecious
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Drought tolerance untested

- **Ornamental Characteristics:** Shiny, thick leaves are densely arranged on stems, undersides are glaucous and appear white; young twigs are reddish-brown
- **Pests and Diseases:** No serious pests or diseases.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** Special value to native bee species.

Cultivars/Relatives: N/A



S. canadensis habit

Description

This is a loose, graceful shrub that usually grows in moist soils in open woodlands, fields and along banks. The American Elderberry (*Sambucus canadensis*) fruits are known to be more flavorful, and are more often used to make jams, jellies, and pies. Winter pruning will control height and promote dense foliage. It includes pruning dead stems, shortening one year stems, or cutting back to the ground in order to rejuvenate.



S. nigra 'Black Lace' flowers



S. canadensis flowers



S. canadensis fruit

- **Family:** Adoxaceae
- **Native Range:** *S. canadensis*: Eastern North and Central America (from Canada to Panama), *S. nigra*: Europe
- **USDA Hardiness Zone:** 3 to 11
- **Height:** 5 to 12 feet
- **Spread:** 5 to 12 feet
- **Growth Habit:** Large multi-stem shrub; suckers and layers to form colonies
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Prefers moist soils but tolerates some drought; tolerates a variety of soil types; tolerant of high pH soil
- **Ornamental Characteristics:** Large umbels of small white to pink flowers; dark purple fruits; foliage color of green, yellow, and purple by cultivar
- **Pests and Diseases:** Some susceptibility to canker, powdery mildew, leaf spot, borers, spider mites and aphids.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** The berries are used by many birds and mammals. The plant is a good source of nectar for insects and pollinators, and also attracts birds.

Cultivars/Relatives:

- **'Adams'** - larger, more numerous fruits than species
- **'Aurea'** - large (to 10 feet), golden leaved variety
- **'Laciniata'** - deeply incised green leaves
- **'Variegata'** - narrow leaflets with creamy white-yellow variegation; prefers semi-shade for best foliage color
- **'York'** - larger, more numerous fruits than species; similar to 'Adams'
- *S. nigra* Cultivars
- **'Black Beauty'** - dark purple foliage; lemon-scented, pink flowers
- **'Black Lace'** - deeply incised dark purple foliage; lemon-scented, pink flowers; dark blackish-red fruits

Sambucus racemosa - Red Elderberry is a similar species in habit and cultural tolerances, but its berries are red and poisonous.

- **'Sutherland Gold'** - deeply incised golden foliage that emerges as bronze



Full Plant



Fruits

Description

Silver Buffaloberry is an upright, bushy, thorny shrub, that can become almost tree-like, tolerating some of the poorest dry soil conditions. It is dioecious, so for fruit to be produced there must be male and female plants. The bright red fruits that mature in fall are edible, but very sour.

- **Family:** Elaeagnaceae
- **Native Range:** Northern and Western North America
- **USDA Hardiness Zone:** 3 to 9
- **Height:** 3 to 20 feet
- **Spread:** 3 to 20 feet
- **Growth Habit:** Irregular shrub to small tree; slow growing; thorny; deciduous; weak suckering habit; capable of nitrogen fixation; dioecious
- **Sun/Shade Requirements:** Full Sun
- **Cultural Tolerances:** Tolerant of flood and drought; tolerant of high pH; relatively high salt tolerance
- **Ornamental Characteristics:** Silvery-grey foliage; yellow flowers which mature to bright red berries

- **Pests and Diseases:** No serious pests or diseases. White heart rot sometimes a problem in older plants.
- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** This plant has special value to native bee populations.

Cultivars/Relatives:

- ***S. canadensis*** - shares the range of *S. argentea* but with a larger eastern distribution; less silvery foliage than *S. argentea*
- **'Sakakawea'** - yellow fruiting variety



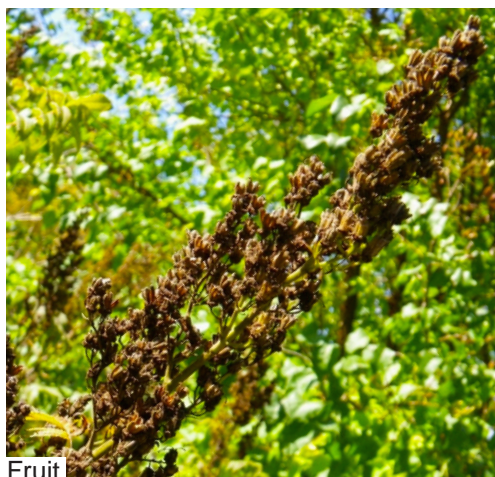
Emerging Foliage



Flower



Full Plant



Fruit

Description

False Spirea is a suckering woody shrub from East Asia. Its botanical name refers to the resemblance of its foliage to plants in the genus *Sorbus* (Mountain Ash). Prized for its hardiness and reliable flowering this plant was historically used for roadside erosion control until its invasive tendencies were discovered. The cultivar 'Sem' has gained popularity recently for its colorful emerging foliage, shorter height, and for its less invasive nature.

