

A Guide to Creating Vegetated Buffers for Lakefront Properties



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Acknowledgements

This handbook was originally published with the help of the Clean Water Act, Section 319 funds, under a grant awarded to the Androscoggin Valley Soil & Water Conservation District, by the Maine Department of Environmental Protection and the US Environmental Protection Agency, Boston Regional Office. Special thanks to Kathy Hoppe and Karen Hahnel, MDEP, for their insightful comments, patience, and unfailing good humor. Rachel Gallant, AmeriCorps member at the MDEP, did the layout and additional editing.

Cover photo taken by Jim Brueck, Owner of Native Lakescapes LLC. The graphics used throughout the text were developed by The Fund for Lake George/Lake George Waterkeeper (pages 5 and 7); the New Hampshire Department of Environmental Services Save the Rain Program (page 11); the Maine Department of Environmental Protection (page 12); Renee Byrd, Clemson Cooperative Extension (page 14); and Cornell Cooperative Extension of Onondaga County (page 19).

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With funding provided by:

U.S. Environmental Protection Agency, Boston Regional Office and Maine Department of Environmental Protection

This hand book has been adapted and reprinted with the permissions of authors Hardesty and Kuhns by the Saratoga County Cornell Cooperative Extension Intermunicipal Stormwater Management (ISWM) Program; Blue R. Neils CPESC, CPMSM Coordinator.

With the help of:

The Saratoga CCE Master Gardeners Program

The Capital Region PRISM Program

The Saratoga County Soil & Water Conservation District

The Friends of the Kayaderosseras (FOK)

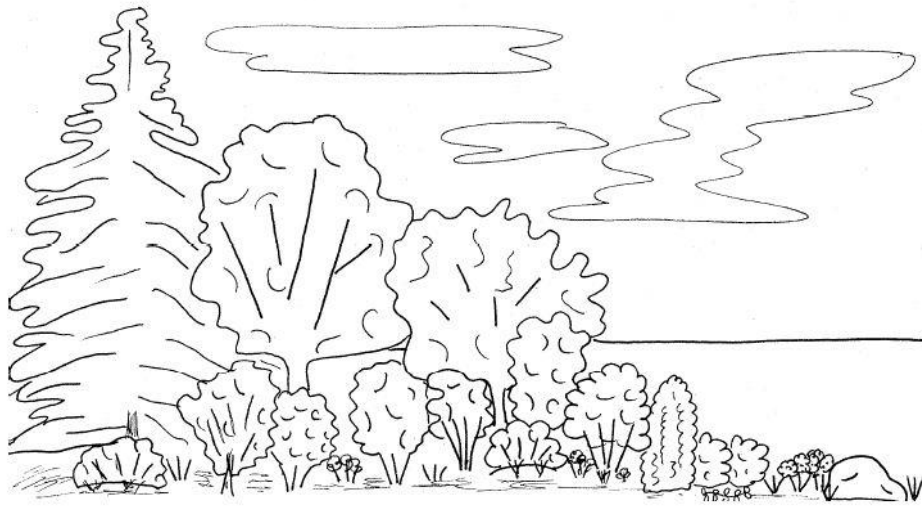
The Saratoga Lake Protection and Improvement District (SLPID);

The Saratoga Lake Association (SLA)

The Saratoga County Water Quality Coordinating Committee

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Introduction

Saratoga County's lakes and streams are among our greatest natural assets. Often, we take for granted the availability of clean waters for fishing, swimming, and escaping from the noise of our daily lives. In fact, as we grow, more and more people are choosing to live on or near the water.

How do population increases in a watershed (Def: finite area of land, draining to a waterbody) put pressure on water quality? As land becomes more developed, trees and shrubs are removed to make room for our homes, businesses, and roads. This causes greater amounts of stormwater runoff. The runoff sweeps the watershed of loose sediment, chemicals and debris, called non-point source pollution, (or *NPS*) and carries the pollution through our wetlands, streams and rivers to our lakes.

Over time, development anywhere within the watershed, whether along a stream or lake, combined with NPS pollution, can have serious effects on the quality of our lakes and streams. Values of shorefront properties are dependent on healthy waters, as are recreational opportunities such as camping, fishing, and boating. Visual signs of NPS pollution include increased weed growth along lake shorelines, reduced water clarity, algal blooms, sediment deltas, and altered wildlife habitats. Since the values of shorefront properties are dependent on healthy waters, it is vital to control NPS pollution.

We, as property owners, can...

- ◆ reduce the effects of polluted runoff,
- ◆ protect the quality of our lakes and streams,
- ◆ and improve property values
- ◆ Increase shoreline and streambank resiliency and resistance to the impact of climate change

...by establishing new buffers or enhancing existing ones!

Buffers, or areas of vegetation situated between the urbanized environment and the water, traps sediment, excess nutrients, and other pollutants, prevents erosion, and helps to stabilize sloped areas and the shoreline.

This handbook will help you get started on planning and planting your shoreline. There are many options for design and plant materials, and we've included information to help you with your planning. Although the primary focus of this handbook is lakefront areas, the same principles apply to all waterfronts throughout a watershed.

What is a Buffer?

Buffers are trees, shrubs, and groundcover that catch sediment and non-point source pollution before they reach the water. Environmental professionals highly recommend creating a vegetative buffer as an effective conservation practice (or Best Management Practice – "BMP") for controlling stormwater pollution and shoreline or streambank erosion.

Lawns alone cannot provide sufficient water quality protection on your shorefront lot. The grasses used in common lawn mixes are shallow-rooted. While they do protect against surface erosion, they do little to trap sediments and absorb pollutants. Lawns are best used as part of an overall landscape design, to provide open space for outdoor activities. To save yourself maintenance time keep lawn areas to a minimum. Avoid use of fertilizers, herbicides, and pesticides; use lime to build a heartier turf. Lime sweetens the soil and makes nutrients available to root systems.



Image courtesy of The FUND for Lake George/Lake George Waterkeeper

The image on the left is a typical lake front cabin with hardly any buffer. The owners are growing a lawn on the space between the cabin and the lake. The image on the right is the same cabin with a buffer strip added. Note the increased privacy!

How do buffers work?

The tree and shrub canopy intercepts raindrops and reduces their impact on the soil.

Leaf surfaces collect rain and allow for evaporation.

Low herbaceous plants and the duff layer filter sediment and pollutants from runoff.

Root systems hold soil in place and absorb water and nutrients.

An uneven soil surface (with hummocks and depressions) allows rain and snowmelt to puddle and soak into the ground (infiltrate).

Conservationists noted long ago that lakes with pristine shorelines suffered few of the water quality problems seen in more developed watersheds. In an ideal world, vegetation along a shoreline would be left undisturbed for distances of 50-250 feet, measured inland from the shoreline, depending on the degree of slope of the terrain. Settlement patterns in many of our lake watersheds are such that houses and camps have traditionally been situated very close to the shoreline, and ideal conditions no longer exist. Properties without vegetation have no barrier against sediments and pollution. Therefore it is very important to create and maintain a buffer strip on your property.

Elements of a good buffer

To be effective, buffers need to be situated between the lake and the developed area of your property. Remember, the purpose of buffers is to slow down runoff so that water and nutrients can filter slowly into the ground.

Buffers should not have straight pathways through them, but winding pathways made of stable, non-erodible material. Straight pathways of bare soil act as channels for pollutants, and are easily eroded. Uneven ground surfaces, with hummocks and depressions, also help to slow down runoff, so that water can filter into the ground. Buffers should be as deep as possible, and span the entire length or width of the developed area you are shielding.

A good buffer should have 3 zones and a variety of plants to maximize the benefit of each type.

Trees. . .whether evergreen or deciduous, break up the impact of rain and wind, provide shade and habitat, and are long-lived. Their deep root systems absorb water and nutrients while holding the land firm.

Shrubs. . .including flowering or non-flowering species, also deflect wind and rain, and are attractive to people and wildlife. Their medium-depth root systems readily absorb water and nutrients.

Groundcovers. . .such as vines, ornamental grasses, flowers and herbs, slow down surface water flow, absorb nutrients and water, and trap sediment and organic debris. Their many forms are attractive, and their shallow root systems hold the soil...

...and the duff layer. The accumulated leaves, pine needles, and other plant matter that collect under trees & shrubs. This layer acts like a sponge, to absorb water, trap sediment, and prevent erosion. Duff is a host to microorganisms that break down plant material and recycle nutrients.



Image courtesy of The FUND for Lake George/Lake George Waterkeeper

Benefits of Buffers

The mixed root systems of tree, shrub, perennials, and groundcovers help to protect the aquatic shoreline environment (the littoral zone).

Reducing overland flow of water helps to prevent siltation of shoreline areas. An overabundance of silts and sediments make the lake bottom mucky, the rocks slippery, and destroys fish spawning areas. Excess sediments from eroded banks and pathways forever alter the shoreline, allowing unwanted plants to take root, further altering the shoreline ecology. Many times, such changes conflict with recreational activities like fishing, swimming and boating.

Buffers protect against noise and enhance privacy for lakefront residents.

Dense plantings of shrubs and trees dampen noise levels from boats and neighborhood traffic. Mixed plantings also furnish an attractive living screen against visual intrusion, and if carefully placed, can actually refine waterfront views. The lower branches of trees can be pruned, framing lakeside views from your home and shoreline.

Buffers can be a deterrent to migratory waterfowl such as Canada geese.

Geese congregate and nest in areas where there is little to no shoreline vegetation. It is thought that this habitat-preference is a predator-avoidance strategy. Having a broad, vegetated buffer from the shoreline into your property/lawn-area will deter their congregation on your property.

Buffers help prevent the spread of invasive species by maintaining a competitive advantage for native species. Restoration provides an opportunity to identify and develop management and control action plans.

Buffers can be designed to provide protection against the effects of wind and sun. Properly placed vegetation can divert chilling winds and provide shade, allowing the "living space" to remain more comfortable. Groundcover protects bare soil and deflects heat.

Buffers are attractive, long-lived, easily maintained, and can be created at low costs.

Many design options exist for buffers. A little time spent in planning can have big payoffs later in up-keep. Just think -- less lawn to mow! Choose a plan that fits your lifestyle, and remember that you do not have to complete your buffer in one season.

Whether we live at the water's edge, or elsewhere in the watershed, all of us want the lake to be clean when we get there. Vegetation along the shorefront benefits everyone!

Understanding Your House Lot

To get started, you need to make a careful assessment of your property. The physical characteristics of your present landscape will provide you with a framework for your buffer design. Understanding the character of your lot is vital, so that you can put the right plants in the right places. Careful planning will save time and money and yield the desired results.

Site characteristics you must consider:

Location of buildings: As you develop your buffer design, take into account the size of your lot and how the buildings and driveway are laid out. If your lot is small or your buildings are set close to the water's edge, you may not be able to have a 100- or even a 75-foot buffer, but any buffer is better than none at all. Today, as a result of many studies, we understand that building close to a lake or stream significantly increases the pollution load going into the lake. Buffers help reduce this pollution load. Since the objective of the buffer is to prevent erosion and filter pollutants, planting buffers above your home or below the road will also help. The goal is always to prevent erosion and intercept water flow before it reaches the lake.

Soil types and condition: It's very important to understand your site's soil type(s), since good soil is the foundation for healthy plants. There must be a good match between the soil and the plants chosen for the buffer. Soil types vary from place to place. For example, one section may be low and remain wet throughout much of the growing season, while another area may be sandy, rocky, shallow, or dry. Look at the plants that are growing there now, or in similar conditions off-site; they will give you good clues about the soil conditions. If you are planning to purchase material for your buffer, keep these varying conditions in mind. Soils with little organic matter -- often found in densely developed areas -- can be improved with the addition of compost and lime. Additional information on how to assess your soil for plant needs is available through the Cornell Cooperative Extension Master Gardener's Office.

Degree of slope: ... or more simply put, is your lot steep or flat? Runoff moves more rapidly over steeper areas making them more sensitive to erosion and will

require a variety of plant types for permanent stabilization. If your house or camp is located on a hillside, try to develop as deep a buffer as possible in order to absorb runoff from roofs, driveways, and outbuildings.

Exposure: Is your property located on a north-facing slope, and therefore subject to cooler temperatures and higher winds? Does it face south, with elevated temperatures or little air movement? Is your site partially protected by a hill? Does it jut out on a point of land? Taking note of exposure will help you select the appropriate plants and create a design that can provide shade on hot days or protection from high winds.

Sunlight: How much sunlight does your buffer site receive? Watch the shadows caused by trees and buildings as the sun moves across the sky, noting areas of deep shade or those that are in full sunlight. This information will also help you choose appropriate plants.

Plant zones: Using plants that are hardy in your temperature zone is important. Generally, the plants selected should be best suited for zones 4b to 5b. If you suspect you are in a marginal area, generally select plants for the cooler zone (4b). Plants from a warmer zone may do well in protected areas of your property, but check with a reputable local nursery, landscaping business, or the Cornell Cooperative Extension Master Gardener for advice. If you have questions about plant materials not covered in this handbook, those same experts can provide answers.

- ◆ *Don't let runoff reach a lake or stream before it is filtered – the deeper the layer of protection, the better the water quality.*
- ◆ *Don't be discouraged if you have a small area to work with.*
- ◆ *Any buffer is better than none at all!*

Other Conservation Practices

Best Management Practices (or *BMPs*) can help you to stabilize areas of minor to moderate erosion on your property and complement the performance of a buffer in controlling runoff. Many practices actually decrease property maintenance costs. Contact the Soil & Water Conservation District for help in identifying those areas which may need some structural attention. A short list of simple BMPs is given

below. For information on how to install these practices, call the Saratoga County Soil & Water Conservation District.

Rock-lined drip edges beneath the roof edge drip line (the eaves), are very helpful in controlling erosion. They also lengthen the life of a building's wood finishes by protecting the walls from splash. A trench dug 6-8" in depth is then filled with 3/4-inch stone. This will allow rainwater to collect and slowly dissipate. In areas of clay or heavily-compacted soils, a 2" lining of sand is recommended before stone is added. Use of a stone-lined drip edge behind foundation plantings will also help prevent damage to plants from roof runoff occurring during heavy rains and ice and snow melt.

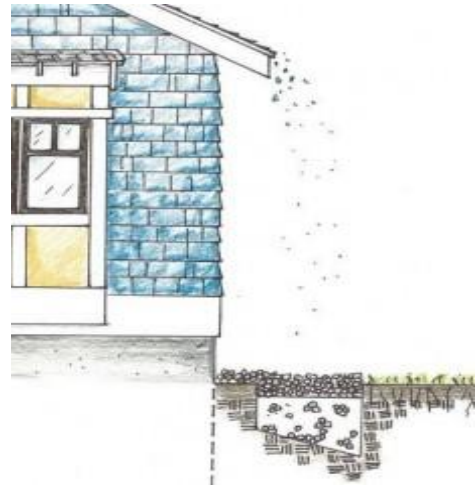


Image courtesy of the New Hampshire DES Soak Up the Rain Program

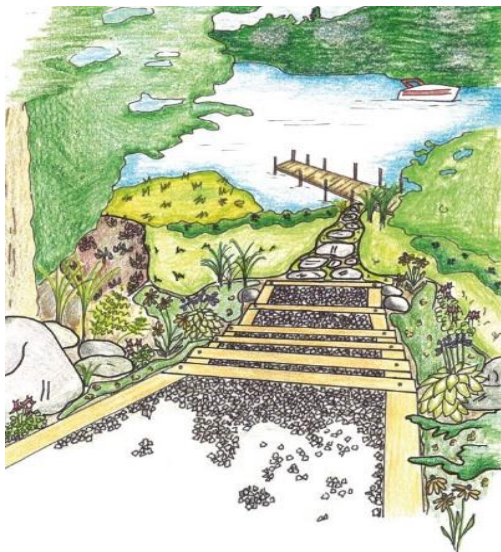


Image courtesy of the New Hampshire DES Soak Up the Rain Program

Stabilized pathways can be accomplished in a number of ways. The simplest method is to cover the pathway with a 2-inch layer of bark mulch or wood chips. This will have to be renewed periodically, as the material decomposes -- about once every couple of years. Other options include seeding the pathway with an appropriate grass mix; setting paving stones, bricks, cement tiles, or slate in a matrix of mulch, wood chips, or crushed stone; or by creating a boardwalk. Remember that winding pathways are preferred so that moving water is less likely to create channels.

Inlet and outlet protection for culverts: To ensure culvert stability and to prevent erosion, the use of stone for headwall protection is strongly recommended. Larger flat rocks are placed on top and to the side of the pipe, and smaller rocks are used to fill in open spaces. Where there is a drop of 6" or more between the base of the culvert and the bottom of the ditch, additional stone should be added to create a small apron. These practices will greatly lengthen the life of a culvert, and will decrease the frequency of maintenance.

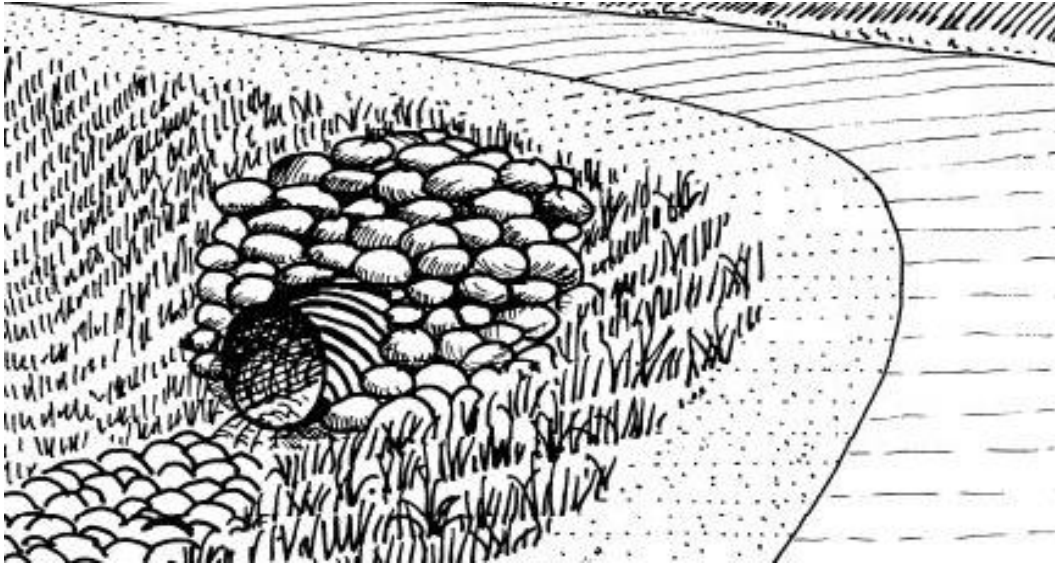


Image courtesy of Maine Department of Environmental Protection

Designing the Buffer

You have several options when designing a buffer.

Look carefully at:

Your lot -- bear in mind the site characteristics (see p. 10).

The developed areas you are treating -- include your house and driveway, camp road or public way, pathway to the lake, boathouse, etc.

Your budget -- both for time (how much on-going maintenance do you want to do?) and financial constraints.

Consider:

- *Traffic patterns in your yard* -- Do you wish to direct pedestrian traffic or limit access to the water? Deter wandering pets?
- *Pathways to the shoreline* -- Do you have separate swimming and boating areas?
- *Desire for privacy* -- Do you wish to be shielded from the road? From neighboring lots? From recreationists on the water?

- *Aesthetics* -- Do you like to garden? Wish to improve the looks and value of your lot?
- *Recreation* -- Do you need a play area? Have family barbecues? Enjoy bird watching?
- *Effects of wind and weather* -- Would you like to have a recreation area sheltered from wind or the hot sun?
- *Habitat* -- Is there a species of animal you are fond of and would like to favor them?

Often folks feel that once a buffer is in place, they will lose control of their access to the water – both physical and visual. Not so! Traffic can be directed by the use of appropriately placed shrubs and trees, which can be trimmed so that views of the water are preserved. Trees and shrubs that are pruned in an “open” manner also allow for better air circulation.

Then decide whether you wish to have. . .

. . .a natural buffer. . .

an enhanced buffer. . .

. . .or a landscaped buffer.

A natural buffer is the simplest and least expensive of the three options. To develop this requires only a decision on your part about the size of the vegetated strip you wish to have, a commitment to stop mowing the area, and the patience to allow plant material to become established and grow. Plants establish themselves in succession, and it will probably be several years before shrubs and trees become rooted and thrive. Advantages of this option are that the native plants that *do* become established are tough and resilient and a natural part of the lake ecosystem -- and you've invested no personal funds.

To develop an enhanced buffer, add to what is already there, or plant a few desirable things and let the rest of the area revert around them. For instance, if you have a number of trees on your lot, in relatively close proximity to the shoreline, you can fill in the spaces between them with shrubs, herbaceous plants,

and groundcovers. Following this option generally means it will take fewer years to get the buffer fully established, and will require only a moderate commitment of time and money on your part. Advantages of this option are that you will have more choices in the plants that you want to have as a part of your landscape, and you will have a head start on getting the buffer in place.

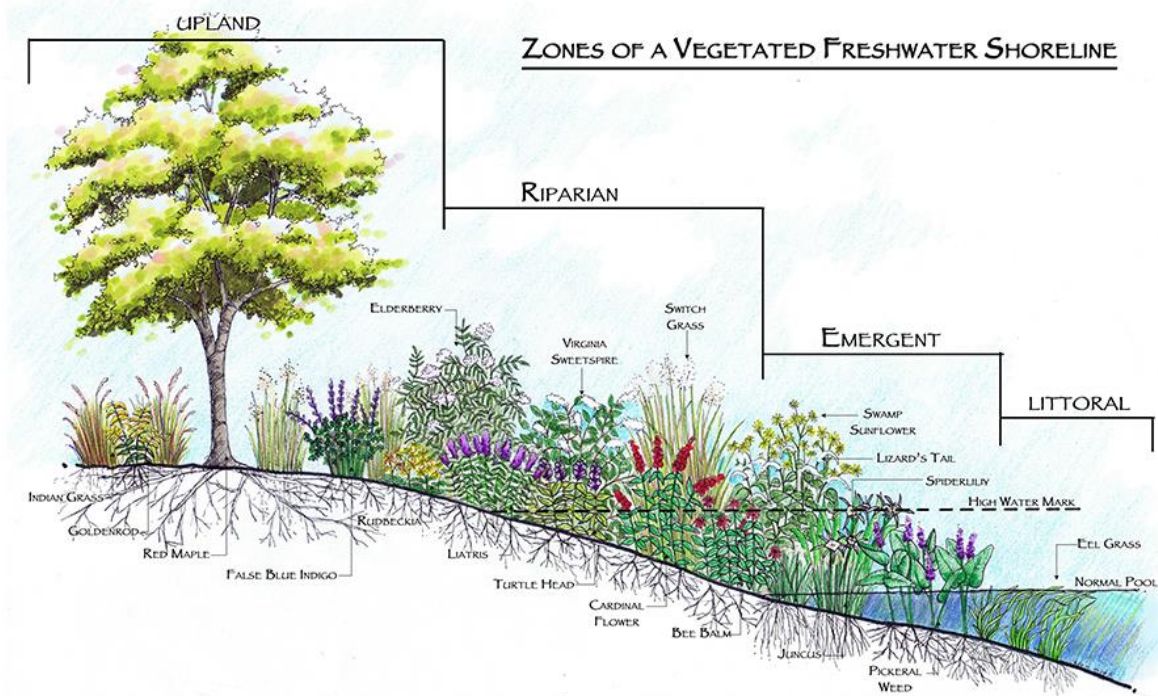


Image courtesy of Renee Byrd, Clemson Cooperative Extension

Choosing a landscaped buffer generally means that it will take a lot less time to establish a protective strip, but will require a more concentrated effort and generally more money. You can spread out your planting over several seasons or several years; an example might be to plant trees the first year, followed by shrubs, and groundcover the second year. This way, you will have absolute control over the design.

Or, combine the options to accommodate your needs as well as those of the buffer strip. For example, abandon mowing along the immediate shoreline, and install a landscaped design to the landward side of that strip for you and your family to enjoy. Whichever option you choose, try to visualize what you want the buffer to look like in five, ten, or more years.

Choose plant material appropriate for your plan. Don't, for instance, plant trees that grow tall naturally and then try to prune them heavily, instead, opt for a tall shrub.

Make use of hardy species that require little maintenance, and no fertilizers.

If you are purchasing plants, deal with a reputable, local firm that can help you select the healthiest plant material available, and who can answer questions on planting considerations.

Using Native Plants in Vegetated Buffers

Native plants are defined as those that were observed in the natural landscape at the time of contact between Europeans and indigenous peoples (about 1450 A.D.). Use of native plants in landscaping, particularly in vegetated buffers, are of value for the following reasons:

*The plants are **appropriate for our regional climate**. They have adapted to this area over time; therefore, there is less maintenance required for these plants.*

*Native plants **have significant wildlife value**, as they are used by many birds and animals for food sources, and for breeding habitat.*

*Use of native plant materials allows us to **celebrate our regional differences**.*

***There are many beautiful native plants.** Many local nurseries carry such material, and can provide specific recommendations for appropriate siting.*

-From a presentation given by Jeff Horton, Shaker Hill Nursery, Poland, ME

Planting Your Buffer

Before you start work on your project, you will have to decide whether to create beds or add point plantings. There are advantages and disadvantages to both methods.

Utilizing point plantings means that you install individual plants at specific locations. The grass around the new plants can be mowed until the plants are

large enough to shade out surrounding grasses, or the grasses can be left to grow up. Either way is okay for the plants, but this is a question of aesthetics and time-management. Choose a maintenance program that you can live with.

Developing a buffer strip by digging beds requires more up-front work. This method involves removing sod from the entire area you are going to plant and replacing it with plants and additional soil. Once all plants are in place, the whole bed should be mulched with at least four inches of well-rotted bark, mulch or compost. The mulch will absorb moisture, discourage weeds, and eventually decompose into the foundation of the duff layer.

Remember to keep new plants watered throughout their *first and second* seasons. Once the root systems are well-established, the plants can survive with little attention, except in times of extreme drought. Give them a little "TLC" to get them started.

If the soil in your area is lacking in organic matter, is clayey, or is heavily-compacted, you will want to add compost to your plantings for the first few years in order to build a healthy soil. Keep in mind that a healthy soil supports small organisms that help to break down nutrients and pollutants for uptake by plants.

Mulching your buffer plants

In undisturbed wooded areas, a natural duff layer builds up over time. Duff is an important part of the ecosystem for a number of reasons. Plant waste (fallen leaves and branches) decompose over time and provide a natural fertilizer for living plants -- this is nature's way of recycling nutrients. Duff also holds quantities of water in reserve, by soaking up runoff and allowing the moisture to be slowly absorbed by plants and underlying soils.

Mulch, such as composted wood fiber or composted yard wastes, mimics natural systems. Newly-planted shrubs and perennials (or herbaceous plants) will benefit from this added layer of protection. Mulch protects areas of bare soil and will also deter unwanted "weeds" in the more formally-designed buffer systems. Be sure to use mulch that has been composted for six months to a year so that nutrients are not leached from the soil. Use about four inches of the material around plants and on any area of bare soil. Remember though, to give plants about an inch of "breathing room" around their bases so that the plants aren't smothered. After planting, allow leaves and evergreen needles to accumulate.

Use of fertilizer and pesticides

One of the most important roles of buffers is the uptake of excess nutrients; in lake watersheds, phosphorus is the nutrient of greatest concern. When planting your buffer, choose species that will not require constant feeding and are naturally resistant to insects and disease. Keep air circulation open to avoid fungal diseases. If plants still appear sick, remove and destroy them to prevent spread of the disease among adjacent plants.

If you really feel that you must use a fertilizer, use it sparingly! Apply a liquid that will immediately soak in and will not sit on the surface to be washed into the water by heavy rains.

Be stingy -- apply fertilizer only during the growing season so that it is taken up immediately. If you must spray for pests or disease, start treatments with the most benign method of control possible, such as baking soda combined with water and a small amount of horticultural oil or a non-phosphate dish soap and water. Use pesticides as a last resort; they are harmful to aquatic life and beneficial insects. Selecting plants that will attract a variety of birds provides the added benefit of an effective means of bug control. Information on safe means of pest and disease control is available from Saratoga County Cornell Cooperative Extension, from organic gardening references, and from many reputable nurseries.

Improving soil health

Where soils have been highly disturbed as a result of construction, or have become heavily compacted as a result of years of foot traffic, it is recommended that well-rotted compost be added when plants are introduced. Mulch plants well and water thoroughly until the plants are established. Most shrubs, once established, are actually best left to fend for themselves. Remember that phosphorus and nitrogen will be supplied by runoff, and will be recycled from fallen plant wastes.

Soil pH testing can help determine how much of your soil's nutrients your plants are able to use. Soil pH is the measurement of the degree of acidity (sourness) or alkalinity (sweetness) of soil. It is measured on a scale of 0 to 14, with lower numbers indicating more acidic and higher numbers more alkaline. The value of 7.0 is neutral—i.e., neither acidic nor alkaline. When pH levels are too high or too low, minerals are bound to soil particles and thus, unavailable to the plants. In general, most plants grow best in a neutral soil pH, although there are important exceptions. For example, blueberries, azaleas and rhododendrons do well in soil pH between 4.5 and 5.5. Lawns favor a pH of 5.5 to 6, while roses do best in soils with a pH of 6.5 to 7.

Adding lime to raise the soil pH can help deter the spread of many weeds. Additional information on soils types, testing, and how to amend the soil is available through the Cornell Cooperative Extension Master Gardener's Office.

Hand digging weeds is another "environmentally friendly" way of controlling unwanted species. Set your lawn mower high enough so that grass length is two to three inches or more. If you don't use a mulching mower and need to rake the lawn, save those clippings for your compost pile!

Work to improve soil health. Compost and mulch will help to provide a beneficial environment for soil organisms and will also help to make the soil more absorbent because of the addition of organic matter. **Providing a healthy soil for your plants will help to keep pests to a minimum.**

Summary

Planting a vegetated buffer between your house and the lake or stream is one very positive step you can take to protect water quality.

The steps you follow to get started are these:

(1) Survey your property for storm water runoff, preferably following a rainstorm. The Soil & Water Conservation District can help you to identify some of the areas of erosion that exist on site. Take notes. *Tools: survey brochure, pencil, notepad.*

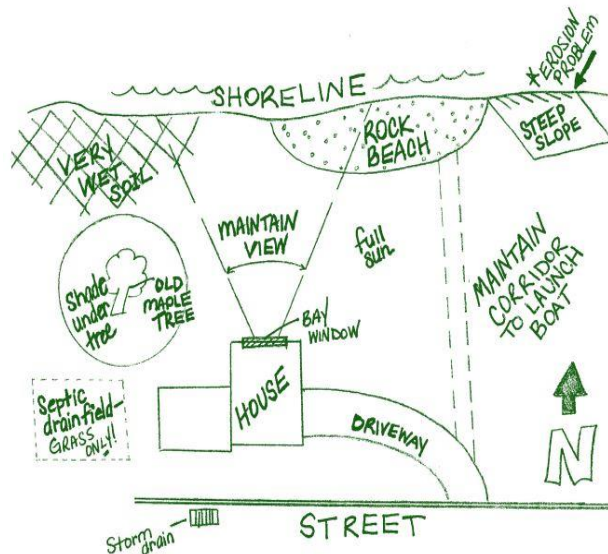


Image courtesy of CCE Onondaga County

(2) Develop a sketch plan of your lot; it is useful in organizing your work. It is helpful to make the drawing to scale if you can manage it. Include features such as your house, outbuildings, driveway, boat launch, utility and recreation areas, swimming access points, and pathways. Also include landscape and topographic details such as areas of slope, existing vegetation, stone walls, ledge outcrops, and wet and dry areas. Make note of your lot's orientation (N-S-E-W) as well as where shadows are cast by buildings. *Tools: graph or drawing paper, pencil, tape measure, ruler, compass, and photographs of your property if you have them.*

(3) List your objectives for the project. Examples might be: adding vegetation near the shoreline, stabilizing pathways, directing traffic to a single access point for swimming, catching runoff from roofs and driveways, and the level of maintenance you are willing to perform once the buffer has been established. Make a realistic estimate of your time frame and budget for project completion. If you are unsure or need advice on species, design, and up-keep contact the Master Gardener's office or a reputable Commercial nursery.

(4) Implement your plan! The work you do now will prevent erosion, increase water quality, and enhance the value of your property

The most important decision to make about your buffer is when to get started. A good design and action plan are vital for sustainability, but do not delay your project. Vegetated buffer strips are a proven means of controlling erosion and other sources of non-point source pollution. Help to protect the water quality of your favorite lake or stream by starting your vegetated buffer project as soon as possible. Your efforts are an investment in the future...for you and the generations to follow!

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*References for plant materials will be found in the [Plant List](#).

Maine Department of Environmental Protection

Issue Profile

Clearing Vegetation in the Shoreland Zone

Revised: September, 2003 contact: 207-287-2111

The information presented in this Issue Profile is based on the standards in the *State of Maine Guidelines for Municipal Shoreland Zoning Ordinances* (Guidelines). If your community's locally adopted shoreland zoning ordinance has more restrictive standards those more restrictive provisions apply.

Background

The Mandatory Shoreland Zoning Act requires municipalities to adopt land use regulations for all areas within the shoreland zone. The shoreland zone consists of areas within 250 feet of the normal high-water line of great ponds, rivers, and tidal waters; within 250 feet of the upland edge of non-forested freshwater and coastal wetlands; and within 75 feet of certain streams. Distances are measured horizontally.

The land use controls adopted by the municipalities must be consistent with or no less restrictive than the Board of Environmental Protection's *State of Maine Guidelines for Municipal Shoreland Zoning Ordinances*.

Do the Guidelines for Municipal Shoreland Zoning Ordinances include limitations on vegetative cutting for development activities in shoreland areas?

Yes. The Guidelines limit the amount of vegetation that can be cut in the shoreland zone. In order to maintain water quality, protect wildlife, and to preserve the natural beauty of shoreland areas, it is important to maintain naturally vegetated shoreland areas. Studies have shown that the removal of natural vegetation and the subsequent conversion of the land to unvegetated surfaces, lawns, or other uniform vegetative cover fails to adequately protect water quality, mostly due to phosphorus and nitrogen runoff (nutrient runoff). An increase in the concentration of phosphorus within a lake of just 1 part per billion can result in a noticeable decrease in water quality.

Nutrient runoff into surface waters can be reduced or prevented by maintaining an uneven-aged stand of trees and other vegetation, including natural ground cover. Furthermore, by leaving the ground surface undisturbed, and by retaining natural depressions for water to collect, nutrients will be removed as water percolates through the upper layers of organic duff.

Water quality is not the only environmental issue affected by the loss of shorefront vegetation. Valuable habitat is lost, and disturbance of wildlife is greatly increased by the loss of a vegetative "screen". As a result, waterfowl, songbirds, shorebirds, and mammal populations are negatively affected.

Although natural beauty is a rather subjective term, most will agree that a Maine coast or inland waterbody with excessive removal of trees and other natural vegetation is not in the best interest of the people of Maine.

What are the restrictions on clearing of vegetation in the shoreland zone?

Generally, in the first 75 feet from the normal high-water line or the upland edge of a wetland, no "clear-cut openings" (openings in the forest canopy greater than 250 square feet) are permitted, although 40% percent of the volume of trees four inches or more in diameter, measured at 4 1/2 feet above ground level can be removed in any ten year period. The cutting must be done such that a well-distributed stand of trees and other vegetation remains. This area is commonly referred to as the buffer strip. Adjacent to great ponds and rivers flowing to great ponds, the buffer strip extends for a distance of 100 feet from the normal high-water line.

Beyond the buffer strip, vegetative cutting limitations are less restrictive. In this area cleared openings are permitted provided that such clearings do not exceed 25% of the lot area, or ten thousand square feet, whichever is greater. In total, however, no more than 40% of the volume of trees can be removed in any 10-year period from the shoreland zone.

Do the Department's Guidelines define a "well-distributed stand of trees and other vegetation"?

The Department's Guidelines define a well-distributed stand of trees and other vegetation by a "point system". This system, which assigns values to trees down to two (2) inches in diameter, requires a certain total value of trees be maintained in any 25-foot by 25-foot square (625 square feet) area within the buffer strip. The tree values are based on tree diameters and are as follows:

Diameter of Tree at 4-1/2 feet Above Ground Level (inches)	Points
2-4 inches	1
>4-12 inches	2
>12 inches	4

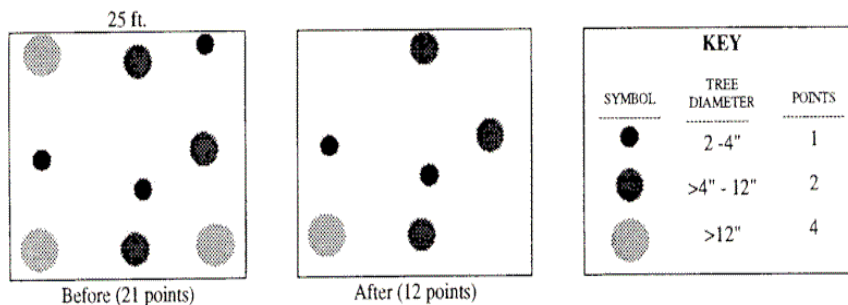
Adjacent to great ponds, and rivers and streams flowing to great ponds, a rating score of 12 or more points must be maintained. Adjacent to other water bodies, tributary streams, and wetlands, a "well-distributed stand of trees and other vegetation" is defined as maintaining a minimum rating score of 8 per 25-foot square area. The point system was created to provide a more enforceable standard for tree cutting activities within the buffer strip.

As an example of the above rating system, adjacent to a great pond, if a 25-foot X 25-foot plot contains two (2) trees between 2 and 4 inches in diameter, three trees between 4 and 12 inches in diameter, and two (2) trees over 12 inches in diameter, the rating score is:

$$(2 \times 1) + (3 \times 2) + (2 \times 4) = 16 \text{ points}$$

Thus, the 25-foot by 25-foot plot contains trees totaling 16 points. Trees totaling 4 points (16 – 12 = 4) may be removed from the plot provided that no cleared opening is created. The figure below is just one example of allowable cutting under the point system.

25 feet Before (16 points) After (12 points)



Is the cutting of vegetation less than 2 inches in diameter limited?

Yes. State law prohibits new cleared openings from being created within the buffer area. If removal of vegetation less than two inches in diameter will create cleared openings, enough vegetation must be retained to prevent the creation of such openings. Furthermore, adjacent to great ponds, and rivers and streams

flowing to great ponds, in order to protect water quality vegetation less than three (3) feet in height must be maintained within the buffer strip.

Are there areas where the cutting of vegetation is prohibited?

Yes. Vegetative cutting is prohibited abutting a great pond zoned Resource Protection for a distance of 75 feet inland of the normal high-water line, except to remove safety hazards.

May I cut within the buffer strip for shoreline access?

Yes. A footpath not to exceed (10) feet in width as measured between tree trunks is permitted provided that a cleared line of sight to the water through the buffer strip is not created. In other words, the footpath must meander, rather than being a straight line to the water. The purpose of this limitation is to prevent runoff from funneling directly along the pathway to the water. By meandering the pathway, runoff is more likely to be trapped by vegetation and natural depressions within the buffer strip.

Adjacent to great ponds, and rivers and streams flowing to great ponds, the width of the footpath is limited to six (6) feet.

May I prune trees within the buffer strip?

Yes. Pruning of tree branches, on the bottom 1/3 of the tree is permitted. Dead branches are permitted to be pruned without restriction.

What if a cleared opening is created within the buffer area due to storm damage, disease, or the removal of an unsafe tree?

When the removal of storm-damaged, diseased, unsafe, or dead trees results in the creation of a cleared opening, the opening must be replanted with native species unless existing new tree growth is present.

Can existing cleared openings to the water be maintained?

Yes. Cleared openings legally in existence on the effective date of the ordinance may be maintained. However, areas that were once fields or cleared openings, but have reverted to primarily shrubs, trees, or other woody vegetation are regulated as any other buffer area under the ordinance.

If I adhere to the "Clearing of Vegetation For Development" Standards in the Department's Guidelines will I be sure that I am in compliance with all clearing limitations?

No. Local ordinances may be more restrictive. You should always consult with you local code enforcement officer before your begin clearing of vegetation in the shoreland zone.

Additionally, NYSDEC and/or the U.S. Army Corps of Engineers may also have enhanced restrictions depending on the extent of your project and the potential alteration of existing shoreline. Be sure to consult with these Agencies before beginning any construction or alteration directly to the existing shoreline or streambank of your property/ies.

THE BUFFER HANDBOOK PLANT LIST

Developed by
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Lake & Watershed Resource Management Associates
With funding provided by
U.S. Environmental Protection Agency
And Maine Department of Environmental Protection
1998
Revised 2001 DEPLW0094-A2001

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Acknowledgements

This plant list was published with the help of Clean Water Act, Section 319 funds, under a grant awarded to the Androscoggin Valley Soil & Water Conservation District and with help from the Maine Department of Environmental Protection and the U.S. Environmental Protection Agency. Graphics and 'clip-art' used in this document came from the University of Wisconsin-Extension and from Microsoft Office 97 (Small Business Edition) and ClickArt 97 (Broderbund Software, Inc.)

Substantial assistance was received from **Phoebe Hardesty** of the Androscoggin Valley Soil & Water Conservation District. Valuable review and advice was given by **Karen Hahnel** and **Kathy Hoppe** of the Maine Department of Environmental Protection. **Elizabeth T. Muir** provided free and cheerful editing botanical advice.

Please read this section before choosing plants for your buffer. It is important to understand how plants were selected for this plant list and to understand the meanings of the various terms and abbreviations used in the list.

1) PLANT SELECTION

- Plants were selected that are low-maintenance, long-lived, hardy and sturdy. A few short-lived plants were included if they spread or self-seed easily. Low-maintenance means, for the most part, that plants do not need pruning, staking, mulching or regular dividing. In some cases, these activities may improve the form of the plant but not affect its ability to function in a buffer and therefore can be performed at the discretion of the land owner. Generally, buffer plants should be sturdy and, once established, able to hold their own against weeds and invasive plants. Plants that require little competition to thrive or special care were not included on this list. Following is a brief summary of the possible benefits of light maintenance:

Pruning

Pruning can sometimes help fill out and invigorate a scraggly shrub but pruning to create a tight, landscaped appearance as is done with many evergreens can limit the plant's ability to absorb rain and make them vulnerable to insects, disease and drought.

Staking

Some of the taller plants included on this list may benefit from staking if they are grown alone or in the open. In a buffer, there should be enough other vegetation to keep things upright. Your site will help determine this; plants in windy locations may need staking, then again you may want to avoid tall plants if you have a lot of wind.

Mulching

Many perennials require winter mulching to protect from freezing and thawing. Most of the plants on this list are hardy enough to not need winter mulch, provided they are not grown beyond their hardiness limit. Here again it can depend on the exposure of your site. You should ask the nursery about this at the time of purchase.

Dividing

Plants that need regular dividing to maintain vigor were not included on this list. They can be used in a buffer if you are willing to maintain

them and keep buffer disturbance to a minimum in the process. Plants such as daylily and iris can form large clumps that benefit from dividing, however, for most varieties, dividing need only be done every 5 to 10 years. Daylilies will continue to thrive without dividing but will produce fewer flowers. Some irises can go indefinitely without dividing and others will die from the center of the clump out. Keep this in mind when selecting varieties for your buffer.

- Many sources were used in the preparation of this plant list. Occasional discrepancies were found in maximum size and hardiness zone. Every attempt was made to provide accurate information but size and hardiness zone should always be double-checked at the nursery.
- Some plants (flowers in particular) were included simply because they add beauty, are good space fillers or attract birds and butterflies. Some of these die back earlier than others and therefore do not provide as much buffering capacity so should not be planted exclusively. On the other hand, some of these emerge early in the spring and provide cover before other plants get started. Virginia Bluebells, Oriental and Hardy Lilies and many bulbs fall into this category.
- For the most part, plants that are hard to come by were left out even if they would be good in a buffer. This was done to avoid frustration on the part of someone looking in vain for a particular plant and to avoid plants being dug from the wild where they may be in limited supply or hard to identify. Examples of these are; Balsam Poplar, Black Willow and Hog Peanut. These and others can be used in buffers if a source can be located. On the other hand, some plants that are hard to find were included because they are native and would be very beneficial in tough situations. Examples of these are; Sweet Fern, Sweet Gale and some ferns. Often local nurseries will have locally native plants that are not available at the larger, franchised nurseries.
- Many of the plants on this list have been cultivated into numerous varieties and new ones are being created yearly. Only well-established varieties or those particularly suited to buffers are mentioned specifically in this list. Chances are, you will have several choices of varieties at the nursery. In choosing, keep in mind the qualities that make plants good for buffers (low-maintenance, long-lived, hardy and sturdy).