- **Family:** Rosaceae
- **Native Range:** Northeast Asia
- **USDA Hardiness Zone:** 2 to 8
- **Height:** 5 to 10 feet
- **Spread:** 5 to 10 feet
- **Growth Habit:** Deciduous, caning, multi-stem shrub; suckers to form colonies
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Tolerates moist soils but not prolonged saturation, fairly drought tolerant. Grows successfully in most types of soils. Tolerates acid to alkaline soil.
- **Ornamental Characteristics:** This plant leafs-out very early in spring. It bears heavily textured pinnately compound foliage on arching canes. Large, foamy white flower spikes are borne terminally in early to mid summer and fade to persistent, architectural clusters of brown seed capsules.

- **Pests and Diseases:** No serious pests or diseases. Can spread aggressively and become invasive in some areas.
- **Deer Resistance:** Rarely Damaged
- **Ecological Effects:** Flowers are utilized by several pollinators.

Cultivars/Relatives:

- **'Sem'** - smaller (Height 3-4', Width 4-6') and less aggressive than species; new foliage emerges yellow, orange, and red, fading to pale green
- **var. stellipila** - later flowering than species (July-August)



Flowers



Full Plant

Description

Steeplebush is a dense, mound-shaped shrub that produces erect stems of pink flowers, and spreads by suckers, forming colonies. It is native to wet meadows, marshes, lake margins, and other moist soiled areas, but can tolerate a wide range of soil conditions. Pruning is done in late winter or early spring. While in bloom, removing faded flower clusters will promote additional blooming.

- **Family:** Rosaceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 3 to 8
- **Height:** 2 to 4 feet
- **Spread:** 3 to 5 feet
- **Growth Habit:** Deciduous, upright, multi-stem shrub; suckering
- **Sun/Shade Requirements:** Full Sun
- **Cultural Tolerances:** Tolerant of a variety of soil types; prefers acid soils; tolerant of flooding and drought
- **Ornamental Characteristics:** Tall, dense racemes of small pink to rose-purple flowers; textured green leaves covered in orange hairs beneath
- **Pests and Diseases:** No serious pests or diseases. Susceptible to many of the diseases that attack other rose family members, including leaf spot, fire blight and powdery mildew, aphids, leaf roller, caterpillars and scale.
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** Birds, butterflies and native bees are attracted to this plant.

Cultivars/Relatives:

- ***S. alba*** - Native to Eastern and Central North America; white to pink racemes of flower; with thin narrow leaves



Flowers

(Vincenz, 2007)



Fruits



Foliage & Fruits

Description

Snowberry is native to wooded hillsides and rocky slopes, with average soils, but can adapt to a wide range of poorer soil conditions. It has sparse branching, eventually forming a thicket, spreading by suckers. This makes it useful as an erosion control plant. Berries ripen to be white and marshmallow-like, and often provide some winter interest, as many bird species do not eat them. This plant would be best suited for the edges of bioswales, where the soil is less saturated. Pruning can be done from late winter to early spring, as needed.

- **Family:** Caprifoliaceae
- **Native Range:** Northern North America
- **USDA Hardiness Zone:** 2 to 7
- **Height:** 3 to 6 feet
- **Spread:** 3 to 6 feet
- **Growth Habit:** Dense, rounded habit; spreads by suckers
- **Sun/Shade Requirements:** Sun to Medium Shade
- **Cultural Tolerances:** Tolerant of a variety of soils; high pH tolerant; drought tolerant and reputedly flood tolerant
- **Ornamental Characteristics:** Small bell shaped rose-pink and white flowers that mature into large white "marshmallow-like" fruits
- **Pests and Diseases:** No serious pests or disease problems. Anthracnose, leaf spot, powdery mildew, rust, berry rot, and spider mites may occur.
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** This plant provides food, cover and nesting for songbirds, gamebirds and small mammals.