2) PLANT LIST ORGANIZATION & INFORMATION

- The plants are listed in two formats; a chart and a narrative list. The chart includes the zone, sun and soil requirements for each plant and can be used for quick reference to identify which plants are suited to your site. Once you know which plants can grow in your location, you can go to the narrative list for details about each plant (size, flowers, uses etc.) and choose the ones you want in your buffer.
- Within each format, the plant list is divided into three major categories; trees, shrubs and ground layers.
- Trees are further divided into deciduous and evergreen categories.
- Shrubs are divided into three categories based on height; large shrubs/small trees, medium shrubs and small shrubs. Each of these groups is further divided into deciduous and evergreen categories.
- Ground layers are divided into four categories based on type of plant; perennial flowers & herbs, ferns, grasses and vines.
- Within each subcategory, plants are listed alphabetically by the name most often associated with that plant in this area. Sometimes this is the 'common name' such as 'daisy' or 'balsam fir' and other times it is the latin name or 'scientific name' such as 'spirea' or 'pachysandra'. This name is followed by the latin name in parentheses and italics. The latin name is universal and can be used anywhere to describe a plant. Common names vary from region to region, even sometimes quite locally. For plants with several well-known common names, one is used first and the others are listed after the latin name. Not all names are listed as some plants have numerous common names!
- The plant sizes that are given are the maximum size (especially for trees). There will be much variation in how large a plant gets depending on the particular variety, the zone and specific location where it is planted. Check with your nursery for expected sizes in your area.
- Many plants come in standard and dwarf varieties. Except for trees, when this is the case for a plant on this list, the plant is listed in the largest size category that it occurs and an asterisk is shown on the chart to indicate that it is also available in dwarf form(s). For instance, lilac is listed only in 'small trees/large shrubs even though varieties

can be found in smaller sizes. For trees, the standard form and the dwarf form are listed in separate categories. For instance, balsam fir is listed in 'trees' and dwarf balsam fir is listed in 'small shrubs'.

- Tolerances for things like salt, drought, flooding etc. are given for plants where these tolerances are known for certain. There may be other plants with these tolerances as well. Always check with your nursery supplier for this information.
- The cold hardiness zones are shown in bold at the end of each description. Zones 3, 4 and 5 occur in upstate New York. The zone given is the coldest one tolerated, so if a plant is shown as zone 3 that means it will also tolerate zones 4 and 5. If you are on the boundary of two zones, it is best to select plants hardy in the colder zone. The zone map provided with this list is general and you should check with the local nursery for plant hardiness. Try to purchase plants that have been grown locally rather than ones brought in from far away. The locally grown ones will be hardier.

3) TERMS AND ABBREVIATIONS

- **Sun** or **Full Sun**: Generally this means 6 or more hours of direct sun in a day.
- **Part-sun**: Generally means less than 6 hours of direct sun or a full day of dappled sunlight.
- **Shade**: Very little to no direct sun, especially through the middle of the day.
- **Moist**: Average soil conditions, not wet, not dry. Able to retain water long enough for plants to use but not soggy.
- **Wet**: Has standing water part of the time or is boggy and damp most of the time.
- **Dry**: Very little moisture, often sandy soil. Dries out quickly after rain.
- **Deciduous**: Deciduous plants lose their leaves or needles every winter and regrow them in the spring. Larch is the only conifer in this area that is deciduous.
- **Semi-evergreen**: These plants may or may not lose all or some of their leaves or needles in the winter depending on their hardiness and the local conditions where they are grown.
- **Evergreen**: These plants do not lose their leaves or needles in the winter. There may be some annual 'shedding' of old needles (as in pine) but the entire plant does not go bare. These plants continue

to grow and feed throughout the winter and need sunlight and water throughout. Evergreen plants like rhododendrons need protection from too much sun and wind in winter to keep their leaves from drying out.

- **Dwarf:** A smaller version of a plant. Some trees and shrubs have been bred to stay small while still retaining many of the features of the full-size form.
- **Cultivated:** These plants have been developed from other plants to have certain qualities. They are not found naturally occurring unless they have escaped from local gardens into the surrounding area. Generally they are not as hardy or valuable to wildlife as naturally occurring plants. However, many desirable qualities can be found in these plants such as disease resistance and increased flower displays
- **Naturally-occurring:** These are plants that have been introduced from elsewhere but have become well-established into the natural landscape. They generally do well and fit in well with the other plants in the area.
- **Native:** These are plants that are believed to have been in place in the landscape prior to the arrival of the pilgrims. They have been long-established as part of the natural plant, animal and soil system in the area. Plants that are native to this area are indicated by an **N** in the plant descriptions. If they are native elsewhere in this country and have been introduced to upstate New York, they are indicated with an **(N)** whenever this information is known.
- **Multi-stemmed:** This usually refers to shrubs and some small trees. Over time numerous stems arise in the same area as the original stem, forming a large clump. These are often good for birds and wildlife and erosion control.
- **Ground Cover (G/C):** These are plants that will spread to cover a large area either by reseeding, through underground rhizomes or by tip rooting. They are often good for erosion control and for filling in difficult areas.
- **Zone:** This refers to the cold hardiness of plants. The country is divided into zones based on the average annual minimum temperatures. The cold tolerance of plants is indicated by the coldest zone in which they will survive.

4) GENERAL TREE & SHRUB PLANTING GUIDE

- Choose plants suitable to your location; sun, moisture, wind and zone.
- Space plants according to the instructions or nursery advice, keeping in mind the eventual spread of the tree or shrub. Things may look too far apart at first, but within a few seasons will spread and fill the space.
- Dig a hole 2-3 times the width of the pot or rootball; you want the roots to spread out more than down so the wider the better. Dig the hole to the same depth as the pot or rootball.
- Keep the rootball intact while handling and planting. Trim off broken roots and long, trailing roots that won't fit in the hole without bending. Do not over prune roots.
- If the plant is root-bound (roots are in a dense, tangled mat) loosen the roots with your fingers or use a knife to make vertical cuts around the rootball to allow roots to branch out.
- Place the rootball so that it is level or slightly above the surrounding soil unless it comes with other instructions.
- In areas with very heavy or wet soil, be sure to consult with nursery personnel on how best to establish new plants in these areas.
- Do not add materials (compost, manure or other soil) to the soil unless it is very poor and you are planting something that needs better soil. If that is the case, add equal amounts of loam, compost or peat moss. In the long run it is better to plant things that can tolerate the existing conditions rather than trying to improve a large area of soil.
- Place the rootball in the hole and back-fill ½ way, flood with water to eliminate air pockets and finish filling the hole. Pack soil firmly but not too heavily. Leave a depression around the plant and flood with water again.
- Do not fertilize the first year. Most trees and shrubs do not need fertilizer at all. Fertilizer can speed growth and result in weak, poorly

rooted plants. If fertilizer is used, use it sparingly and only for a year or two after the plant is established. Some plants (rhododendrons etc.) may need an acid booster if planted in non-acidic soil. In any event, apply fertilizer so that it cannot wash into a lake or stream.

- The first season, keep soil moist but not soggy. It is better to water deeply now and then (approximately once a week) rather than frequent, light waterings. It takes about 5 gallons to a 3 foot shrub to saturate the soil. Use more if the soil is particularly dry or sandy and less if the soil is heavy or wet. Take care not to wet the leaves or needles to help prevent disease. Proper watering the first year is the most critical factor to success.
- Do not stake plants unless they will not stay upright in a moderate wind. Use a broad, soft material that will not damage the bark. Remove bindings as soon as the plant can support itself and do not let the bindings get tight.
- Do not wrap trunks except for the first few winters to prevent rodent damage. Be sure to remove wrapping in the spring!
- Mulch with 2 inches of bark or cardboard taking care not to let the mulch touch the stems.
- Remove dead branches with good, sharp pruners but do not prune vigorously until the second season, if at all. Ask the nursery for advice on pruning at planting time. The need for pruning depends on the age of the plant and how long it has been potted or balled.
- In windy or sunny locations, evergreens may benefit from a wilt-proofing spray applied in the fall to prevent winter desiccation. In addition, some plants may need burlap or wooden frames to protect them from winter wind, sun and snow loads, especially when they are small. However, once a tree or shrub gets large, this is not practical. It is better to choose plants tolerant of these conditions. Ask the nursery how long a plant will need protecting and choose according to what you can manage.
- Plant bare-root plants as soon as possible. Keep the roots moist until planting and keep plant lightly covered and in a cool, shady location.

5) PLANTING PERENNIALS

- Generally, perennials should be planted at the same depth as they were in the pots. Carefully spread roots and plant in well prepared soil. Take the time ahead of planting to prepare a good bed and avoid having to disturb the plants later.
- Perennials should not need fertilizer unless they are planted in a poor location or fertilizer is needed for proper flowering. Once again, it is better to choose plants suitable to your location rather than try to improve large areas of soil. The soil should be loosened and weeded and compost or manure should be well worked into the soil prior to planting. Plants will benefit from annual or occasional side-dressing with compost. Care must be taken to prevent compost and other material from washing into lakes or streams.
- The success of perennials depends on adequate watering and weeding the first few seasons. Once established, many perennials require very little maintenance, especially if they are part of a natural planting.

6) NON-NATIVE, INVASIVE PLANTS

- The plants listed below are non-native plants either known or suspected to be invasive in parts, if not all, of upstate New York. They spread rapidly by seeds, underground rhizomes or suckers and can take over an area, eliminating the natural vegetation and therefore adversely altering the natural habitat. Once established, many of these plants are hard to eradicate. They should be avoided even if they are available through nurseries.

Avoid these plants:

- ◇ Purple loosestrife
- ◇ Non-native honeysuckles
- ◇ Japanese barberry
- ◇ Buckthorn (smooth & common)
- ◇ Oriental bittersweet
- ◇ Japanese knotweed
- ◇ Multi-flora rose

Choose alternatives:

- ◇ Red maple
- ◇ Black locust
- ◇ Autumn olive
- ◇ Rugosa rose
- ◇ Burning bush (winged euonymus)

7) TREES 30 TO 100 FEET IN HEIGHT

**TREES
30 TO 100 FEET IN HEIGHT**

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	Sandy
Deciduous								
Basswood	3	X	X	X		X		
Beech	3	X				X		
Bigwood Aspen	4	X				X	X	X
Box Elder	4	X	X		X	X	X	
Cottonwood	4	X				X		
European Alder	4	X	X		X			
Green Ash	3	X	X		X	X	X	
Honey Locust	5	X			X	X		
Katursa Tree	5	X	X			X		
Littleleaf Linden	3	X				X	X	
Mountain Ash	3	X					X	X
Northern Red Oak	3	X				X	X	
Paper Birch	3	X				X	X	
Quaking Aspen	3	X				X	X	
Red Maple	3	X	X		X	X	X	
River Birch	4	X			X	X	X	
Silver Maple	3	X			X	X		
Sugar Maple	3	X				X		
Swamp White Oak	4	X			X	X		
Weeping Willow	3	X			X	X		
White Ash	3	X				X		
Yellow Birch	3		X	X		X		
Evergreen								
Austrian Pine	4	X				X	X	
Balsam Fir*	3	X	X		X	X		
Black Spruce	3	X			X	X		
Colorado Blue Spruce	3	X				X		
Hemlock*	3	X	X	X		X		
Japanese Black Pine	5	X				X	X	X
Larch (Tamarack)	3	X			X	X		
Norway Spruce	3	X				X	X	
Red Pine	3	X				X	X	X
White Cedar*	3	X	X		X	X		X
White Pine	3	X	X	X		X	X	
White Spruce	3	X	X			X	X	

* also available in dwarf forms

See Section 3, Terms & Abbreviations, for explanation of column headings.

DECIDUOUS



Basswood (*Tilia americana*) Also known as Linden. Grows 60 to 80 feet. A lush, ornamental shade tree with large leaves and fragrant white flowers in summer. Sun to shade. Rich, moist soil. Not tolerant of salt. **Zone 3 N** (Image courtesy of James L. Reveal, Lady Bird Johnson Wildflower Center)



Beech (*Fagus grandifolia*) Grows to 70 feet. Has a short trunk with a wide, rounded crown and smooth bark. Attractive, light-green leaves create dense shade. Leaves hang on after turning yellow to brown in the fall. Full sun. Rich, moist soil. Good for birds. **Zone 3 N** (Image courtesy of Sally and Adam Wasowski, Lady Bird Johnson Wildflower Center)



Bigtooth Aspen (*Populus grandidentata*) Grows to 60 feet with a narrow, round-topped crown. Leaves flutter in the wind like quaking aspen. Rapid growth. Full sun. Does best in rich, moist, sandy soil but tolerates drier soils. Good for birds. **Zones 3-4 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Box Elder (*Acer negundo*) Grows to 50 feet with a 30 foot spread. Short trunk and stout branches provide a deep, broad crown. Compound leaves. Rapid growth. Full to part-sun. Moist soil. Found naturally along stream and lake edges. Used as an ornamental in parks and along roads. **Zone 4 N** (Image courtesy of Julie Makin, Lady Bird Johnson Wildflower Center)



Cottonwood (*Populus deltoides*) Grows to 80 feet with a high, pyramidal crown. Large leaves. Cottony seeds evident in late spring. Rapid growth. Full sun. Moist soil. Found in rich, moist soil near streams and lakes. Good for grouse.

Branches may break in storms. **Zone 4** (Image courtesy of James L. Revel, Lady Bird Johnson Wildflower Center)



Center)

Green Ash (*Fraxinus pennsylvanica*) Grows to 60 feet. Attractive shade tree. Compound leaves. Rapid growth. Full to part-sun. Dry to wet soil. Tolerates flooding and salt. Found along rivers and streams. Yellow fall color. **Zone 3 N** (Image courtesy of Ray Mathews, Lady Bird Johnson Wildflower



Stephanie Brundage, Lady Bird Johnson Wildflower Center)

Honey Locust (*Gleditsia triacanthos*) Grows to 80 feet (50 in Northern New England) with a broad, flat-topped crown. Compound leaves are graceful and lacy. Long, interesting seed pods. Thorns on trunk and branches. Full sun. Moist, fertile soil. Tolerates poor drainage and salt. Yellow fall color. **Zones 4-5** (Image courtesy of



Katsura Tree (*Cercidiphyllum japonicum*) Grows to 60 feet with a 30 foot spread. Nice form. Used as an ornamental. Bluish-green leaves are orange and smell spicy in fall. Full sun. Moist, well-drained soil. **Zones 4-5** (Image courtesy of Geneva Wirth, NC State Extension, CC-BY-NC 2.0)



Littleleaf Linden (*Tilia cordata*) Grows to 50 feet with a 35 foot spread and an upright, oval crown. Darkgreen leaves and fragrant, yellow flowers in early summer. Full sun. Adaptable to a variety of soils and conditions. **Zone 3** (Image courtesy of Dinesh Valke, NC State Extension, CC-BY-SA 2.0)



Mountain Ash (*Sorbus alnifolia* & *aucuparia*)

These are similar to ornamental mountain ashes. Grow from 35 to 50 feet with a 20 foot spread (larger than the American Mountain Ash). Fine, compound leaves turn from green to varying shades of brilliant yellow to red in the fall. Clusters of white flowers in spring, followed by red berries in fall. Full to part-sun. Moist soil. Good for birds. **Zone 3** (Image courtesy of Andrey Zharkikh, NC State Extension, CC-BY 2.0)



Northern Red Oak (*Quercus rubra*) Grows to 70 feet with a similar spread A 'grand tree' with reddish-brown bark and dark-green leaves.

Leaves are brown and persistent into late fall. Rapid growth. Full sun. Moist to dry soil. **Zone 3 N** (Image courtesy of Julie Makin, Lady Bird Johnson Wildflower Center)



Paper Birch (*Betula papyrifera*) Also called White Birch. Grows to 70 feet with a 35 foot spread and an irregular, pyramidal crown. Often found in clumps of 3 or more and used ornamentally. Interesting snow-white bark that peels horizontally. Found along lakes and streams. Tolerates occasional flooding and drought. Rapid growth. Full sun. Does best in moist, well-drained soil. Good for birds. **Zone 3 N** (Image courtesy of Stephanie Brundage, Lady Bird Johnson Wildflower

Center)



Quaking Aspen (*Populus tremuloides*) Also called Popple. Can grow to 60 feet but usually less. Narrow, rounded crown. Nice yellow to gold fall color. Leaves quiver in the breeze, making a soft rustling sound. Rapid growth. Short-lived. Full sun. Moist to dry soil. Tolerates a wide variety of conditions. Tolerates heat and some salt. Not

flood tolerant. Good for wildlife and birds. Preferred food of beavers. Likely to lose trees if active beavers in the area. Found in clearcuts, after fires and in old fields. **Zone 3 N** (Image courtesy of Eric Beckers, Lady Bird Johnson Wildflower Center)



Red Maple (*Acer rubrum*) Grows to 60 feet with a 35 foot spread. Nice early red spring flowers and good red fall color. Used as an ornamental. Rapid growth. Full to part-sun. Prefers moist, acid soil but tolerates a wide variety of conditions. Tolerates wet soil and flooding. Not salt tolerant. Found along swamps and lakes. **Zone 3 N** (Image

courtesy of Albert F.W. Vick, Lady Bird Johnson Wildflower Center)



River Birch (*Betula nigra*) Also can be found in a dwarf variety. Grows to 70 feet with a 50 foot spread. Short trunk is often divided into several arching limbs forming an irregular crown. Gray to brownish-red bark is attractive in winter. Full sun. Best in moist soil. Tolerates poor drainage and flooding. Found along river and lake banks. **Zones 4-5 N** (Image courtesy of Sally and Andy Wasowski, Lady Bird Johnson Wildflower Center)



Silver Maple (*Acer saccharinum*) Grows to 70 feet or more with a 45 foot spread. Attractive tree with graceful, arching branches. Bright-green leaves have a silvery-white underside. Good yellow fall color. Rapid growth. Full sun. Best on moist, well-drained soil but tolerates several weeks of flooding. Found along river banks and bottom

lands. Used ornamentally. Good for birds and wildlife. **Zone 3 N** (Image courtesy of Jim Lawrence, NC State Extension, CC-BY-NC-ND 4.0)



Sugar Maple (*Acer saccharum*) Grows to 80 feet or more with a 40 foot spread. Good shade tree with classic shape if grown in the open. Excellent yellow to red fall color. Full sun best but tolerates some shade. Moist, well-drained soil. Does not tolerate wet or compacted soil. Sensitive to salt. Found in upland areas throughout New England. **Zone 3 N** (Image courtesy of Albert F.W. Vick, Lady Bird Johnson Wildflower Center)



Swamp White Oak (*Quercus bicolor*) Grows to 60 feet with similar spread. Produces quantities of acorns. Poor fall color. Full sun. Moist to wet soil. Scraggy, peeling branches make it less appealing as an ornamental but its value lies in its tolerance of swampy, poorly-drained conditions. Good for wildlife. **Zones 4-5 N** (Image courtesy of MPRB Forestry, NC State Extension, CC BY-NC 2.0)



Weeping Willow (*Salix alba* var. *Tristis* or *Salix babylonica* or *Salix niobe*) Grows to 70 feet with a similar spread. Graceful, drooping branches with long, slender leaves with pale, silvery undersides. Interesting ornamental or specimen tree. Drops a lot of leaves and branches. Rapid growth. Full sun. Moist to wet soils. **Zone 3**

(Image courtesy of Jim Robbins, NC State Extension, CC BY-NC-ND 4.0)



White Ash (*Fraxinus americana*) Grows to 80 feet. A tall, slender tree with good yellow fall color. In the open the tree can become quite spreading. Compound leaves. Rapid growth. Full sun. Best on moist, well-drained soil but tolerates poor drainage and heavy soil. Often found growing near water. Good for birds. **Zone**

3 N (Image courtesy of Sally and Andy Wasowski, Lady Bird Johnson Wildflower Center)



Yellow Birch (*Betula alleghaniensis*) Grows to 80 feet with a 50 foot spread. Attractive golden, peeling bark on older specimens. Part-sun to shade. Moist soil. Found near streams. Good for birds. **Zone 3 N** (Image courtesy of Julie Makin, Lady Bird Johnson Wildflower Center)

EVERGREEN



Austrian Pine (*Pinus nigra*) Grows to 100 feet with a 30 foot spread. A large, wide, dense tree with long, dark-green needles. Branches occur down to the base of the trunk. Large, interesting cones. Full sun. Moist to dry soil. **Zone 4** (Image courtesy of Paul Wray, Iowa State University Extension)



Balsam Fir (*Abies balsamea*) Grows to 50 feet with a 25 foot spread. Straight, conical tree with horizontal branches. Typical Christmas tree shape. Short, dark-green, fragrant needles. Small, light-brown cones. Also available in dwarf forms. Sun to part-sun. Prefers cool, moist, upland soil. Good for wildlife and birds. **Zone 3 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Black Spruce (*Picea mariana*) Grows to 50 feet. A very narrow, straight tree with thin, somewhat pendulous branches. Short, blue-green needles and small cones. Full sun. Moist soil. Tolerates poor, poorly-drained, swampy conditions. Good for birds and small wildlife. **Zone 3 N** (Image courtesy of Nan Hampton, Lady Bird Johnson Wildflower Center)



Colorado Blue Spruce (*Picea pungens*) Many varieties available with different heights. Grows to 100 feet with a 20 foot spread. A tall, narrow tree with dense, silver-blue to blue-green foliage. Needles are mediumlength and sharp. Branches occur in regular whorls. Very ornamental. Full sun. Prefers moist soil but will do well in dry areas also. Good for birds. Native to the Rockies. **Zone 3** (Image courtesy of Paul Wray, Iowa State University Extension)



Hemlock (*Tsuga canadensis*) Grows to 80 feet with a 30 foot spread. Large, irregular, pyramidal tree. Small, deep-green needles with a loose, feathery appearance. Graceful appearance. Small, interesting cones. Also available in dwarf forms. Sun to shade. Does best in cool, moist, well-drained soil. Tolerates shade and some flooding. **Zone 3 N** (Image

courtesy of Sally and Andy Wasowski, Lady Bird Johnson Wildflower Center)



Japanese Black Pine (*Pinus thunbergii*) Can grow to 80 feet but usually only to 50. Irregular open habit with wide-spreading, horizontal branches. Bright-green needles and attractive brown cones. Full sun. Sandy, acid soil. Salt tolerant. Drought tolerant. Good for shore plantings. **Zone 5** (Image courtesy of Plant Image Library, NC State Extension, CC-BY-SA 2.0)



Larch (*Larix laricina*) Also called Tamarack and Hackmatack. Grows to 65 feet. A narrow, upright open tree with horizontal branches and graceful, sweeping twigs. Fine, light-green needles with a lacy appearance turn yellow in fall and drop off (not really an evergreen). Full sun. Prefers moist soil but tolerates poor, wet soil and flooding. Found in

wetlands. **Zone 3 N** (Image courtesy of Nan Hampton, Lady Bird Johnson Wildflower Center)



Norway Spruce (*Picea abies*) Grows to 100 feet. Tall, dense, attractive, conical tree with drooping branches and branchlets. Can be 30 feet across at the base. Makes an excellent windbreak. Many varieties available. Full sun. Moist soil. Good for birds and wildlife. **Zone 3** (Image courtesy of MPF, NC State Extension, CC BY-SA 3.0)



Red Pine (*Pinus resinosa*) Also called Norway Pine. Grows to 80 feet. Large, handsome, straight tree with horizontal branching, often limited to the top third of the tree in older specimens. Long, dark-green, stiff needles and nice cones. Interesting, reddish bark. Rapid growth. Full sun. Best in dry, sandy soil. Tolerates poor soil. Found on dry, rocky ridges. First

discovered near Norway, Maine. **Zone 3 N** (Image courtesy of Paul Wray, Iowa State University Extension)



White Cedar (*Thuja occidentalis*) Also called Arbor Vitae. Grows to 60 feet and 25 feet across at the base. A dense, oval or pyramidal tree with flat, green, aromatic foliage. Makes a good hedge and windbreak. Can be sheared but has an attractive form on its own. Many varieties available, including dwarf forms. Sun to part-sun. Moist soil best.

Tolerates dry, sandy to wet soils. Tolerates flooding and occasional drought. Found in wet soils and swampy areas. Good for birds and wildlife. **Zone 3 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



White Pine (*Pinus strobus*) Grows to 100 feet with a 40 foot spread. A large, open tree with horizontal branching. Branches occur to the base in open-grown specimens. Long, soft, blue-green needles give a softer overall appearance than Red Pine. Several varieties available. Can be pruned to hedges and windbreaks. Rapid growth. Sun to part-sun. Moist soil best but tolerates dry soil. Does not tolerate salt or flooding. Good for birds and wildlife. **Zone 3 N** (Image

courtesy of Albert F.W. Vick, Lady Bird Johnson Wildflower Center)



White Spruce (*Picea glauca*) Grows to 65 feet. A large, conical tree with horizontal branching and darkgreen to bluish foliage. Broader and fuller than black spruce. Slow growth and a somewhat disagreeable odor when needles are bruised. Makes a good windbreak. Several forms available. Full sun. Moist soil. Tolerates a variety of conditions. Common on lake shores. Good for birds and wildlife. **Zone 3 N**
 (Image courtesy of Eric Beckers, Lady Bird Johnson Wildflower

Center)

8) SMALL TREES/LARGE SHRUBS 12 TO 30 FEET IN HEIGHT

**SMALL TREES/LARGE SHRUBS
10 TO 30 FEET IN HEIGHT**

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	Sandy
Deciduous								
American Hornbeam	4		X	x		X	x	
American Mountain Ash	3	X	X			X		
Blackhaw	4		X			X	X	
Canada Plum	3	X	X	X		X		
Chokecherry	3	X	X			X		
Common Witchhazel	4	X	X	X		X		
Crabapple*	4	X				X	X	
Eastern Wahoo	5			X		X		
Hawthorn*	4	X				X	X	X
Hop Hornbeam	3	X	X	X			X	
Kwanzan Cherry	5	X				X		
Laurel Willow	3	X			X			
Lilac*	3 or 4	X				X	X	
Nannyberry	3	X	X	X		X	X	
Ninebark	3	X	X			X	X	
Northern Arrowwood	3	X	X			X	X	
Pagoda Dogwood	4	X	X	X		X		
Purpleosier Willow	3	X	X	X	X	X		
Pussy Willow	3	X			X	X		
Serviceberry*	3 or 4	X	X			X	X	
Siberian Peashrub	3	X				X	X	
Smooth Sumac	3	X	X	X			X	
Speckled Alder	3	X	X	X	X	X		
Staghorn Sumac	3	X	X	X			X	
Striped Maple	3		X	X		X		
Evergreen								
Eastern Redcedar*	4 or 5	X	X	X	X	X	X	X
Fraser Fir	4	X	X			X	X	
Japanese Yew	3	X	X	X		X	X	X
Mugo Pine*	3	X	X	X		X		

* also available in dwarf forms

See Section 3, Terms & Abbreviations for explanation of column headings.

DECIDUOUS



American Hornbeam (*Carpinus caroliniana*) Grows to 30 feet with a round-topped crown. Has a short, twisted trunk. Good understory tree. Orange fall color. Part-sun to shade. Grows in moist rich soil along streams and swamps. Adaptable to other soils. **Zone 4 N** (Image courtesy of Julie Makin, Lady Bird Johnson Wildflower Center)



American Mountain Ash (*Sorbus americana*) Grows from 15 to 30 feet high in cool woods and along river banks. Has fine, attractive foliage and yellow to red fall color. Full sun. Tolerates sandy soil and some drought. Good for birds. **Zone 3 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Wildflower Center)

Blackhaw (*Viburnum prunifolium*) Grows 12 to 15 feet with similar spread. The short trunk is often crooked. Found on dry, rocky hillsides and in thickets. Has round, white flower clusters, followed by black fruit. Maroon fall color. Part-sun. Moist to dry soil. **Zone 4 N** (Image courtesy of J.W. Smith, Lady Bird Johnson



Canada Plum (*Prunus nigra*) Grows from 12 to 25 feet, often with a distorted shape. Found in roadside thickets and edges of woods. Has early, white flowers and edible fruit. Dark bark is attractive in winter. Sun to shade. Moist soil. **Zone 3 N** (Image courtesy of J.W. Smith, Lady Bird Johnson Wildflower Center)



Chokecherry (*Prunus virginiana*) Grows to 25 feet, often in a multi-stemmed clump. An open shrub with white flower clusters, followed by small, red, edible fruit. Found along roadsides and river banks, in abandoned fields and rich woods. Sun to part-sun. Adaptable to most

soils. Good for birds. **Zone 3 N** (Image courtesy of James L. Reveal, Lady Bird Johnson Wildflower Center)



Common Witchhazel (*Hamamelis virginiana*)
Grows 20 to 30 feet with a similar spread. A small tree with an irregular crown. Fragrant, yellow flowers in October and good yellow fall color. Found in moist soils along streams and lakes. Sun to shade. **Zone 4 N** (Image courtesy of Kurt Wagner, NC State Extension, CC BY-NC-ND 4.0)



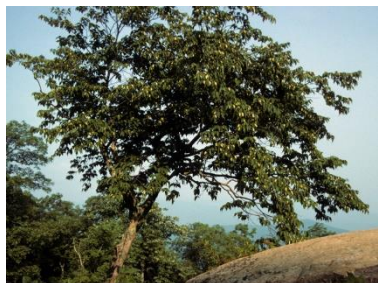
Crabapple (*Malus sp.*) Many varieties available. Grows 15 to 25 feet with similar spread. Attractive, small tree with showy, spring flowers and small fruits, some edible. Full sun. Adaptable to poor soil but must be well-drained. Good for birds. **Zone 4** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Eastern Wahoo (*Euonymus atropurpurea*)
Grows to 25 feet. Has tiny, purple flowers, orange fruit and orange to purple fall color. Shade. Moist soil. **Zone 4** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Hawthorn (*Craetegus sp.*) Many species. Grows 15 to 30 feet. Thorny shrub with interesting, twisted branches, apple-like blossoms and tiny fruits in fall. Yellow to orange fall color. Full sun. Moist to dry soil. Naturally found in rocky, sandy soil. **Zone 4 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Hop Hornbeam (*Ostrya virginiana*) Also known as Ironwood. Grows 20 to 30 feet. A round-topped tree with reddish-brown, shaggy bark. Found in rich, rocky woods and on warm, gravelly slopes. Sun to shade. Moist to dry soil.

Zone 3 N (Image courtesy of Sally and Andy Wasowski, Lady Bird Johnson Wildflower Center)



Kwanzan Cherry (*Prunus serrulata*) Grows 20 to 30 feet with a 20 foot spread. A vase-shaped tree with dark-green leaves that turn orange/bronze in the fall. Large pink flowers in summer. Sun. Moist soil. **Zone 5** (Image courtesy of Myrabella, NC State Extension, CC BY-SA 3.0)



Lilac (*Syringa sp.*) Several species and varieties available. Grows from 3 to 30 feet with corresponding spread. Attractive, upright shrub with dense, green foliage and large clusters of showy, fragrant flowers from white to pink to purple. Some varieties spread to form large clumps. Full sun. Adaptable to various soil conditions, must be well-drained. Good bird nesting sites. **Zones 3-5** (Image courtesy of Dan Keck, NC State Extension, CC0)



Nannyberry (*Viburnum lentago*) Also known as Wild Raisin. Grows to 20 feet in fast, spreading growth. Showy, white flowers in June; black fruit and good fall color. Found along roads, edges of woods, streambanks and in thickets. Sun to shade. Moist to dry soil. Good for birds. **Zone 3 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Ninebark (*Physocarpus opulifolius*) Grows 8 to 14 feet. Shows rapid growth. Clusters of white flowers in spring; interesting pink fruit and yellow fall color. Has peeling bark. Grows in thickets, along river banks and in rocky places. Sun to part-sun. Moist to dry soil. Good for birds. **Zone 3 N** (Image courtesy of Stephanie Brundage, Lady Bird Johnson Wildflower Center)



Northern Arrowwood (*Viburnum recognitum*) Grows 10 to 15 feet in clumps and thickets. White spring flowers; blue fruit and red fall color. Sun to part-sun. Moist soil. Good for birds. **Zone 3 N** (Image courtesy of Thomas L. Muller, Lady Birdy Johnson Wildflower Center)



Pagoda Dogwood (*Cornus alternifolia*) Grows 15 to 20 feet with similar spread. Branches and leaves occur in flattened layers. Fragrant, white flowers and blue fruit. Maroon fall color. Red stems in winter. Part-sun to shade. Cool, moist, well-drained soil. **Zone 4 N** (Image courtesy of Stephanie Brundage, Lady Bird Johnson Wildflower Center)



Purplesier Willow (*Salix purpurea*) Also called 'Streamco Willow'. Standard form of the Dwarf Arctic Willow. Grows 10 to 18 feet in ideal conditions. A slender shrub that forms thickets. Typical, long, narrow willow leaves have a purplish cast to the upper surfaces and pale undersides. Shoots and branches have a purple to red hue. Easy to establish from unrooted cuttings. Excellent erosion control along streams. Sun to part-sun. Any moist to wet soil. Is not drought tolerant. Good for grouse and wildlife. **Zone 3** (Image courtesy of Jim Robbins, NC State Extension, CC BY-NC-ND 4.0)



Pussy Willow (*Salix discolor*) Grows to 20 feet in multi-stemmed clumps up to 15 feet wide. Spreading shrub with fuzzy catkins in spring. Full sun. Naturally found in moist to wet soil but tolerates drier soil. Good for birds. **Zone 3 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Serviceberry (*Amelanchier sp.*) Several species and varieties available. Also called Juneberry, Shad, Sugar Plum, Sarviceberry. Grows from 5 to 30 feet high in multi-stemmed clumps. Attractive shrub with white flower clusters, edible, purple-blue berries and orange-red fall color. Sun to shade. Moist

to dry soil, depending on variety. Good for birds. **Zones 3-5 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Speckled Alder (*Alnus rugosa*) Grows to 20 feet in large, bushy clumps. Does best in full sun but tolerates light shade. Moist to wet soil. Found along brooks, lakes, swamps. Does well in poor conditions. Fixes nitrogen. Good bird habitat and food. **Zone 3 N** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Staghorn Sumac (*Rhus typhina*) Grows to 20 feet. Upright, open habit with fuzzy stems. Yellow flowers; large, upright clusters of red fruit and yellow to red fall color. Sun to shade. Well-drained soil. Tolerates poor soils. Common in old pastures and open areas. Good for migrating birds. **Zone 3 N** (Image courtesy of

John Hixson, Lady Bird Johnson Wildflower Center)



Striped Maple (*Acer pensylvanicum*) Grows to 30 feet with a 15 to 20 foot spread. Slender, upright tree with irregular branches and interesting greenish bark with white stripes. Part-sun to shade. Moist, cool soil. Found in cool woods and on rocky mountain slopes. **Zone 3 N** (Image courtesy of Albert F.W. Vick, Lady Bird Johnson Wildflower Center)

9) PERENNIAL HERBS AND FLOWERS

PERENNIAL HERBS & FLOWERS

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	G/C
Anise Hyssop	4	X				X		
Artemesia	3	X	X				X	
Aster	3	X	X			X		
Astilbe	4	X	X		X	X		
Baptisia	3	X	X		X	X	X	
Barrenwort	3		X	X	X	X		X
Barren Strawberry	4	X	X	X		X		X
Basket of Gold	3	X	X			X		
Bee Balm	4	X	X		X	X		
Bellflower	4	X	X			X	X	X
Bergenia	4	X	X		X	X		X
Bird's Foot Trefoil	3	X			X	X	X	X
Black-eyed Susan	3	X	X			X		
Blazing Star	3	X	X		X	X	X	
Bleeding Heart	4		X			X		
Blue Star Flower	3		X			X		
Blueberry	3	X	X			X	X	X
Boltonia	4	X			X	X		
Boneset	3	X	X		X	X		
Bugbane	3		X	X	X	X		
Bugleweed	3	X	X	X		X	X	X
Bugloss	3	X	X	X	X	X		
Bunchberry	3			X		X		X
Butterfly Weed	4	X					X	
Cardinal Flower	3	X	X		X	X		
Catmint	3	X	X		X	X	X	X
Chameleon Plant	3	X	X	X	X	X		X
Chinese Lantern	3	X	X			X		
Comfrey	4		X		X	X		
Coneflower	3	X				X		
Cornflower	3	X				X		
Cranesbill	3-5	X	X	X	X	X	X	X
Creeping Jenny	3	X	X		X	X		X
Creeping Phlox	3		X	X		X		X
Crown Vetch	3	X	X			X	X	X
Culver's Root	3	X	X			X		
Cushion Spurge	3	X				X	X	
Daisy	4-5	X				X		
Daylily	3	X	X		X	X		
Evening Primrose	4-5	X	X			X	X	X
False Lupine	3	X	X			X	X	

See Section 3, Terms & Abbreviations, for explanation of column headings.

PERENNIAL HERBS & FLOWERS CONTINUED

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	G/C
False Sunflower	3	X	X			X	X	
Fleabane	4	X	X				X	
Foamflower	4		X	X	X	X		X
Forget-Me-Not	3		X	X	X	X		
Germander	5	X	X			X		X
Globeflower	3	X	X		X	X		
Globe Thistle	3	X					X	
Goat's Beard	4	X	X		X	X		
Goldenrod	3	X				X	X	
Heather	4	X				X		
Helen's Flower	3	X			X	X		
Horehound	3	X					X	X
Hosta	3	X	X	X	X	X		X
Hyssop	3	X	X			X		
Iris	3 to 5	X	X		X	X	X	
Jacob's Ladder	3		X		X	X		X
Jewelweed	3		X	X	X	X		
Joe-Pye Weed	3	X	X		X	X		
Lady's Mantle	3	X	X			X		X
Lamb's Ears	4	X	X			X		X
Lamiaeum	3		X	X		X		X
Lamium	3		X	X		X	X	X
Lavender	5	X				X		
Lemon Balm	4	X	X			X	X	
Ligularia	4		X	X	X	X		
Lily	3 to 5	X	X			X		
Lily of the Valley	3		X	X		X		X
Lily-turf	4	X	X	X	X	X	X	X
Loosestrife	3	X	X		X	X	X	
Lungwort	3		X		X	X		X
Lupine	4	X	X			X	X	
Mallow	4	X				X	X	
Masterwort	4		X	X		X		
Meadow Rue	3 to 5	X	X		X	X		
Meadowsweet	4	X	X		X	X		
Milkweed	3	X			X	X	X	
Mint	3 to 5	X	X		X	X		X
Moss Phlox	3	X	X			X	X	X
Obedient Plant	3	X	X		X	X		
Oregano	3	X				X		X
Pachysandra	4		X	X		X		X
Pearly Everlasting	3	X				X	X	

See Section 3, Terms & Abbreviations, for explanation of column headings.

PERENNIAL HERBS & FLOWERS CONTINUED

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	G/C
Periwinkle	4	X	X	X		X		X
Phlox	3	X				X		
Plume Poppy	3	X	X			X		
Potentilla	5	X	X			X	X	X
Pussy-toes	3	X					X	X
Sage	3 to 5	X				X	X	
Sedum	3	X	X			X	X	X
Skullcap	4		X		X	X		
Snow-in-Summer	3	X				X	X	X
Snow-on-the-Mountain	3	X	X	X	X	X	X	X
Solidaster	5	X				X		
Solomon's Seal	3		X	X	X	X		
Sunflower Heliopsis	3	X				X	X	
Sweet Flag	3	X	X		X			
Sweet Woodruff	4		X	X		X		X
Swordleaf Inula	3	X			X	X		
Tansy	3	X				X		
Thin-leaved Sunflower	3	X				X		
Thyme	4	X	X			X	X	X
Tickseed	3	X				X		
Turtlehead	4	X	X		X	X		
Valerian	4	X	X			X		
Veronica	3 to 5	X	X			X		X
Viola	3 to 5	X	X			X		X
Virginia Bluebells	3		X	X		X		
White Clover	3	X	X		X	X		X
Wild Ginger	3 to 4		X	X		X		X
Wintercreeper Euonymus	3	X	X	X		X		X
Wintergreen	3		X	X		X		X
Yarrow	3	X				X	X	

See Section 3, Terms & Abbreviations, for explanation of column headings.



Anise Hyssop (*Agastache foeniculum*) Not related to Anise or Hyssop. Grows to 3 feet with a 2 foot spread or less, if crowded. Bushy, aromatic herb with long-blooming spikes of purple flowers attractive to bees, butterflies and hummingbirds. Anise-scented foliage and flowers used medicinally and in teas. Spreads

by self-seeding. Full sun. Moist soil. **Zone 4** (Image courtesy of James L. Reveal, Lady Bird Johnson Wildflower Center)



Artemisia (*Artemisia sp.*) Also known as Wormwood. Several species and varieties available. Range in height from 6 inches to 6 feet with 1 to 3 foot spreads. All have silvery, delicate, fern-like,

aromatic foliage that persists into winter and can be used dried. Most have inconspicuous flowers that blend with the foliage. Sun to part-sun. Poor, dry soil. Tolerates drought but not excess moisture or fertilizer. **Zone 3** (Image courtesy of Bernadette Clark, NC State Extension, CC BY 2.0)



Aster (*Aster sp.*) Most are varieties of *A. alpinus*, *A. novae-angliae* and *A. lateriflorus*. Bushy plants with either a mounded or open habit and colorful, daisy-like flowers. Growth ranges from 6 inches to 6 feet. Taller ones may require staking and therefore may not be appropriate for naturalized buffer plantings. Flowers come in all colors. Most bloom in late summer but some bloom in spring also. Full sun although some tolerate some shade. Best in well-drained soil; some tolerate wet soil also. Some species are native. **Zone 3** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Astilbe (*Astilbe sp.*) Many varieties available. Grow 1 to 4 feet with most in the 2 to 3 foot range. Delicate, fern-like leaves and showy plumes of flower clusters in white, pink, red and purple. Summer blooming. Do best with occasional dividing. Sun to part-sun. Moist to wet, rich soil. Not drought tolerant and not tolerant of winter wetness. **Zone 4** (Image courtesy of Stephanie Brundage, Lady Bird Johnson Wildflower Center)



Baptisia (*Baptisia sp.*) Two or three species available. Also called False Indigo. Bushy plant grows 3 to 4 feet with rich, bluish-green leaves and loose clusters of pea-like flowers in white, yellow or blue in spring or summer. Sun to part-sun. Best in rich soil but tolerates poor, dry soil and wet soil. **Zone 3** (Image courtesy of Ray Mathews, Lady Bird Johnson Wildflower Center)



Barren Strawberry (*Waldsteinia sp.*) Grows 6 to 8 inches and spreads to form a nice ground cover. Strawberry-like, semi-evergreen foliage. Yellow flowers in late spring. Easy to grow. Sun to shade. Well-drained soil. **Zone 4** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Barrenwort (*Epimedium sp.*) Grows 8 to 15 inches high as a compact, spreading ground cover. Strong rhizomes help in erosion control. Bright-green, compound leaves and white, yellow or red flowers in spring. Yellow, bronze or red fall color. Part-sun to shade. Rich, moist soil.