Cultivars/Relatives:

- **var. *laevigatus*** - more vigorous than species; larger in all parts, particularly the fruits; grows to taller than 6 feet
- **'Variegata'** - variegated white-edged leaves



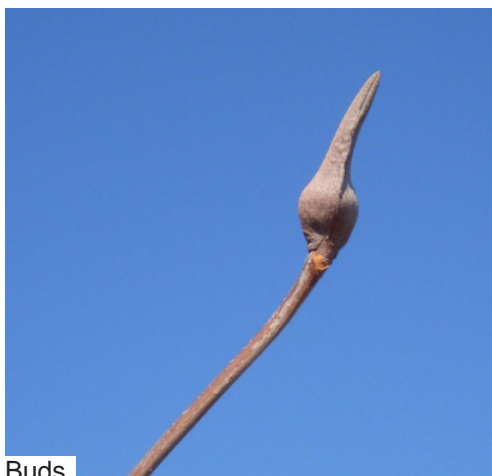
Flowers

Description

Nannyberry Viburnum is a large, upright, multi-stemmed shrub or single-trunk small tree. It is native to hillsides, stream banks, and open woods with average, well-drained soil. Fruits are prized by birds and other wildlife, but are edible to humans as well and can be consumed raw or made into preserves. Flower buds for the following year form in summer, so pruning should be done immediately after flowering. Selective stem pruning is needed in order to keep its form. Remove any root suckers as well, unless naturalization is desired.



Full Plant



Buds



Foliage

- **Family:** Adoxaceae
- **Native Range:** Northeastern and Central North America
- **USDA Hardiness Zone:** 2 to 8
- **Height:** 14 to 16 feet
- **Spread:** 6 to 12 feet
- **Growth Habit:** Deciduous, upright, multi-stem shrub; suckers to form colonies
- **Sun/Shade Requirements:** Full Sun
- **Cultural Tolerances:** Prefers full sun, is tolerant of a variety of soils and flood; somewhat drought tolerant; tolerates high pH
- **Ornamental Characteristics:** Glossy green leaves; umbels of white to pink flowers that mature to dark blue, edible fruits; attractive reddish-purple fall foliage
- **Pests and Diseases:** No serious pests or diseases. Occasionally susceptible to powdery mildew in humid climates. Moderately susceptible to Viburnum Leaf Beetle
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** Squirrels, butterflies and birds are attracted to this plant for its foliage and growth habit.

Cultivars/Relatives:

- **'Deep Green'** - large to 20 feet; lustrous dark green leaves
- **'Pink Beauty'** - pink fruits that turn purple with age



Full Plant

Description

Possumhaw Viburnum is a shrub with upright stems, that arch with age. It is native to savannas, low, wet woods, and bogs, but is adaptable to a variety of conditions, tolerating only occasional drought. For the best cross-pollination and fruit display, planting in groups of more than one variety is recommended. Berries are edible, though highly acidic, and provide striking color of blues, pinks and purples contrasting with the foliage. New cultivars show improved pink and blue fruit color and deep red-orange fall color. Pruning may be done after flowering, but it will take away from the fruit display at the end of summer.



Flowers



Fruits



V. cassinoides Full Plant

- **Family:** Adoxaceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 3 to 8
- **Height:** 5 to 12 feet
- **Spread:** 5 to 12 feet
- **Growth Habit:** Dense, rounded, upright, multistem, deciduous shrub; plant at least two varieties to get good fruit set
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Requires acid soils; prefers moist to wet soils, but can handle occasional drought
- **Ornamental Characteristics:** Glossy green leaves; umbels of white flowers that mature to colorful fruits; fruits start out green and color through pink to purple-blue; excellent orange and red fall foliage
- **Pests and Diseases:** No serious pests or diseases. Occasional pests and diseases might include: aphids, borers, nematodes, scale, thrips, anthracnose, leaf spots and powdery mildew. Highly susceptible to Viburnum Leaf Beetle.

- **Deer Resistance:** Seldom Severely Damaged
- **Ecological Effects:** This plant and its berries are utilized by songbirds, water birds, shorebirds and small mammals.

Cultivars/Relatives:

- ***V. cassinoides*** - more northern species; *V. nudum* is sometimes recognized as a sub-species of *V. cassinoides*
- **'Brandywine'** - glossy leaves, better fruit color than species; wine-red fall foliage
- **'Count Pulaski'** - large glossy leaves, better fruit color than species
- **'Deep Pink'** - is a *V. cassinoides* cultivar with deep pink fruits
- **'Pink Beauty'** - relatively compact, to 6 feet; leaves, fruit, and fall color attractive as with species
- **'Winterthur'** - glossy leaves, excellent fruit color



Full Plant

Description

Blackhaw Viburnum is a stiff-branched shrub or small tree, sometimes reaching up to 30 feet in height. Its native habitat is low to upland wood edges, thickets and roadsides, but is adaptable to many soil types. Ripe black-blue fruits are edible, but seedy, and can be used to make jams. Prune immediately after flowering, because the following year's buds are formed in summer. Improved cultivars should be chosen for mildew resistance and good fall color.