Tolerates wet conditions. Good ground cover; may be slow getting established. **Zone 3** (Image courtesy of Susan Strine, NC State Extension, CC BY 2.0)



Basket of Gold (*Aurinia sp.* or *Alyssum sp.*) Also called Perennial Alyssum. Grows 6 to 12 inches in a spreading mound. Semi-evergreen, grayish-green foliage. Masses of brilliant yellow flowers in early spring to summer. Rapid growth. Sun to part-sun (blooms best in full sun). Well-drained soil. Good in rocky areas. **Zone 3** (image courtesy of

Lazaregagnidze, NC State Extension, CC BY-SA 3.0)



Bee Balm (*Monarda didyma*) Other species also cultivated. Grows 2 to 4 feet and spreads quickly. Lush, aromatic foliage and interesting, showy clusters of white, pink, red or purple flowers that attract bees, butterflies and hummingbirds. Sun to part-sun. Rich, moist soil best. Tolerates wet soil. Excellent

for naturalizing. **Zone 4 N** (Image courtesy of James L. Reveal, Lady Bird Johnson Wildflower Center)



Bellflower (*Campanula sp.*) Also called Harebell. Cultivated from native and non-native species. Many varieties are available but not all are appropriate for natural plantings. Ones to consider include varieties of *C. carpatica*, *C. glomerata*, *C. lactiflora*, *C. latifolia* and *C. poscharskyana*. They vary in height from low, spreading ground covers to 3 foot, bushy plants. All are spreading if given the right conditions. Attractive, deep-green foliage and clear blue, white or lavender bell-shaped flowers, sometimes in large clusters. Bloom in summer. Sun

to part-sun. Moist well-drained soil. Some tolerate drought and some wet soil. **Zone 4** (Image courtesy of Fritz Flohr Reynolds, NC State Extension, CC BY-SA 3.0)



Bergenia (*Bergenia cordifolia*) Grows 12 to 18 inches. Vigorous, spreading plants with large, bold, glossy, semi-evergreen leaves that turn from green to burgundy in cold weather. Showy spikes of white, pink or red flowers in early spring. Sun to part-sun. Moist soil. Tolerates wet soil. Good as ground cover

in damp, sunny or partly sunny areas. **Zone 4** (Image courtesy of Lotus Johnson, NC State Extension, CC BY-NC 2.0)



Bird's Foot Trefoil (*Lotus corniculatus*) Grows 18 to 24 inches. A common wildflower in the Midwest. Useful as erosion control and quick cover on road banks and other disturbed areas. Bright-green foliage and brilliant yellow, pea-like flowers in spring and summer. Full sun. Tolerates a wide variety of soils (not sandy). Some

drought tolerance. **Zone 3** (Image courtesy of Robert H. Mohlenbrock, USDA-NRCS PLANTS Database)



Black-eyed Susan (*Rudbeckia sp.*) Also called Yellow Coneflower. Several species and varieties; some native, some not; some short-lived and others long-lived and spreading. Some are invasive. Grows 1 to 4 feet with lush, green foliage and large, yellow to orange, daisy-like flowers with dark centers. Blooms summer to fall. Rapid growth. Easy to grow. Sun to part-sun.

Moist soil. **Zone 3 N** (Image courtesy of Michael Dana, Lady Bird Johnson Wildflower Center)



Blazing Star (*Liatris sp.*) Several species cultivated. Also called Gay Feather. Grow 2 to 4 feet in clumps with stiff, grass-like foliage and tall flower spikes in summer. Flowers available in white, pink or purple. Good in natural areas. Sun to part-sun. Best in well-drained soil. Sandy soil okay. Some tolerate wet. Most are native to the Midwest and have become established in New England. **Zone 3** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Bleeding Heart (*Dicentra sp.*) Grows 1 to 3 feet and can spread to clumps 3 to 4 feet across. Dwarf and non-spreading varieties are available. Graceful, arching stems with fern-like leaves and arching sprays of heart-shaped flowers in white, pink or red in late spring. Part-sun. Tolerates full sun in cool areas. Moist, well-drained soil. Good near woodlands. **Zone 4** (Image courtesy of NC State Extension)



Blue Star Flower (*Amsonia tabernaemontana*) Also called Willow Amsonia. Grows 2 to 3 feet with willow-like, gray-green leaves and clusters of sky-blue, star-shaped flowers in late spring. Foliage turns yellow in fall. Nice, low-maintenance plant for natural settings. Does best in part-

sun and cool, moist soil. Tolerates full sun and drier soils but is not as vigorous. Native to the Midwest. **Zone 3** (Image courtesy of Sten Porse, NC State Extension, CC BY-SA 3.0)



Blueberry (*Vaccinium angustifolium*) Also called Lowbush Blueberry. Grows to 1 foot and spreads by suckering. Small, glossy leaves turn bright-red in fall. Small, white flowers, followed by edible, blue fruit in mid to late summer. Sun to part-sun. Well-drained, acid soil. A sturdy, adaptable ground cover. Good for birds and small

mammals. **Zone 3 N** (Image courtesy of Stephanie Brundage, Lady Bird Johnson Wildflower Center)



Boltonia (*Boltonia asteroides*) Grows 2 to 4 feet. An informal, vigorous, spreading, aster-like plant with blue-green foliage and profuse, small, white to pink, daisy-like flowers in late summer to fall. Easy to grow. Good for natural areas. Full sun best. Moist soil. Tolerates wet. **Zone 4** (Image courtesy of W.D. and Dolphia Bransford, Lady Bird Johnson Wildflower Center)



Boneset (*Eupatorium perfoliatum*) Grows 3 to 5 feet. Vigorous, spreading, coarse-leaved plants with showy clusters of white flowers in summer and fall. Naturally occurs in moist, open areas. Sun to partsun. Moist to wet soil. Good in natural plantings. **Zone 3 N** (Image courtesy of Stephanie Brundage, Lady Bird Johnson Wildflower Center)



Bugbane (*Cimicifuga sp.*) Also called Snakeroot or Black Cohosh. Tall, slender, woodland plants, growing 3 to 7 feet tall, with deep-green, fern-like foliage and 1 to 2 foot, arching stalks of fragrant, white to purple flowers in late summer to fall. Part-sun to shade. Rich, moist soil. Tolerates wet

soil. Good in a wild garden. **Zone 3** (Image courtesy of Thomas L. Muller, Lady Bird Johnson Wildflower Center)



Bugleweed (*Ajuga sp.*) Several species and varieties. A low, dense, fast-growing ground cover reaching a height of 6 to 9 inches. *Ajuga reptans* spreads the most while others are more mounded in habit. Lush, lustrous foliage ranges from dark-green to bronze-purple with some variegated forms. Full sun enhances foliage variations. Short spikes of flowers

bloom late spring to early summer in shades of white, pink, blue and purple. Sun to shade. Any well-drained soil. **Zone 3** (Image courtesy of Jim Robbins, NC State Extension, CC BY-NC-ND 4.0)



Bugloss (*Brunnera macrophylla*) Grows 12 to 18 inches. Fast-growing woodland plant with large, heartshaped leaves, and small clusters of Forget-Me-Not-like flowers in spring. Sun to shade. Moist to almost 34 wet soil. Good in woods and along pond or stream edges. **Zone 3** (Image courtesy of Cathy Dewitt, NC State Extension, CC BY 4.0)



Bunchberry (*Cornus canadensis*) A naturally-occurring woodland ground cover that is now available at some nurseries. Grows to 6 inches and spreads underground. Has four leaves and white 'dogwood' type flowers in early summer, followed by clusters of red berries. Needs undisturbed areas to become established. Shade. Cool, moist, acid soil. **Zone 3 N**

(Image courtesy of Jason Hollinger, NC State Extension, CC BY 2.0)



Butterfly Weed (*Asclepias tuberosa*) Grows 2 to 3 feet. Vigorous, upright plants with narrow, green leaves and showy, bright-orange flowers in summer that attract butterflies. Full sun. Sandy, well-drained soil best. Tolerates dry, infertile soil. **Zone 4** (Image courtesy of Mary Keim, NC State Extension, CC BY-NC-SA 2.0)



Cardinal Flower (*Lobelia cardinalis*) Grows 2 to 4 feet. Vigorous plants with rich, green foliage and tall spikes of scarlet flowers in summer. May need dividing to maintain vigor; self-seeds. May need winter protection in Zone 3; check when purchasing. Sun to part-sun. Best in part-sun. Rich, moist, well-drained soil. Tolerates wet conditions. Good in naturalized areas and near water. **Zone 3 N** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Catmint (*Nepeta cataria, mussinii [X faassenii]*) Two species, one being the familiar Catnip. Both are spreading, aromatic herbs with gray-green leaves and spikes of flowers in late spring. Catnip grows 2 to 3 feet high with lemony-minty smelling leaves attractive to cats and white to pink flowers. Catmint is bushier and grows 12 to 18 inches in mounds with blue flowers. Both grow rapidly and should be planted where spreading is okay. Sun to part-sun. Rich, moist soil. Tolerates dry soil (helps control spreading) as well as wet. **Zone 3** (Image courtesy of Lucy Bradley, NC State Extension, CC BY-NC 4.0)



Chameleon Plant (*Houttuynia cordata*) Grows 6 to 9 inches. Vigorous, spreading plant with heart-shaped leaves variegated in green, red, yellow and pink. Small, white flowers in spring. Easy to grow; can be invasive. Good ground cover for wet areas. Sun to shade. Moist to wet soil. **Zone 3** (Image courtesy of Swallowtail Garden Seeds, NC State Extension, CC BY 2.0)



of NC State Extension, CC0)

Chinese Lantern (*Physalis alkekengi* or *franchetii*) Grows to 2 feet and spreads. Dark-green, coarse leaves and small, creamy-white flowers in summer. Ornamental, papery, golden-orange seedpods are used in dry arrangements. Easy to grow but very aggressive. Sun to part-sun. Moist soil. **Zone 3** (Image courtesy



Wildflower Center)

Comfrey (*Symphytum officinale*) Grows 1 to 2 feet. Vigorous, coarse, hairy, branching plant forms clumps. Large leaves at base of plant; smaller as they go up. Loose, branching clusters of white, pink, purple to blue flowers all summer. Good in natural settings. Part-sun. Moist to wet soil. **Zone 4** (Image courtesy of Alan Cressler, Lady Bird Johnson



Native to the Midwest. **Zone 3** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)

Coneflower (*Echinacea angustifolia* & *purpurea*) Several varieties with different flower colors are available. Grows 2 to 4 feet. Sturdy plant with dark-green leaves and large, daisy-like flowers with raised centers. Colors range from deep-pink to white to yellow. Easy to grow. Full sun. Moist, well-drained soil, especially in winter. Tolerates heat, drought and wind.



Full sun. Best in well-drained, alkaline soil. Good for large areas where

Cornflower (*Centaurea* sp.) Also called Perennial Bachelor's Buttons. Varieties available in several heights and colors. Grow 18 inches to 4 feet and bloom anywhere from late spring to late summer. Large, spreading plant with lush, green foliage and large, fringed flowers.

it can spread. **Zone 3** (Image courtesy of Thayne Tuason, NC State Extension, CC BY-SA 4.0)



Cranesbill (*Geranium sp.*) Many species and varieties. Attractive, full, mounded plant growing 6 inches to 2 feet and spreading. Geranium-shaped leaves occur in different sizes, depending on variety, and most have attractive red color in fall. Numerous bright flowers held above the foliage in shades of white, pink, red, purple and blue. Most

bloom all summer. Easy to grow. Sun to part-sun. Moist, well-drained soil. Some varieties are tolerant of more moisture, or dry soil, or shade. Many make good ground covers. Check with nursery for your specific needs. **Zones 3 to 5** (Image courtesy of NC State Extension, CC0)



Creeping Jenny (*Lysimachia nummularia*) Also called Moneywort and Creeping Charlie. Rapidly spreading ground cover mounding 4 to 8 inches high. Smooth, rounded, bright-green leaves and numerous, fragrant, bright-yellow flowers throughout summer. Sun to part-sun. Moist to wet soil. Tolerates

some shade. Good in moist woodlands and pond and stream edges. **Zone 3 N** (Image courtesy of Jim Robbins, NC State Extension, CC BY-NC-ND 4.0)



Creeping Phlox (*Phlox stolonifera*) Grows to 8 inches. Low, spreading plant forms dense ground cover. Profuse, fragrant, early spring flowers in shades of white, blue and pink. Part-sun to shade. Moist, well-drained soil. Good in woodland settings and semi-shaded areas. **Zone 3** (Image courtesy of Chris Kreussling, NC State Extension, CC BY-NC-ND 2.0)



Crown Vetch (*Coronilla varia*) Grows to 2 feet and spreads vigorously. Tangled, sprawling vines with small, pea-like foliage and masses of white to pink clusters of flowers that bloom all summer. Good for erosion control on banks and in large areas. Very aggressive. Sun to part-sun. Well-

drained soil. Tolerates poor, dry soil. **Zone 3** (Image courtesy of Strobilomyces, NC State Extension, CC BY-SA 3.0)



Culver's Root (*Veronicastrum virginicum*) Grows 3 to 7 feet with handsome whorls of slender leaves and long spikes of tiny, white to pink to blue, tube-like flowers in late summer. May be slow to establish. Good for moist meadows and woods. Sun to part-sun. Moist soil. **Zone 3 N** (Image courtesy of Joshua Mayer, NC State Extension, CC BY-SA 4.0)



Cushion Spurge (*Euphorbia epithymoides*) Grows 12 to 18 inches. Long-lived, spreading clumps form a dense mound. Dark-green leaves are somewhat fleshy and turn red in fall. Covered with bright-yellow flowers in spring and summer. (Milky sap from stems can cause irritation in sensitive people.) Easy to grow. No maintenance. Full sun. Any well-drained soil. Tolerates dry soil. **Zone 3** (Image

courtesy of Anja Jonsson, NC State Extension, CC BY-NC 2.0)



Daisy (*Chrysanthemum X superbum* & *C. rubellum*) Many species and varieties of daisies are available but these (Shasta Daisy and Hybrid Red Chrysanthemum) are best suited to the natural planting. Both are vigorous and spreading. Both do best in full sun and rich, moist soil. *C. rubellum* is

compact and branching, grows 2 to 3 feet and has masses of large, fragrant, pink to red, daisy-like flowers in late summer. Tolerates

some shade. Hardy to **Zone 5**. Shasta Daisy is available in several varieties. Most grow 2 to 3 feet ('Little Princess' grows to only 12 inches) with deepgreen foliage and large, white, daisy-like flowers. Prefer well-drained soil. **Zone 4** (Image courtesy of Forest and Kim Starr, NC State Extension, CC BY 3.0)



Daylily (*Hemerocallis sp.*) Many, many varieties available. Heights vary from 15 inches to 4 feet. Long, narrow, lily-like leaves form large clumps. Large, fragrant, lily-like flowers in many shades of white, yellow, orange, pink and red. Bloom for long periods during the summer. Hardy and easy to grow. Good for naturalizing. Sun to part-sun. Moist, well-drained soil. Heat and drought tolerant. Also tolerates wet soil.

Zone 3 (Image courtesy of Carl Lewis, NC State Extension, CC BY 2.0)



Evening Primrose (*Oenothera sp.*) Also called Sundrops. Several species available. Spreading, somewhat shrubby plants, growing 6 inches to 2 feet. Smaller varieties can be useful as ground covers. Profuse, bright-yellow (some white to pink) flowers throughout summer. Sun to part-sun. Well-drained soil (some do best in poor/sandy/dry

soil). **Zones 4 to 5N** (Image courtesy of Andreas Rockstein, NC State Extension CC BY-SA 4)



False Lupine (*Thermopsis caroliniana & lanceolata*) Grows 2 to 4 feet and resembles a sprawling lupine. Attractive, blue-green foliage and tall spikes of yellow flowers in summer. Easy to grow and longlived. Good in natural plantings. Sun to part-sun. Moist soil. Tolerates drought. **Zone 3** (Image courtesy of Bob Gutowski, NC State Extension, CC BY-SA 2.0)



False Sunflower (*Heliopsis scabra*) Grows to 3 feet. A showy, informal plant with golden sunflower-like flowers in summer. Easy to grow. Good in natural plantings. Sun to part-sun. Moist soil. Tolerates some drought and poor soil. **Zone 3** (Image courtesy of Debbie Roos, NC State Extension, CC BY 2.0)



Fleabane (*Erigeron speciosus*) Varieties are cultivated from native species. Grows 2 to 3 feet. A sturdy plant good for natural plantings. Clusters of large, pink to purple, daisy-like flowers in summer. Sun best. Tolerates some part-sun. Sandy, well-drained, poor soil. **Zone 4 N** (Image courtesy of JJ Harrison, NC State Extension, CC BY-SA 3.0)



Foamflower (*Tiarella sp.*) Forms clumps 6 to 12 inches high with low, broad leaves, either lobed or heart-shaped. Leaves turn bronze in fall. Some are slow-growing; others rapid. Profuse airy, white to pink flowers on long stalks in late spring to summer. Part-sun to shade. Moist, rich soil. Tolerates wet. Low-maintenance ground cover for woodland areas. **Zone 4 N** (Image courtesy of Lindley Ashline, NC State Extension, CC BY-NC 2.0)



Forget-Me-Not (*Myosotis sp.*) Native and non-native species available. A somewhat short-lived perennial but will self-seed and become well-established if given the right conditions. Form clumps 6 to 18 inches high with many, small, clear-blue flowers in early spring to summer. Sun to part-sun. Moist soil. Some do well with more shade and moisture, Good in woodland settings. **Zone 3 (N)** (Image courtesy of Bernard Dupont, NC State Extension, CC BY-SA 2.0)



Germander (*Teucrium chamaedrys*) Standard and dwarf varieties are available. The standard is shrubby and compact and grows 1 to 2 feet tall. The dwarf grows 6 to 10 inches tall and spreads to 3 feet, making a good ground cover. Both are aromatic and have shiny, green leaves and small, pinkish purple flowers late in summer. Full sun best but tolerates some shade. Any well-drained soil. **Zone 5** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Globeflower (*Trollius sp.*) Several species and varieties available. Grows 1 to 3 feet with large, white to yellow to orange, buttercup-like flowers on stems above the mounded leaves. Bloom in spring or summer. Vigorous. Sun to part-sun. Moist to wet, cool soil. Do well in semi-shaded, boggy areas and pond edges. **Zone 3** (Image courtesy of W.D. and Dolphia Bransford, Lady Bird Johnson Wildflower Center)



Globe Thistle (*Echinops ritro*) Grows 2 to 4 feet. Coarsely divided leaves are whitish underneath. Large, ball-shaped, steely-lavender-blue flower heads on long stems in late summer. Easy to grow. Full sun. Dry soil. Tolerates drought. **Zone 3** (Image courtesy of Acabashi, NC State Extension, CC BY-SA 4.0)



Goat's Beard (*Aruncus sp.*) Shrub-like perennials, forming large clumps over time, but not invasive. Both standard and dwarf species available. Standard grows to 5 feet with 2 to 3 foot compound leaves and large, feathery, creamy-white plumes of flowers in summer. Dwarf form grows to 12 inches with deeply cut leaves and creamy flowers. Sun to part-sun. Moist soil. **Zone 4 N** (Image courtesy of Jerzy Opiola, North Carolina Extension, CC BY-SA 4.0)



Goldenrod (*Solidago sp.*) Several varieties available. Grow 2 to 4 feet with varying forms and foliage. Bright golden-yellow clusters or plumes of flowers in late summer and fall. Vigorous plants; some can become invasive. Good in natural plantings. Good for butterflies and bees. Do not cause hayfever. Full sun. Moist, well-drained soil. Tolerate

dry soil. **Zone 3 N** (Image courtesy of Liz West, NC State Extension, CC BY 4.0)



Heather (*Calluna sp.*) Check hardiness before using this one. In an appropriate, protected spot, this can be a good ground cover. Evergreen, spreading mound with tiny, sharp, needle-like leaves and lots of tiny white to purple flowers in summer to fall. Full sun. Moist, well-drained, peaty, acid soil. May tolerate dry soil. May need winter protection.

Zone 4 (Image courtesy of John Haslam, NC State

Extension, CC BY 2.0)



Helen's Flower (*Helenium autumnale & bigelovii*) Also called Sneezeweed. Varieties developed from native species. Adaptable, sturdy and informal. Good in natural plantings. Grows 3 to 5 feet in clumps with narrow leaves and numerous, showy, daisy-like flowers in yellow to bronze. Blooms late summer to fall. Full sun. Moist soil. Tolerates

wet soils. **Zone 3 (N)** (Image courtesy of Melissa McMasters, NC State Extension, CC BY 2.0)



Horehound (*Marrubium vulgare*) A bushy, erect herb growing 1 to 2 feet high. Vigorous and spreading. Crinkled, woolly, highly aromatic, grayish-green leaves and small, white flowers close to the stem. Not native but has become naturalized in many areas. Full sun. Any well-drained soil. Does well in poor, dry, sandy soil. Can be used as a tall

ground cover. **Zone 3** (Image courtesy of Harry Rose, NC State Extension Plant Toolbox, CC BY 2.0)



Hosta (*Hosta sp.*) Also called Plaintain Lily. Many species and varieties available. Grow 6 inches to 3 feet. Lush, leafy plants slowly spreading in clumps. Foliage comes in all shades of green with many variegated forms. Flowers are white to purple in clusters on very short or very long stalks. Bloom in summer. Easy to grow. Many uses, from hedges to ground covers to fillers under trees and shrubs. Sun to shade; do best in part-sun to shade. Moist soil. **Zone 3** (Image courtesy of Kathleen Moore, NC State Extension, CC BY 2.0)



Hyssop (*Hyssop officinalis*) Beautiful, semi-bushy, aromatic herb growing 2 to 3 feet with small, shiny, dark-green leaves and long spikes of profuse, fragrant, tiny, blue flowers late summer to fall. Attracts bees and butterflies. Reseeds vigorously. Sun to part-sun. Moist, well-drained soil. **Zone 3** (image courtesy of Lotus Johnson, NC State Extension, CC BY-NC 2.0)



Iris (*Iris sp.*) Several species and varieties available. Grow 3 inches to 4 feet in height, depending on the variety. Plants spread by rhizomes and have long, slender, sword-like leaves and unique, showy flowers, ranging from white to yellow, pink, bronze, purple and blue. Some are highly fragrant. Flowers occur late spring to summer. Sun to part-sun. Most prefer moist, well-drained soil and tolerate some drought. Some require more moisture. Look for easy-care varieties. Some are native. **Zones 3 to 5 (N)** (Image courtesy of Pam Williams, Lady Bird Johnson Wildflower Center)



Jacob's Ladder (*Polemonium caeruleum & reptans*) Also called Greek Valerian. Grows 1 to 3 feet. *P. caeruleum* is larger and forms clumps while *P. reptans* is smaller and spreads to form a ground cover. Delicate, light-green, fern-like foliage and loose clusters of white, blue or purple flowers in late spring to summer. Part-sun. Prefers cool, moist soil, some wet. Good at woodland edges. *P. reptans* is native to New England. **Zone 3 (N)** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Jewelweed (*Impatiens capensis*) Also called Touch-Me-Not. This is a native plant that may not be available at nurseries but can be spread by seed and occurs naturally in moist to wet, shaded locations. It grows 2 to 5 feet with light-green succulent stems and leaves like cultivated *Impatiens*.

Spotted orange flowers hang on slender stems beneath the leaves. Blooms in summer. Ripe seedpods pop open when touched. Part-sun to shade. Moist to wet soil. **Zone 3 N** (Image courtesy of James L. Reveal, Lady Bird Johnson Wildflower Center)



Joe-Pye Weed (*Eupatorium purpureum*) Grows 4 to 7 feet. Vigorous, spreading into large clumps. A large plant with large, coarse, vanilla-scented leaves and large, showy clusters of dull pink to purple flowers in late summer and fall. Sun to part-sun. Moist to wet soil. Good in wet, natural plantings. **Zone 3 N** (Image courtesy of John Hixson, Lady Bird Johnson Wildflower Center)



Lady's Mantle (*Alchemilla mollis*) Other species and varieties are available but this one is probably best for a natural planting. Grows 12 to 18 inches and forms large, mounded, spreading clumps. Useful as a ground cover. Large, rounded, semi-lobed, gray-green leaves and masses of small, bright, yellow, star-shaped flowers that

bloom in early summer. Sun to part-sun. Moist, well-drained soil.

Zone 3 (Image courtesy of Kingsbrae Garden, NC State Extension, CC BY-NC-SA 2.0)



Lamb's Ears (*Stachys byzantina* & *officinalis*) Also called Betony or Woundwort. Several varieties with differing shades of foliage and flowers or no flowers. Grows 8 to 20 inches depending, on variety. All have large, soft, velvety, gray, silver to green foliage. Spread to form clumps or mats. Some varieties make good ground covers.

Some are non-blooming, others have spikes of small pink to purple flowers. Sun to part-sun. Moist, well-drained soil. Tolerates some shade if soil is on the dry side. **Zone 4** (Image courtesy of Carl Lewis, NC State Extension, CC BY 2.0)



Lamium (*Lamium galeobdolon* or *Galeobdolon luteum*) Also called Yellow Archangel and Golden Deadnettle. Grows 1 to 2 feet high and spreads. Striking silver splashes on foliage and dense clusters of yellow flowers in spring. Useful as a ground cover and for naturalizing in difficult shady areas. Can be invasive. Part-sun to shade.

Any well-drained soil. **Zone 3** (Image courtesy of Ben Sale, NC State Extension, CC BY-NC-ND 2.0)



Lamium (*Lamium maculatum*) Also called Spotted Deadnettle. Several varieties. Grows 4 to 12 inches. Vigorous, spreading ground cover forms a leafy mat. Can be invasive. Sturdy and easy to grow. Variegated foliage with clusters of small, snapdragon-like, white, pink or purple flowers in spring. Part sun to shade. Any well-drained soil. Tolerates some drought. Good shady ground cover. **Zone 3** (Image courtesy of M Albi, NC State Extension, CC BY-SA 2.0)



Lavender (*Lavandula angustifolia*) Grows 1 to 2 feet. A bushy, evergreen perennial with narrow, graygreen, fragrant foliage and spikes of fragrant, purple flowers in summer. Leaves and flowers used for their fragrance. Full sun. Moist, rich, well-drained soil. Tolerates sandy soil. **Zone 5** (Image courtesy of Aneo, NC State Extension, CC BY-SA 2.0)



Lemon Balm (*Melissa officianalis*) Bushy herb grows 2 to 3 feet high and spreads by seed and underground. Deeply-veined, heart-shaped, shiny, light-green, lemon-scented leaves and small, white flowers throughout summer. Used for teas and fragrances. Easy to grow. Attracts honeybees. Sun to part-sun. Rich, well-drained soil. **Zone 4** (Image courtesy of Will Lewis, NC State Extension, CC BY 4.0)



Ligularia (*Ligularia sp.*) Grows 3 to 5 feet with large, decorative, toothed or deeply cut leaves up to 20 inches wide and loose clusters or tall spikes of yellow or orange daisy-like flowers in summer. Large, dramatic plants. In some, the undersides of the leaves are bronze or purple and some have black or purple stems. Need moist, cool locations. Do well near bogs, streams and ponds. Part-sun to shade. Rich, moist soil. Tolerates wet soil. **Zone 4** (Image courtesy of NC State Extension)



Lily (*Lilium sp.*) Many species and varieties available. Grow 2 to 4 feet tall. Look for longlived, easy-care (i.e., ones that do not need staking or need to be divided regularly) varieties. Some are spreading and can fill in areas nicely, coming up through grass and weeds. Turk's Cap Lily is good for naturalizing. Flowers are typical lily flowers in a wide variety of colors and shapes. Many are fragrant. Bloom summer to fall. Sun to part-sun. Moist, well-drained soil. **Zones 3 to 5** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Lily of the Valley (*Convallaria majalis*) Grows 6 to 12 inches with 8 inch long, deep-green leaves and extremely fragrant, bell-shaped, white flowers hanging along the stems. Blooms in spring. Spreads underground to form a ground cover in cool, moist, shaded areas. Good in woodland settings. Part-sun to shade. Moist soil. **Zone 3** (Image courtesy of James C. Baugh, Lady Bird Johnson Wildflower Center)



Lily-turf (*Liriope spicata*) Rapidly-spreading, grass-like lily. Grows 8 to 18 inches in mounds. Deepgreen foliage is evergreen and may need winter protection from ice. Clusters or spikes of light-purple flowers in summer, followed by black berries. Easy ground cover. Holds well on slopes. Sun to shade. Tolerates a variety of soils; best if well-drained. Tolerates poor soil and drought and wet soil. **Zone 4** (Image courtesy of NC State Extension)



Loosestrife (*Lysimachia punctata and clethroides*) Yellow Loosestrife and Gooseneck Loosestrife. *NOT* to be confused with Purple Loosestrife (*Lythrum salicaria*) which is very invasive and of no ecological value here. The *Lysimachia* loosestrifes are both native and non-native. They are spreading but not invasive. Good for woodland or naturalized plantings. Grow 1 to 3 feet. Yellow Loosestrife has bright-yellow flowers on an upright, leafy stem while Gooseneck Loosestrife has graceful, arching spikes of white flowers above the leafy stem. Bloom in summer over a long period. Sun to part-sun. Dry to wet soil. Best in part-sun and moist soil. **Zone 3 (N)** (Image courtesy of NC State Extension)



Lungwort (*Pulmonaria sp.*) Several varieties available, varying in flower color and leaf variegation. Grow 9 to 18 inches in spreading clumps. A good ground cover in cool, moist areas. Lush foliage is green and speckled with white or silver in most varieties. Loose clusters of white, pink, blue or purple flowers open in early spring with or

before the foliage. Part-sun. Moist to wet, well-drained soil. **Zone 3**
(Image courtesy of Cathy Dewitt, NC State Extension, CC BY 4.0)



Lupine (*Lupinus perennis*) Wild Lupine. Cultivated hybrids are also available but not as long-lived unless very well established. Wild forms will reseed in natural settings. Vigorous plants grow 1 to 2 feet (hybrids somewhat taller). Form attractive mounds of interesting, palmately lobed leaves with tall, upright spikes of blue, pink, red, white or yellow flowers. True wild lupine usually occurs in blue but other colors have been developed. Sun to part-sun. Acid, well-drained soil best. Tolerates poor, dry

conditions once established. **Zone 4 N** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Mallow (*Malva sp.*) Several species and varieties available. Grows 2 to 4 feet. An informal, free-flowering, somewhat shrubby plant. Deeply lobed to feathery foliage and clusters of large white to pink flowers throughout summer into fall. Good for naturalizing; self-seeds readily and forms large patches. Full sun. Dry, alkaline soil.

Tolerates drought. Not native but has become naturalized. **Zone 4**
(Image courtesy of Michael Wunderli, NC State Extension, CC BY 2.0)



Meadow Rue (*Thalictrum sp.*) Several species and varieties, native and non-native. Graceful plant with airy, fern-like foliage and loose clusters of delicate flowers with a fluffy appearance in spring and summer. Grows 3 to 5 feet. Forms loose clumps. Foliage ranges from light-green to bluish-green and flowers range from white to yellow to light-purple. Good at edges of woods and water. Sun to part-sun. Some varieties do best in part-sun. Rich, moist soil. Some tolerate wet soil. **Zones 3 to 5 (N)** (Image courtesy of R.W Smith, Lady Bird Johnson Wildflower Center)



Meadowsweet (*Filipendula sp.*) Several species are available, differing in flower color and tolerance of dry soil. Grow 2 to 6 feet. Easy to grow, require little care as long as there is plenty of moisture. Good in natural settings. Attractive, divided leaves; some fern-like. Masses of white, pink or red, fluffy flower clusters in summer. Sun to part-sun. Moist to wet soil. Does *not* like acidic soil. **Zone 4** (Image courtesy of R.W Smith, Lady Bird Johnson Wildflower Center)



Milkweed (*Asclepias incarnata*) Also called Swamp Milkweed. Vigorous, upright plant with narrow foliage and fragrant, white or pink flowers that attract butterflies. Grows 3 to 4 feet and blooms in summer. Easy to grow. Interesting seedpods. Spreads easily by seed. Good for naturalizing wet areas. Full sun. Dry to wet soil. **Zone 3 N** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Mint (*Mentha sp.*) Many species available. Spreading, aromatic herbs with small white to pink to purple flowers. Some species are invasive. Many make good ground covers. Upright plants grow 1 to 3 feet tall with branching stems and dark-green, deeply veined leaves (Pennyroyal, *M. pulegium*, has creeping stems). They flower in summer, with tiny flowers either close to the stem or in spikes at the tips of the stems. Many are native; many are not. Sun to part-sun. Rich, moist, slightly acidic soil. Many are found naturally near water and in wet places. **Zones 3**

to 5 (N) (Image courtesy of R.W Smith, Lady Bird Johnson Wildflower Center)



Moss Phlox (*Phlox subulata*) Also called Moss Pink. Grows 4 to 9 inches high in a spreading mat or mound. Makes a good ground cover in sunny, well-drained areas. Short, needle-like leaves and masses of blue, white or pink flowers in spring. Sun to part-sun. Sandy, well-drained soil best.

Zone 3 (N) (Image courtesy of R.W Smith, Lady Bird Johnson Wildflower Center)



Obedient Plant (*Physostegia virginiana*) Slender, upright plant grows 2 to 4 feet high and spreads rapidly. Good in natural settings where it can spread but can be very aggressive. A dwarf form is available which only grows to 18 inches. Varieties that spread less vigorously also have been developed. Narrow, coarse leaves and long spikes of showy, white, pink or purple flowers in late summer. Sun to part-sun.

Acidic, moist soil. Tolerates wet soil. **Zone 3 N** (Image courtesy of Dan Mullen, NC State Extension, CC BY-NC-ND 2.0)



Oregano (*Origanum vulgare*) Grows to 18 inches in a spreading, trailing mat. Small, highly aromatic leaves and clusters of tiny white to purple flowers in summer. Plant parts used as flavoring in cooking. Good ground cover for small areas. Full sun. Well-drained, non-acidic soil best. **Zone 3** (Image courtesy of Peter O'Connor, NC State Extension, CC BY-SA 2.0)



Pachysandra (*Pachysandra terminalis*) Also called Japanese Spurge. Several varieties available, differing in color of leaves and growth habit. Grows 6 to 12 inches and spreads underground. Glossy, green leaves, some variegated and spikes of white flowers in late spring. An excellent ground cover for shaded areas. Part-sun to shade. Moist, well-drained soil. Best with high organic matter.

Zone 4 (Image courtesy of Carl Lewis, NC State Extension, CC BY-SA 2.0)



Pearly Everlasting (*Anaphalis margaritacea*) Other cultivated species are available. Slender plant grows to 2 feet with narrow, gray-green, woolly leaves and masses of small, white flowers in late summer. Flowers used for drying. Native and extremely drought tolerant. Full sun.

Moist to dry soil. **Zone 3 N** (Image courtesy of NC State Extension)



Periwinkle (*Vinca minor*) Also called Myrtle. Several varieties available with different flower colors and growth heights. The standard species is the hardiest. A trailing, spreading, evergreen plant growing to 10 inches high with glossy, dark-green leaves and white, blue or lavender flowers in spring.

An excellent, hardy, long-lived ground cover that has become naturalized in our area. Sun to shade. Moist, well-drained soil. Does not do well in drought. **Zone 4** (Image courtesy of Ryan Kaldari, NC State Extension)



Phlox (*Phlox paniculata*) Also called Garden Phlox. There are other species and varieties of Phlox that also would do well in natural plantings (Wild Sweet William *P. maculata* & Woodland Phlox *P. divaricata*). Grows 2 to 4 feet in large clumps. Large, pyramid-shaped clusters of extremely fragrant flowers in many shades of white, pink, lilac and red. Summer-blooming. Full sun. Moist, rich soil. Has become naturalized in our area. **Zone 3**

(Image courtesy of Debbie Roos, NC State Extension)



Potentilla (*Potentilla sp.*) Also called Cinquefoil. Several varieties and species; some spreading and some not. Look for ones that make good ground covers. Easy to grow. Grow from 3 to 18 inches, either erect or sprawling, depending on variety. Three to five-lobed foliage may be semi-evergreen and is often woolly. Bright flowers in spring or summer are red, apricot or yellow. A good choice is *P. tabernaemontani*. It forms a 6 to 9 inch high, spreading, evergreen mat with yellow spring flowers.

Sun to part-sun. Tolerates a variety of soils. Light, sandy soil best.

Zone 5 (Image courtesy of Phillip Bouchard, NC State Extension, CC BY-NC-ND 2.0)



Pussy-toes (*Antennaria dioica*) Low, 1 inch high, gray-green or silver basal leaves and 3 to 8 inch flower stalks. Rapidly spreads to form a mat. Clusters of small, white or pink, fuzzy flowers on stalks in spring. Makes a good ground cover in sunny, dry, poor areas where little else will grow. Full sun. Dry soil.

Zone 3 (N) (Image courtesy of Julie Makin, Lady

Bird Johnson Wildflower Center)



Sage (*Salvia sp.*) Several species and varieties available with different growth habits and soil requirements. Look for ones that do not require winter mulching or other special care. Several are tolerant of heat and drought. Grow from 1 to 4 feet depending on variety. Dark-green, blue-green or gray-green, aromatic leaves and spikes of pink to purple flowers in summer or fall. Form slowly spreading clumps. Full sun. Moist to dry, well-drained, acid soil best. Some are drought tolerant. **Zones 3 to 5**
(Image courtesy of Lucy Bradley, NC State Extension)



Sedum (*Sedum sp.*) Also called Stonecrop. Many species and varieties available, differing in growth height and flower color. Easy to grow; many spreading to form mounds or ground covers. Grow from 2 to 24 inches with succulent leaves and profuse clusters of white, pink, red or yellow flowers. Bloom time varies from spring to summer with many having long bloom times lasting into fall. Attract butterflies. Full sun best but some tolerate part-sun. Most prefer fertile, well-drained soil but many tolerate poor, dry soil and many tolerate drought and heat. Good ground covers for sunny, rocky or sandy areas. **Zone 3** (Image courtesy of Patrick Standish, NC State Extension, CC BY-SA 2.0)



Skullcap (*Scutellaria sp.*) Several species; some native and some not. Grows 1 to 2 feet and spreads. Slender plant with bright-green leaves and numerous, small, deep-blue flowers sometimes in spikes and sometimes close to the stem. Bloom summer to fall. Part-sun. Rich, moist to wet soil. **Zone 4**



Snow-in-Summer (*Cerastium tomentosum*) Grows 6 to 8 inches in spreading mounds. Easy to grow; spreads quickly. Small, silvery leaves and masses of small, white flowers in late spring and summer. Full sun. Must have well-drained soil. Some varieties grow in pure sand. **Zone 3** (Image courtesy of Phil Sellens, NC State Extension, CC BY 2.0)



Snow-on-the-Mountain (*Aegopodium podagraria*) Also called Bishop's Weed. A leafy ground cover. Grows 8 to 18 inches high with variegated green and white leaves. Spreads rapidly - very aggressive. Small, white flowers in clusters on long stalks in early summer. Grows well where nothing else will grow. Has become naturalized in some areas. Sun to shade. Wet to dry, rich to poor soil. **Zone 3** (Image courtesy of Manu, NC State Extension, CC BY-SA 2.0)



Solidaster (*Solidaster luteus*) A cross between aster and goldenrod. Grows 18 to 30 inches. Large, bushy plants with small, narrow leaves and masses of small, yellow, daisy-like flowers in summer. Good for naturalizing. Full sun. Moist, well-drained soil. **Zone 5**



Solomon's Seal (*Polygonatum sp.*) Three species available, varying in height from 18 inches to 7 feet. Some are native. Handsome plants with lily-like leaves along an arching stem and white, bell-shaped flowers hanging below leaves in late spring. Some are fragrant. Excellent in woodland settings. Spread underground. Part-sun to shade. Moist, acid soil. Tolerates wet. Shady, damp woods best. **Zone 3** (Image courtesy of W. Plynn, NC State Extension, CC BY-NC-ND 4.0)



Sunflower Heliopsis (*Heliopsis helianthoides*) Also called False Sunflower and Oxeye. Several varieties available. Grows 3 to 6 feet. Low-maintenance, hardy plants form clumps but do not spread. Coarse, dark-green leaves and showy, yellow to gold, sunflower-like flowers (2 to 3 inches across) summer to fall. Good in natural plantings. Full sun. Moist, well-

drained soil best but tolerates drought and poor soils. Native to northern midwest. **Zone 3** (Image courtesy of Joshua Mayer, NC State Extension, CC BY 2.0)



Sweet Flag (*Acorus calamus*) This is a native plant that may not be easy to find at nurseries but would make a valuable addition to a shoreline, wet area planting. It grows 1 to 4 feet tall with long, sword-like leaves and a dense spike of small, tightly-packed, greenish-yellow flowers along the stem. Full to part sun. Wet soil. Does well on stream and pond edges.

Zone 3 N (Image courtesy of Giles Watson, NC State Extension, CC BY-SA 2.0)



Sweet Woodruff (*Galium odoratum* or *Asperula odorata*) Grows 9 to 12 inches and spreads rapidly. Small, fragrant, glossy-green leaves in whorls around the slender, many-branched stems. Loose clusters of small, white, star-shaped, fragrant flowers in spring and summer. Makes a good ground

cover in moist, shady areas. Part-sun to shade. Moist, well-drained soil. **Zone 4** (Image courtesy of Dan Mullen, NC State Extension, CC BY-NC-ND 4.0)



Tansy (*Tanacetum vulgare*) Vigorous, spreading plants grow to 3 feet with highly aromatic, fern-like foliage and bright-yellow, button-like flowers in late summer. Good for naturalizing sunny areas. Related to a native species. Has become naturalized in many areas. Full sun best. Tolerates

partsun. Any well-drained soil. **Zone 3** (Image courtesy of Joe Thomissen, NC State Extension, CC BY-NC-ND 4.0)



Thin-leaved Sunflower (*Helianthus decapetalus*) Vigorous, spreading, native, sunflower-like plant. Grows 3 to 5 feet high with large, coarse leaves and large, yellow sunflower-like flowers in late summer. Good for natural plantings. Full sun. Moist, well-drained soil. **Zone 3 N** (Image courtesy of H, Zell, NC State Extension, CC BY-SA 3.0)



Thyme (*Thymus sp.*) Several varieties of low, spreading, aromatic herbs. Grow 2 to 12 inches, depending on variety. Small, shiny leaves and masses of tiny rose to purple clusters of flowers in spring or summer. Good ground covers for sunny, dryish areas. Some varieties tolerate high traffic. Best in full sun and well-drained, acid

soil. Tolerates part-sun. **Zone 4** (Image courtesy of Bjorn S., NC State Extension, CC BY-SA 2.0)



Tickseed (*Coreopsis sp.*) Several species and varieties available; some native to the Midwest and naturalized here. Reliable and easy to grow. Some are spreading and some are drought resistant. Grow 8 to 36 inches. Have lobed to fern-like to thread-like, well-branched foliage and masses of brilliant to soft yellow to orange to pink

daisy-like flowers in spring and summer. Most are long-blooming. Full sun. Moist, well-drained soil. Some tolerate drought. Good in natural plantings. **Zone 3 (N)** (Image courtesy of Cathy Dewitt, NC State Extension, CC BY-SA 4.0)



Turtlehead (*Chelone sp.*) *Chelone glabra* (white turtlehead) is native; *C. lyonii* & *obliqua* are not. Grow 2 to 4 feet high with coarse, dark-green leaves and long-blooming spikes of snapdragon-like flowers in white to pink to red. Bloom summer to

fall. Spread to form patches. Found in wet areas along streams and lakes. Full to part-sun. Rich, acidic, moist to wet soil. **Zone 4 (N)**
(Image courtesy of R.A. Nonenmacher, NC State Extension, CC BY-SA 4.0)



State Extension, CC BY 2.0)

Valerian (*Centranthus sp.* or *Valeriana sp.*) Vigorous, bushy plants growing 2 to 3 feet high with green to blue-green leaves and showy clusters of small, fragrant, white to deep-red flowers in summer. Spreads by self seeding. Full to part-sun. Poor, moist, well-drained soil. Does not like acidic soil. **Zone 4** (Image courtesy of Michael Pierce, NC



small flowers in shades of white, pink, purple and blue. Many bloom from spring to fall. Full to part-sun. Moist, well-drained soil. Nice, versatile plant. **Zones 3 to 5** (Image courtesy of Terry Glase, Lady Bird Johnson Wildflower Center)

Veronica (*Veronica sp.*) Also called Speedwell. Many species and varieties available. Reliable, hardy, easy to grow. Grow from 6 to 24 inches; many form clumps; many good as ground covers. Foliage is usually dense and ranges from silvery-gray to glossy, dark-green. Flowers occur in clusters or spikes of numerous



settings. Full to part-sun. Moist, fertile, well-drained soil. Spread best in semi-shaded locations. Good ground cover. **Zones 3 to 5 (N)**
(Image courtesy of Melanie Shaw, NC State Extension, CC BY-ND 2.0)

Violet (*Viola sp.*) Many species and varieties available; some are native. Grow 3 to 12 inches and spread under proper conditions. Bright-green, heart-shaped, oval or divided leaves and numerous, unique flowers in spring. Occur in many colors; some bicolor; many fragrant. Good in moist, woodland



Virginia Bluebells (*Mertensia virginica & siberica*) Easy to grow, woodland plant. Clump-forming plants grow 1 to 2 feet high with delicate, gray-green leaves and drooping clusters of sky-blue, bell-shaped flowers. Some die back after blooming so need to be planted with plants that will fill in the area through the summer. Part-sun to shade. Rich, moist soil.