Fruit



Flowers



Foliage

- **Family:** Adoxaceae
- **Native Range:** Eastern North America
- **USDA Hardiness Zone:** 3 to 9
- **Height:** 12 to 15 feet
- **Spread:** 6 to 12 feet
- **Growth Habit:** Deciduous multi-stem shrub or single-stem small tree
- **Sun/Shade Requirements:** Full Sun to Part Shade
- **Cultural Tolerances:** Tolerant of flooding and drought; tolerates fairly deep shade, however flowers best in full sun
- **Ornamental Characteristics:** Glossy dark green leaves; umbels of white flowers that mature to blue-black fruit; excellent reddish fall color; "alligator" bark when mature
- **Pests and Diseases:** No serious pest or disease problems. Occasionally susceptible to powdery mildew. Moderately susceptible to Viburnum Leaf Beetle.
- **Deer Resistance:** Seldom Severely Damaged

- **Ecological Effects:** The berries are utilized by several bird and mammal species. This plant is also desirable to native bees and bumble bees.

Cultivars/Relatives:

- **'Early Red'** - emerging leaves are tinged red; fall foliage is deep red
- **'Knighthood'** - dark purple fall color; mildew resistant
- **'Ovation'** - upright, columnar habit to 10 feet tall; emerging leaves are reddish; mildew resistant
- **'Summer Magic'** - more rounded, tight habit than species; beautiful yellow and red fall foliage

Plant Qualities at a Glance

Below are some simplified lists of the plants described previously which can further help in selecting the right plant for a site.

Plants that require acid soils:

- *Aronia melanocarpa*
- *Clethra alnifolia*
- *Ilex glabra*
- *Ilex verticillata*
- *Itea virginica*
- *Spiraea tomentosa*
- *Viburnum nudum*

Plants that fix nitrogen:

- *Amorpha fruticosa*
- *Hippophae rhamnoides*
- *Morella pensylvanica*
- *Shepherdia argentea*

Plants that tolerate Saline Water/Soil:

- *Amorpha fruticosa* *
- *Aronia arbutifolia* *
- *Aronia melanocarpa* *
- *Baccharis halimifolia* ***
- *Cephalanthus occidentalis* *
- *Clethra alnifolia* *
- *Hippophae rhamnoides* * (Qin, He, Tan, Wang, Chen, 2009)
- *Ilex glabra* *
- *Itea virginica* *
- *Morella (Myrica) pensylvanica* **
- *Rhus copallina* **
- *Salix repens* *
- *Sambucus canadensis* *
- *Shepherdia argentea* ** (Qin, He, Tan, Wang, Chen, 2009)

- * Tolerates infrequent flooding by water with low salinity
- ** Tolerant of infrequent flooding by brackish water
- *** Tolerant of infrequent to prolonged flooding by brackish to saline water

reference for above unless otherwise noted (Thunhorst, 1993)

Additional Information

For Cultural and Distribution information of the plants:

- **Missouri Botanical Garden's Plant Finder Database**
<http://www.missouribotanicalgarden.org/plantfinder/plantfindersearch.aspx>
- **University of Connecticut Plant Database of Trees, Shrubs and Vines**
<http://www.hort.uconn.edu/plants/>
- **USDA Plant Database**
<http://plants.usda.gov/java/>
- **Cornell University Woody Plants Database**
<http://woodyplants.cals.cornell.edu/search.php>
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For Stormwater Retention/Infiltration Practice Construction and Standards information:

- **Save the Rain - Green Projects List**
<http://savetherain.us/green-projects-list/>
- **NYC - DEP Standards for Green Infrastructure**
http://www.nyc.gov/html/dep/pdf/green_infrastructure/bioswales-standard-designs.pdf
- **New York State Stormwater Management Design Manual**
<http://www.dec.ny.gov/chemical/29072.html>

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Acknowledgements

We would like to sincerely thank the following individuals and organizations without whom this project would not have been possible:

- The CU Kenneth Post Laboratory and Greenhouse staff for the use of their propagation and growing facilities
- Bluegrass Lane Turf and Landscape Research Center staff for their patience, assistance, and the use of their facilities
- Nette Compton and the New York City Department of Parks and Recreation
- Stephen Harris the City-County Arborist for Syracuse/Onondaga County, and the Syracuse Department of Parks
- Our team of proof-readers: Josh Cerra, Liz Kushner, Bryan Denig, and Philip Dropkin
- And last but not least, all the members of the Urban Horticulture Institute and Horticulture Section, School of Integrative Plant Science at Cornell University.

<http://www.hort.cornell.edu/uhi/outreach/index.htm>