Zone 3 (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



White Clover (*Trifolium repens*) New Zealand is best variety for durability. Hardy and long-lived; spreads quickly once established. Grows to 8 inches with typical, 3-lobed leaves and small, white blossoms in summer. Good in steep areas and areas with high foot-traffic. Sun to partsun. Moist soil. Tolerates heavy clay soils, heat and excessive moisture. Does not do as well in sand.

Zone 3 (Image courtesy of Cathy Dewitt, NC State Extension, CC BY 4.0)



Wild Ginger (*Asarum sp.*) Native and non-native species available. Should not be collected from the wild. Found in moist, rich woods. Grows 4 to 8 inches high with large, glossy, heart-shaped leaves and a single, inconspicuous, reddish-brown cup-shaped flower close to the ground. Grown mostly for its leaves as a woodland ground

cover. Spreads underground. May need protection from competition until established. Part-sun to shade. Rich, moist, well-drained soil.

Zones 3 to 4 (N) (Image courtesy of Bruce Kirchoff, NC State Extension, CC BY 2.0)



Wintergreen (*Gaultheria procumbens*) Also called Checkerberry. Low, native, evergreen, slow-creeping ground cover. Grows 3 to 6 inches. Small, glossy, bright-green, wintergreen-tasting leaves; small, white to pink, bell-shaped flowers in spring, followed by wintergreen-tasting red berries that

persist into winter. Leaves turn red in fall. Good in woodland settings. Part-sun to shade. Moist, acid, sandy or peaty soil best. **Zone 3 N**
 (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Yarrow (*Achillea sp.*) Several species and varieties available; some native, some not. Grow 6 to 36 inches with fragrant, fern-like foliage. Taller varieties better for natural plantings. Easy to grow, forming large clumps. Numerous, small flowers in showy, rounded or flat-topped clusters ranging in color from white to shades of yellow, pink and red. Full sun. Well-drained soil. Drought tolerant. **Zone 3 (N)** (Image courtesy of Alan

Cressler, Lady Bird Johnson Wildflower Center)

10a,b,c) FERNS, GRASSES & VINES

FERNS, GRASSES & VINES

Plant Name	Zone	Sun	Part Sun	Shade	Wet	Moist	Dry	G/C
Ferns								
Christmas Fern	3		X	X		X		
Cinnamon Fern	3	X	X	X	X	X		
Hay-scented Fern	3		X	X		X	X	X
Interrupted Fern	4		X	X	X	X		
Lady Fern	4		X	X		X		
Ostrich Fern	3		X	X	X	X		
Royal Fern	3	X	X	X	X	X		
Sensitive Fern	3	X	X	X	X	X		
Grasses								
Bulrushes	3 to 4	X	X		X			
Bur-Reed	3	X	X		X			
Big Bluestem	3	X				X	X	X
European Dunegrass	4	X					X	X
Manna Grass	3	X			X			X
Reed Grass	3	X			X	X		
Ribbon Grass	4	X	X		X	X		X
Switch Grass	3 to 5	X				X	X	X
Vines								
Boston Ivy	4	X	X			X	X	X
English Ivy	4	X	X	X		X	X	X
Sweet Pea	3	X	X			X	X	X
Virginia Creeper	3	X	X	X		X	X	X

See page 3, Terms & Abbreviations, for explanation of column headings

10a) FERNS



Christmas Fern (*Polystichum acrostichoides*) Grows 1 to 2 feet. Evergreen fern with once-divided, leathery, dark-green foliage. Forms large clumps, 2 to 3 feet across. Good on rocky, woodland hillsides. Part-sun to shade. Moist, well-drained soil. **Zone 3 N** (Image courtesy of Sally and Andy Wasowski, Lady Bird Johnson Wildflower Center)



Cinnamon Fern (*Osmunda cinnamomea*) Grows to 3 feet. Vigorous, spreading to form large, vase-shaped clumps. Large, doubly-divided fronds are light-green in spring and dark-green by fall. Fertile fronds are fuzzy, cinnamon-brown. Very hardy. Full sun to shade. Moist, acid, highly organic soil best.

Only tolerates full sun if plenty of moisture. **Zone 3 N** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Hay-scented Fern (*Dennstaedtia punctiloba*) Vigorously spreading fern grows to 12 inches with light green, finely-divided fronds. Foliage sweet-scented when crushed. Versatile fern grows in many soils and tolerates drought. Found in clearings and on rocky slopes. Part-sun to shade. Moist, well-drained soil.

Drought tolerant. **Zone 3 N** (Image courtesy of Kathleen Moore, NC State Extension, CC BY 2.0)



Interrupted Fern (*Osmunda claytoniana*) Grows 3 to 4 feet in large, vase-shaped clumps. Pale-green fronds not as deeply divided as Cinnamon Fern. Green, sterile portions of fronds are 'interrupted' along the stalk with brown, fertile portions. Part-sun to shade. Moist, acid soil. Good, woodland fern. **Zone 4 N** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Extension, CC BY 2.0)

Lady Fern (*Athyrium filix-femina*) One of the only ferns offered in different varieties. Grows in clumps 2 to 3 feet tall with lacy, pale-green, arching fronds. Found in moist, partly-shady areas but tolerates more sun and dry soil than most ferns. Part-sun to shade. Moist, rich soil best. **Zone 4 N** (Image courtesy of Peggy A Lopipero Langmo, NC State



Ostrich Fern (*Matteucia struthiopteris*) Known for its fiddleheads in the spring. Grows to 4 feet. Large, upright, coarse-textured fronds. Found in swamps and moist woods. Part-sun to shade. Rich, moist to wet soil. **Zone 3 N** (Image courtesy of Alan Cressler, Lady Bird Johnson Wildflower Center)



Center)

Royal Fern (*Osmunda regalis*) Beautiful, stately, vigorous fern with branching, pale to bright-green fronds, depending on the amount of light. Grows 2 to 6 feet (tallest in wet conditions). Spreads slowly. Full sun to shade. Best in part-sun to shade. Wet soils but not submerged. **Zone 3 N** (Image courtesy of Stephanie Brundage, Lady Bird Johnson Wildflower



soil. **Zone 3 N** (Image courtesy of James Garland Holmes, Lady Bird Johnson Wildflower Center)

Sensitive Fern (*Onoclea sensibilis*) Interesting fern with completely separate fertile fronds often used in dried arrangements. Grows 1 to 2 feet in moist soil. Fronds pale to deep-green and twice-divided with fertile fronds brown with persistent, bead-like spore cases along the stalk. Full sun to shade. Moist to almost wet

10b) GRASSES



Bulrushes (*Scirpus sp.*) Many species of tall (4 to 6 feet high) grass-like plants with long, narrow leaves and striking flower heads; some with dark-brown 'spikelets' and others fluffy. Found in wet areas and shallow water. Full to part-sun. Wet soil, standing water. **Zones 3 to 4 N** (Image courtesy of Stephanie Brundage, Lady Bird Johnson Wildflower Center)



Bur-Reed (*Sparganium sp.*) A family of grass-like plants growing 1 to 4 feet high in shallow water with either upright or floating stems and long, narrow leaves. Flowers are greenish-brown and followed by a bur-like ball. Full to part-sun. Wet soil, standing water. **Zone 3 N** (Image courtesy of R.W. Smith, Lady Bird Johnson

Wildflower Center)



Big Bluestem (*Andropogon gerardi*) A versatile group of grasses; this species tolerant of dry, poor conditions. Long-lived, grows 3 to 6 feet tall with lush green leaves that turn red in fall and bluish-purple stems. Flower and seed heads branch into 3 parts. Needs extra care to get established but forms excellent cover once established. A common prairie grass. Full sun. Moist to dry soil.

Tolerates poor, dry, sandy soil. **Zone 3 N** (Image courtesy of Carolyn Fannon, Lady Bird Johnson Wildflower Center)



Manna Grass (*Glyceria aquatilis*) Spreading, cultivated grass for damp areas. Grows to 3 feet with slender, arching, white and yellow variegated foliage. Native species grow in marshes, shallow water and wet areas. Full sun. Wet soil. **Zone 3** (Image courtesy of R.W. Smith, Lady Bird Johnson Wildflower Center)



Reed Grass (*Calamagrostis canadensis*) Also called Canada Bluejoint Grass. Other species and varieties are available. Grows 2 to 4 feet. A typical, upright, attractive grass. Spreads slowly to form clumps. Some varieties are more vigorous. Slender stems and flower heads. Does well in wet soil and is a good soil stabilizer. Full sun. Moist, fertile soil. Good near water. **Zone 3 N** (Image courtesy of R.W.

Smith, Lady Bird Johnson Wildflower Center)



Switch Grass (*Panicum virgatum*) Several varieties. Grows 4 to 7 feet in thick, spreading clumps. Good for wildlife and birds. Typical long, narrow leaves and decorative, feathery flower heads. Holds shape throughout winter. Needs 1 or 2 years to become established. Full sun. Tolerates poor, acid, sandy, dry soil.

Heat and drought tolerant. **Zones 3 to 5 N** (Image courtesy of Carolyn Fannon, Lady Bird Johnson Wildflower Center)

10c) VINES

Note: The vines listed here are ones that make good ground covers in particular. There are many more climbing vines that could be added to a buffer simply for variation and to add dimension. Check for ones that do not overwhelm other vegetation.



Boston Ivy (*Parthenocissus tricuspidata veitchii*) Dense, climbing or sprawling vine with maple leafshaped, glossy, dark-green leaves that turn crimson in the fall. Tolerates dry conditions once established. Sun to part-sun. Moist to dry soil. **Zone 4** (Image courtesy of J. Mark Dodd, NC State Extension, CC BY-NC-ND 2.0)



English Ivy (*Hedera helix*) Low-maintenance, dense, evergreen vine with broad, glossy, dark-green leaves. Many varieties are available. It climbs things or trails along the ground. Sun to shade. Moist to dry soil. Tolerates some drought. **Zone 4** (Image courtesy of Donald Hobern, NC State Extension, CC BY 2.0)



Sweet Pea (*Lathyrus latifolius*) Vigorous, flowering vine good on rocky slopes. Easy to grow once established. Forms a 2 to 3 foot thick mat of vegetation making it good for erosion control on poor, sandy or rocky slopes. Also good food and cover for birds and wildlife. Typical pea-like vines and leaves and long blooming, showy white to pink to red flowers. Blooms summer to fall. Sun to part-sun. Moist, well-drained soil best but tolerates poor, sandy, clayey soils. **Zone 3** (Image courtesy of Phil

Sellens NC State Extension, CC BY 2.0)



Virginia Creeper (*Parthenocissus quinquefolia*) Also called Woodbine. Rapid growth. Spreads vigorously; can be invasive. Good as ground cover over rocky slopes. Deep-green, palmately-divided leaves turn crimson in fall. Bluish, black berries in fall. Good for birds. Sun to shade. Adaptable to most soils. **Zone 3 N** (Image courtesy of Jacki

Dee, NC State Extension, CC BY-NC-ND 2.0)

11) REFERENCES USED IN COMPILING BUFFER PLANT LIST

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Appendix III - Invasive Species

Invasive species are organisms that are not native to an area and harm human health, the economy, or the environment. They can destroy the places we love and require costly solutions. In the United States, management and production losses associated with invasive species cost \$120 billion annually (Pimentel et al. 2005).

Invasive species threaten nearly every aspect of our world and are one of the greatest threats to New York's biodiversity. They cause or contribute to:

- Habitat degradation and loss
- The loss of native fish, wildlife, and tree species
- The loss of recreational opportunities and income
- Crop damage, diseases in humans, and livestock
- Risks to public safety

Invasive species come from all around the world, often through shipping containers, ballast waters from boats, and ornamental nursery stock.

Terrestrial (living on land) Invasive Species include:

- Animals, like Emerald Ash Borer and Spotted Lanternfly
- Plants, like Japanese Barberry and Giant Hogweed
- Diseases, like Oak Wilt and Chestnut Blight

Aquatic Invasive Species include:

- Animals, like Northern Snakehead Fish
- Plants, like Hydrilla and Eurasian Watermilfoil

People unknowingly spread invasive species. Follow these simple suggestions to prevent the spread of invasive species and protect the people and places you love.

Clean Play Go recommends to stop invasive species in their tracks by...

- Removing plants, animals & mud from boots, gear, pets & vehicle.
- Cleaning your gear before entering & leaving the recreation site.
- Staying on designated roads & trails.
- Using certified or local firewood & hay.

Pimentel, D., Zuniga, R. & Morrison, D. 2005, 'Update on the environmental and economic costs associated with alien-invasive species in the United States', *Biology Ecological Economics*, vol. 52, no. 3, pp. 273-288.

Basically, look for and remove seeds, plant pieces, and insects on your hair and clothing, gear and equipment, vehicles and trailers, dogs, horses and other animals. Clean off dirt/mud which could harbor unseen pests. For more information on the Clean Play Go outreach campaign, visit:

<https://www.playcleango.org/help-stop-invasive-species-with-playcleango>.

Aquatic invasive species that can be transported through recreational activities are called Aquatic Hitchhikers. Use Clean Drain Dry practices when using recreational boats, kayaks, SUP's and fishing gear.

CLEAN off visible aquatic plants, animals, and mud from all equipment before leaving water access Rinse equipment and boat hulls (with high pressure, hot water when possible. Rinse interior compartments of boats with low pressure, hot water (120°F) Flush motor with hot water (120°F) for 2 minutes (or according to owner's manual).

DRAIN motor, bilge, livewell, and other water containing devices before leaving water access.

DRY everything for at least five days OR wipe with a towel before reuse.

Dispose of debris at designated cleaning stations or waste-disposal areas. If these areas are unavailable, clean in parking lots or driveways where invasive pests are unlikely to spread. Avoid cleaning near waterways; invasive species may spread to new areas downstream.

Learn more about Clean Drain Dry at <https://stopaquaticitchhikers.org/>.

New York Invasive Species (IS) Information

- Capital Region Partnership for Regional Invasive Species Management (PRISM): www.capitalregionprism.org
- New York Invasive Species Information Clearinghouse: <http://nyis.info/>
- NYS DEC Invasive Species Regulations: <https://www.dec.ny.gov/animals/99141.html>

Invasive Species Plant Lists

The following pages contain invasive species plant ID cards with information on the identification, habitat/impact, and management of each species, as well as photos to help with ID. The species ID cards are broken into the follow categories:

- Widespread Aquatic Invasive Plants
- Emerging Aquatic Invasive Plants
- Widespread Terrestrial Invasive Plants
- Emerging Aquatic Invasive Plants

Common/Widespread Invasive Plants: These widespread invasive species have become some of the most common plants in our region. These plants crowd out native species and are generally unpalatable to herbivores, which increases their competitive advantage.

Emerging Invasive Plants: Emerging plants are species that have not established a population fully in the region, giving us a chance to stop these invaders in their tracks through eradication and rapid response efforts.

For more extensive invasive plant lists and additional information on the difference between emerging and widespread plants, visit the Capital Region PRISM webpage: www.capitalregionprism.org

Disclaimer on Invasive Species Management

Please note that neither Cornell Cooperative Extension of Saratoga County nor any representative thereof makes any representation of any warranty, express or implied, of any particular result or application of the information provided by us or regarding any product. If a product is involved it is the sole responsibility of the User to read and follow all product labeling instructions and to check with the manufacturer or supplier for the most recent information. Nothing contained in this information should be interpreted as an express or implied endorsement of any particular product or criticism of unnamed products. With respect to any information on pest management the User is responsible for obtaining the most up-to-date pest management information. The information we provide is no substitute for pesticide labeling. The User is solely responsible for reading and following manufacturer's labeling and instructions.

Definitions

- **Alternate:** One leaf per plant node, leaf direction alternates with each node.
- **Apex:** Tip of leaf.
- **Axil:** Point where leaf emerges from stem.
- **Basal:** Grows from lowest part of stem.
- **Benthic mat:** Mats installed on body of waterbody to prevent plant growth.
- **Brackish:** Mix of fresh and salt water.
- **Bract:** Specialized leaf, typically associated with reproduction, which is different color, shape, texture, etc. from other leaves.
- **Compound:** Multiple small parts (leaflets) emerging from the same leaf stem.
- **Entire:** Leaf margins are smooth.
- **Monoculture:** Single species growing in dense stand.
- **Petioles:** Stalk that attached leaf to stem.
- **Rhizome:** Continuous underground stem that sends out shoots at its nodes.
- **Sepal:** Part of flower that encloses petals, usually leaf-like.
- **Solarize:** Process of killing off plant material by exposing it to heat from sun's rays.
- **Stolons:** Continuous underground stem that forms roots at its nodes to form new plants.
- **Tubers:** Potato-like structures that form underground for energy storage and forming new plants.
- **Turbidity:** Cloudiness of water.
- **Turions:** Wintering bud that separates from plant and remains dormant in sediment until conditions are favorable.
- **Umbel:** Cluster of flowers that emerge from common point, looks like umbrella.

Widespread Aquatic Invasive Species



Identification

- **Leaves:** Long, thin, stiff leaves that curl under and have serrated edges. Opposite arrangement on highly branched stem.
- **Stems:** Reddish-brown stem up to 4 ft. long.
- **Flowers:** Small flowers emerge at leaf axil in early summer. They then develop into oblong seeds that mature by fall.

Habitat and Impacts

- Prefers calm waters and can tolerate turbidity and pollution. Can grow in depths up to 15 ft.
- Popular food source for waterfowl, which increases spread.
- Grows and spreads very quickly which allows it to outcompete native species.
- Can form dense mats that impede recreation.

Spread and Management

- Spreads by fragmentation
- Hand-pull or mechanically harvest small populations before it goes to seed. However, this can increase chance of producing fragments that can form new infestations.
- Herbicide can be effective.
- Clean, Drain, Dry!



References

1. Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org
2. Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org

Curly-leaved Pondweed

Potamogeton crispus

Potamogetonaceae

Submerged Perennial



Identification

- **Leaves:** Alternate, elongated leaves that are toothed and wavy, grow directly attached to stem and range from green to dark brown in color and are slightly translucent.
- **Stems:** Flattened, grooved stems. Yellow or red rhizomes have rooting at the nodes.
- **Flowers:** Produces small, leaf-like, brown-green flowers in spring. Reproduces using overwintering turions that appear in mid-summer.

Habitat and Impacts

- Grows in lakes and ponds. Thrives in variety of conditions, including poor water quality and low temperatures.
- Early spring emergence outcompetes native aquatic vegetation and ease of spread can impede recreation and even change water flow patterns.

Management

- Hand-pull small, shallow populations, with care to remove entire root stock. Bag and solarize all removed material.
- Benthic mats or mechanical harvesting can be effective at reducing population size.
- Herbicide can be effective.



References

3. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
4. Chris Evans, University of Illinois, Bugwood.org
5. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Eurasian Water-Milfoil

Myriophyllum spicatum

Haloragaceae

Submerged Perennial



Identification

- **Leaves:** Feather-like leaves grow in whorls of 4 around the stem. Each leaf has between 9 and 21 leaflets that collapse out of water.
- **Stem:** Stem typically lighter brown-pink color and branch off near surface. Rooted, submerged aquatic plant that grows between 3-13 feet deep.
- **Flowers:** Spikes of small reddish green flowers appear above the surface of the water between June and July.

Habitat and Impacts

- Found in lakes and ponds of varying water quality. Can be found in brackish water.
- Outcompete and displace native aquatic plants and fish communities.
- Can form dense mats that can impede recreational opportunities.

Management

- Manual and mechanical harvesting can be effective for small populations, however be careful not to generate fragments as they can start new populations.
- Herbicide can be effective.
- Clean, Drain, Dry!



References

6. Alison Fox, University of Florida, Bugwood.org
7. Graves Lovell, Alabama Department of Conservation and Natural Resources
8. Shaun Winterton, California Department of Food and Agriculture, Bugwood.org

Flowering Rush

Butomus umbellatus

Butomaceae

Wetland Perennial



Identification

- **Leaves:** Basal leaves have a triangular cross section and twist toward the tips. Can reach 3 ft. tall.
- **Stem:** Green, triangular stem is stiff when out of water and limp when submerged. Has extensive root and rhizome system.
- **Flowers:** White to pink flowers grow in an umbel, have 3 petals and 3 petal-like sepals. Bloom between June and September in shallow waters. Seeds typically non-viable.

Habitat and Impacts

- Found in fresh water marshes, wetlands, and along lake shores.
- Spreads quickly, can outcompete native wetland species, and can block shorelines for recreation.

Spread and Management

- Once introduced spreads by fragmentation and rhizomatic growth.
- Cut plant at water level multiple times throughout the growing season. Bag and dispose of all cut fragments to prevent spreading.
- Digging can be effective for small populations in areas with shallow water levels.
- Herbicide can be effective.



References

9. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
10. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
11. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
12. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Water Chestnut

Trapa natans

Lythraceae

Floating Annual



Identification

- **Leaves:** Clusters of floating, shiny, triangular leaves with toothed edges, stiff hairs, and distinct veining on the underside. Leaves float due to bulges where stem meets leaf.
- **Stems:** Rooted with flexible stem that can grow in depths up to 15 ft. Stem has submerged feathery leaves similar to Eurasian water-milfoil.
- **Fruits:** Green nuts with four sharp spines that turn black when mature, appear at center of clusters beneath the surface in late July. Nuts fall by mid-August.

Habitat and Impacts

- Found in lakes and ponds or slow moving streams.
- Dense mats block sunlight for submerged native plants and cause water temperature to rise, which impacts fish communities.
- Impedes on recreational opportunities.

Spread and Management

- Hand pulling or mechanical harvesting before seed production can reduce population size. Place removed material in bags or on land away from waterbody to solarize.
- Herbicide can be effective.



References

13. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
14. Shaun Winterton, California Department of Food and Agriculture, Bugwood.org
15. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org



Identification

- **Leaves:** Long, flat, erect leaves with sharp pointed tip. Can reach lengths up to 2 ft. long, but flowering stems are usually shorter.
- **Flowers:** Bright yellow, three sepal flowers bloom on round stalks between May and June.
- **Fruits:** Flower develops into large, green seed pod that can hold dozens of flat, round seeds.

Habitat and Impacts

- Found in wetlands and along banks of rivers, streams, ponds, and lakes.
- Rhizomes allow for dense monocultures which pushes out native plants and makes it difficult for waterfowl and other animals to get around. Can also clog intake and drainage pipes.
- Toxic to livestock and other animals.

Spread and Management

- Seed pods burst open in fall to release seeds, which are spread by water.
- Small populations can be hand pulled or dug out, with care to remove entire root system. Wear protective equipment as sap can cause irritation.
- Repeated mowing within the growing season can prevent seed production.
- Herbicide can be effective.



References

16. Nancy Loewenstein, Auburn University, Bugwood.org
17. Nancy Loewenstein, Auburn University, Bugwood.org
18. Joseph M. DiTomaso, University of California-Davis, Bugwood.org
19. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
20. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Emerging Aquatic Invasive Species



Identification

- **Leaves:** Elongated, light green, whorls of 4-8 leaves. Finely serrated (only visible under magnification).
- **Stems:** Stiff, cylindrical, rooted in sediment, grow vertically to the surface, then horizontally to form dense surface mats. Up to 15 ft. long.
- **Flowers:** White, three petaled flowers, bloom June-August, stems emerge above the water.
- **Look-a-likes:** Hydrilla but lacks tubers and has non-visible serrations. Native *Elodea* spp. but has more leaves per whorl.

Habitat and Impacts

- Lakes, ponds, and streams. Can tolerate wide range of temperatures and turbidity, but grows best in with higher dissolved oxygen levels.
- Forms dense mats that crowd/shade out plants.
- Impacts wildlife movement and recreation.

Spread and Management

- Once introduced spreads by fragmentation
- Herbicide can be effective.
- Grass carp may also be used, but can change water quality and food chain.
- Manual and mechanical removal cause fragmentation and can lead to new populations.

References

1. Barry Rice, sarracenia.com, Bugwood.org
2. U.S. Geological Survey, U.S. Geological Survey, Bugwood.org
3. Robert Vidéki, Doronicum Kft., Bugwood.org
4. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org





Carolina Fanwort

Cabomba caroliniana

Cabombaceae

Submerged Perennial

Identification

- **Leaves:** Submerged leaves, fan shaped, deeply divided branching pattern, opposite branching on the stem. Floating leaves are smooth and elliptic shaped.
- **Stems:** Reddish-green stems can reach 6-10 feet with white or reddish hairs. Stem is rooted but can survive for up to 6 weeks free-floating.
- **Flowers:** White to pale yellow, six petaled flowers, grow on emerging stalks off floating stems. Blooms May to September and self-pollinate.

Habitat and Impacts

- Typically found in lakes and ponds. Grows well in high nutrient, low pH, and turbid waters.
- Dense populations can change flow of water, impede recreation and crowd out native species.
- Changes pH, dissolved oxygen levels, and nutrient levels in the water column.

Spread and Management

- Once introduced, spreads by fragmentation
- Hand pulling or seining is typically not effective due to fragmentation. Can be effective if repeated annually on small populations.
- Herbicide or water draw-downs can be effective.

References

5. Shaun Winterton, California Department of Food and Agriculture, Bugwood.org
6. Robert Vidéki, Doronicum Kft., Bugwood.org
7. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
8. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org





European Frog-bit

Hydrocharis morsus-ranae

Hydrocharitaceae

Floating Perennial

Identification

- **Leaves:** Small (≤ 2 in.), heart shaped, leathery, green floating leaves. Underside of leaf is brownish-purple with spongy appearance for floating.
- **Stems:** Roots are free-floating and can reach up to 12 inches long. Stolons running from the center of the plant produce juvenile plants and overwintering turions.
- **Flowers:** White, 3-petaled flowers bloom in early summer but rarely produce seeds.

Habitat and Impacts

- Found in slow moving, calcium rich water.
- Vegetative reproduction allows the growth of monocultures which crowd and shade out native vegetation and make it difficult for recreation.
- Mass die off in late summer can cause oxygen levels in the water to drop, leading to fish kill.

Spread and Management

- Hand pulling from a boat can reduce spread. Place material on land or solarize in bags.
- Mechanical harvesting before turion production can be effective for larger populations.
- Herbicide can be effective.

References

9. Jouko Lehmuskallio, Nature Gate
10. Kriss de Niort, Habitatitude
11. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
12. Jouko Lehmuskallio, Nature Gate





Identification

- **Leaves:** Bright green, pointed and serrated leaves grow in whorls of 3-10 (avg. 5) directly from the stem. Sharp “tooth” on underside of leaves along the mid-rib.
- **Stems:** Grow horizontally at the surface, forming dense mats. Can reach 30 ft. long. Roots form tubers for energy storage and annual growth.
- **Flowers:** Thin flowering stalks form near the surface and small white flowers float.

Habitat and Impacts

- Found in fresh water and is very tolerant of varying water conditions. Especially tolerant of low light conditions.
- Early season growth and fast growth can outcompete native plants. Dense mats impede recreation, change water flow, and interfere with fish spawning.

Spread and Management

- Once introduced, spreads by fragmentation
- Hand pulling and mechanical harvesting can be effective if performed several times within growing season. Suction harvesters may be effective as well.
- Herbicide can be effective.

References

13. Robert Vidéki, Doronicum Kft., Bugwood.org
14. Tim Murphy, University of Georgia, Bugwood.org
15. Robert Vidéki, Doronicum Kft., Bugwood.org
16. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org



Parrot Feather

Myriophyllum aquaticum

Haloragaceae

Emergent Annual



Identification

- **Leaves:** *Emergent leaves:* whorls of 4-6, stiff, feather-like compound leaves with 10 leaflet pairs. *Submerged leaves:* reddish-orange, compound leaves with 4-6 leaflets in whorls of 4-6.
- **Stems:** Round, reddish-green to green stem, up to 5 ft. tall. Surface growth is horizontal with vertical shoots that can reach 1 foot above the surface. Stolons grow for dispersal, energy storage, and overwintering.
- **Flowers:** Small white flowers on leaf axil of emerging stem.

Habitat and Impacts

- Prefers shallow wetlands, banks of slow moving streams, ponds, or lakes. Grows quickly in high water and nutrient levels.
- Fast growth and spread leads to dense mats that outcompete native species, serve as habitat for mosquito larvae, and impact recreation.

Spread and Management

- Once introduced, spreads by fragmentation and stolon growth.
- Hand pulling can be very labor intensive for large infestations. Best for small populations.
- Herbicide can be effective.



References

17. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
18. Nancy Loewenstein, Auburn University, Bugwood.org
19. Rebekah D. Wallace, University of Georgia, Bugwood.org

Variable Leaf Milfoil

Myriophyllum heterophyllum

Haloragaceae

Submerged Perennial



Identification

- **Leaves:** Whorls of 4-6 submerged feather like leaves densely packed on the stem. Stiff, elongated bracts grow above the surface but are much shorter than submerged leaves.
- **Stems:** Heavy and stiff, reddish-green stems can reach heights of 15 ft.
- **Flowers:** Small, white flowers bloom at base of emerged bracts between July and August.

Habitat and Impacts

- Found in lakes, ponds, and streams. Tolerant of slightly acidic water.
- Grows thick dense mats that decrease water quality, crowd out native species, and impede on recreation.

Spread and Management

- Spreads primarily by fragmentation.
- Manual removal can be effective for small populations. Take care to not create fragments that can start new plants.
- Mechanical harvest has also proven to be effective for larger populations when performed early in the growing season.
- Herbicide may be effective.



References

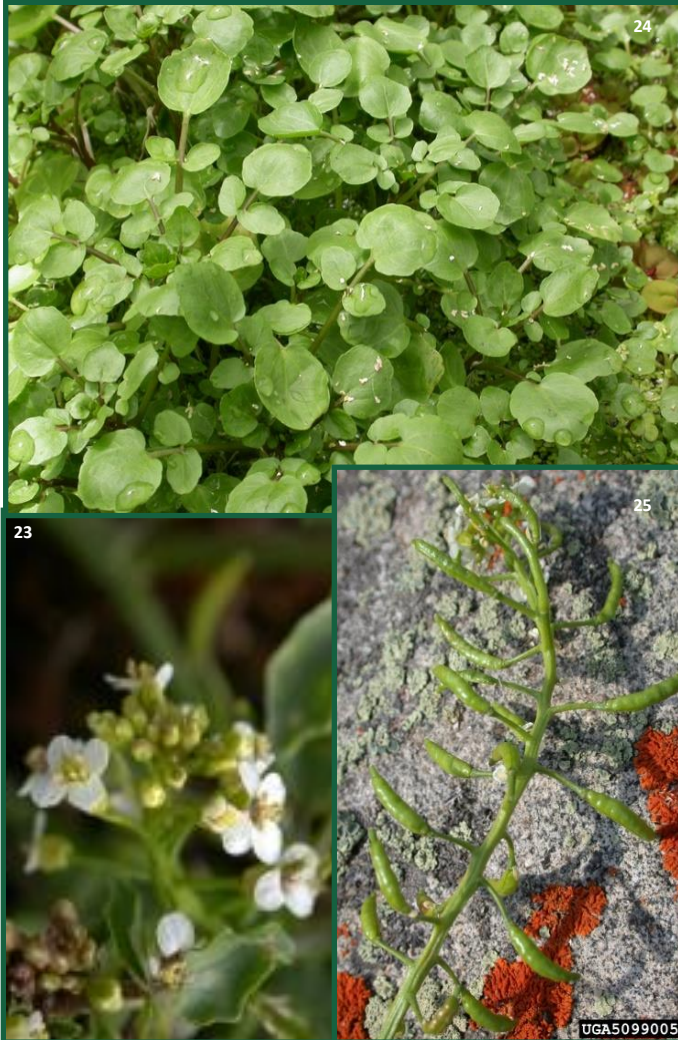
20. Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org
21. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
22. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Watercress

Nasturtium officinale

Brassicaceae

Perennial Herb



Identification

- **Leaves:** Compound with 3-7 leaflets. Leaflets have wavy margins and grow between 1-4 in. Terminal leaflet is largest. Distinct peppery taste.
- **Stem:** Hollow, succulent stems, roots at nodes.
- **Flowers:** Terminal flowering spikes emerge in late spring. Flowers are white, small, and have four petals.
- **Fruit:** Light green, elongated, curved fruit forms on spreading flowering spike. Each fruit has four rows of seeds.

Habitat and Impacts

- Found along the edges of cold lakes, reservoirs and slow moving streams. Prefers gravel soil and areas with high sun and humidity.
- Alters nitrogen levels in the water and forms dense mats that can change the flow of water and decrease habitat for native species.

Spread and Management

- Manual removal is effective for small populations. Be sure to remove plant before it goes into seed to reduce the risk of spreading.
- Herbicide can be effective.
- Do not release water garden individuals or seeds into free-living state.



References

23. Mary Ellen (Mel) Harte, Bugwood.org
24. Mary Ellen (Mel) Harte, Bugwood.org
25. Shaun Winterton, California Department of Food and Agriculture, Bugwood.org



Identification

- **Leaves:** Thick, glossy, oval to lance shaped leaves. Bulb shaped petioles keep leaves afloat. 6-8 leaves per plant that grow in rosettes.
- **Stems:** Dark, feathery free floating roots.
- **Flowers:** Spikes emerge between August and September. Flowers are lavender with the top petal containing a yellow spot surrounded by dark blue.
- **Fruit:** Three-celled capsule with many (>100) seeds.

Habitat and Impacts

- Found in slow moving fresh water. Prefers warmer temperatures.
- Dense mats can reduce dissolved oxygen, crowd out native vegetation, and alter flow.

Spread and Management

- Spreads by stolons, fragmentation and seeds.
- Small populations can be hand pulled before flowering. Cutting can cause drops in dissolved oxygen, which can be dangerous to fish.
- Water draw-downs and reducing nutrient load has been effective at reducing population size.
- Herbicide can be effective.



References

26. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
27. Willey Durden, USDA Agricultural Research Service, Bugwood.org
28. Rebekah D. Wallace, University of Georgia, Bugwood.org
29. Rebekah D. Wallace, University of Georgia, Bugwood.org
30. Katherine Parys, USDA-ARS, Bugwood.org



Identification

- **Roots:** Feathery, dense roots reach down about 2 ft. below the surface. Also produces stolons.
- **Leaves:** Grey-green leaves arranged in rosettes. Resembles head of lettuce but has distinct parallel veining and soft hairs. Leaf widens at apex.
- **Flowers and Fruit:** Small, inconspicuous flowers bloom in clusters on stalks that are hidden by the leaf axil. Several male flowers surround single female flower on a plant. Female develops into green fruit containing hundreds of seeds.

Habitat and Impacts

- Found in warm, slow moving water and is tolerant of salinity.
- Dense mats can block access to the water for wildlife and recreation. Reduces dissolved oxygen levels and crowd out native species.

Spread and Management

- Seeds spread by water movement, wildlife, and humans.
- Hand pulling small infestations can be effective. Mechanical harvesting is commonly used for large infestations. Both should be performed before going into seed.
- Herbicide can be effective.



References

31. Forest and Kim Starr, Starr Environmental, Bugwood.org
32. Graves Lovell, Alabama Department of Conservation and Natural Resources, Bugwood.org
33. Robert Vidéki, Doronicum Kft., Bugwood.org
34. Leslie J Mehrhoff, University of Connecticut, Bugwood.org

Yellow Floating Heart

Nymphoides peltate

Menyanthaceae

Floating Perennial



Identification

- **Stems:** Stem is rooted in the ground and can grow up to 6 ft. long.
- **Leaves:** Bright green leaves are round to heart shaped with wavy margins and float on the surface. Underside is purple and veiny.
- **Flowers:** Between May and October, 5-petaled yellow flowers bloom. Petals are distinctly fringed. Between 2-5 flowers grow per plant from nodes. Flowers develop into seed capsule that disperse flat, shiny.

Habitat and Impacts

- Found in slow moving streams, ponds, and lakes. Tolerant of anaerobic environments.
- Thick mats outcompete native species, stop flow of water, and decrease dissolved oxygen in the water. Prevents recreation and harbors mosquitos.

Spread and Management

- Seeds spread by wildlife, water, and humans.
- Repeated hand-pulling is effective for small populations. Mechanical harvest can be used for larger populations. Be sure to remove before going into seed and to monitor population.
- Herbicide can be effective.



References

35. Shaun Winterton, Aquarium and Pond Plants of the World, Edition 3, USDA APHIS PPQ, Bugwood.org
36. Rob Andress, Department of Conservation & Natural Resources, Bugwood.org
37. Leslie J Mehrhoff, University of Connecticut, Bugwood.org

Common Terrestrial Invasive Species



Autumn Olive

Elaeagnus umbellata

Elaeagnaceae

Woody Shrub

Identification

- **Stem:** Brown, speckled with thorns. Can grow up to 20 ft tall.
- **Leaves:** Elongated, bright green with a wavy margin and silver underside. Grow 2-3 in long.
- **Flower and Fruit:** Small white flowers appear in spring in clusters off the branches. In August, clusters of red berries appear along the branches. Berries last until November.

Habitat and Impacts

- Commonly found on edges of old farm fields, forests, riparian corridors and lawns.
- Crowd out native plants and increases nitrogen levels in the soil which can harm prairie plants.

Spread and Management

- Spread facilitated by wildlife.
- Hand-pulling or digging can be useful for small and young infestations. Weed wrench should be used to ensure root stock is removed.
- Cutting and mowing should be avoided because it causes the plant to reshoot.
- Can be grazed by livestock.
- Herbicide can be effective.



References

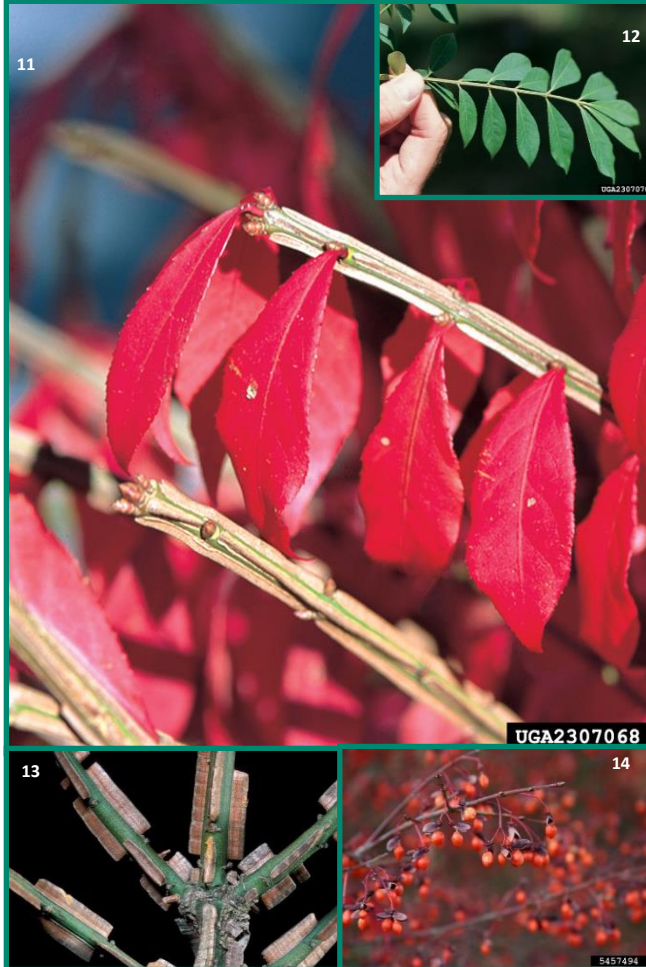
19. James H. Miller, USDA Forest Service, Bugwood.org
20. James H. Miller, USDA Forest Service, Bugwood.org
21. Pennsylvania Department of Conservation and Natural Resources-Forestry, Bugwood.org
22. Nancy Loewenstein, Auburn University, Bugwood.org

Winged Burning Bush

Euonymus alatus

Celastraceae

Deciduous Shrub



Identification

- **Stem:** Green with brown woody “wings” along the length, grow in round pattern around the trunk.
- **Leaves:** 2 in. long elliptical shaped, grow opposite on stem and turn from green to a bright red in fall.
- **Flowers and Fruit:** Small green flowers appear between May and June. Brown-red wing-shaped seed capsules reveal bright red fruits between July and October.

Habitat and Threat

- Commonly found in gardens but has begun to invade forest habitat. High seed production and viability allows it to outcompete native species.

Spread and Management

- Spread via wildlife.
- Hand pulling small individuals and surrounding seedlings can reduce impacts. Removed material can be left on site to dry if there aren't any seeds on the plant. If there are seeds, bag and solarize material.
- Cut branches off larger individuals, then use weed wrench to remove trunk and roots.
- Herbicide can be effective.



References

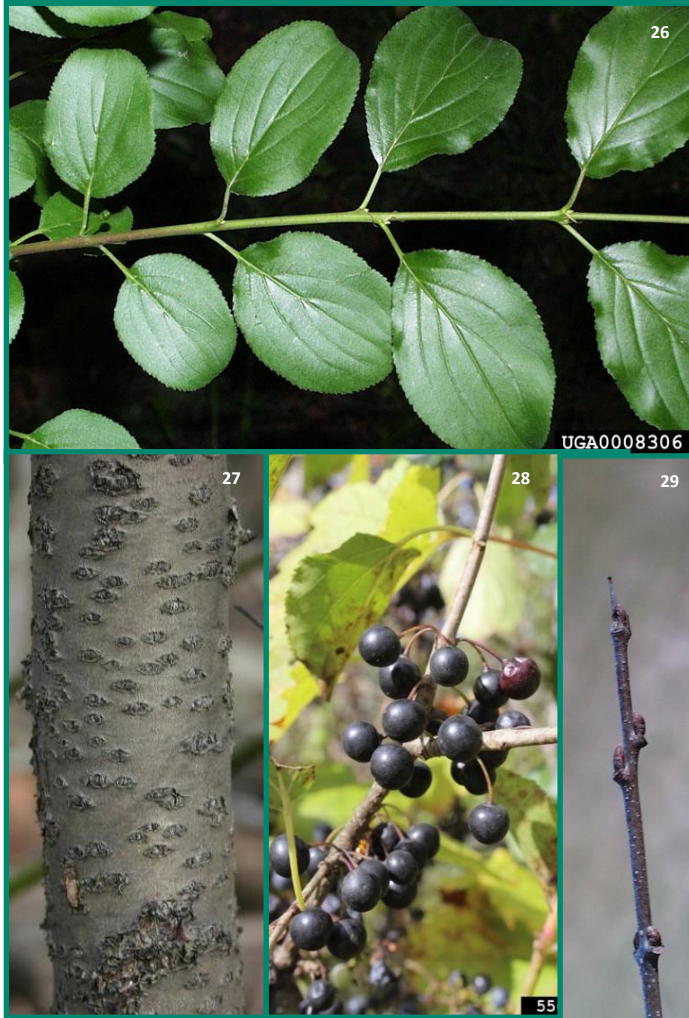
11. James H. Miller, USDA Forest Service, Bugwood.org
12. James H. Miller, USDA Forest Service, Bugwood.org
13. Barry Rice, Sarracenia.com, Bugwood.org
14. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Common Buckthorn

Rhamnus cathartica

Rhamnaceae

Deciduous Shrub



Identification

- **Stem:** Gray bark with lenticels. Stem tips often have sharp thorns. Bright yellow to orange beneath the bark.
- **Leaves:** Alternate, oval-shaped leaves with deep forward curving veins and toothed edges.
- **Flowers and Fruit:** Small, four-petal yellow flowers bloom in late spring in clusters along the stem or axils. Round, dark purple berries that contain 4 hard seeds appear between August and September.

Habitat and Impacts

- Found in disturbed areas, edge habitat, and open canopies.
- Outcompetes native species and changes soil composition to keep native species out.

Spread and Management

- Spread by wildlife and humans.
- Hand pull small plants and use weed wrench on larger plants to remove entire root system.
- Cutting, girdling, and mowing multiple times per growing season can prevent the plant from going into seed, but it also stimulates re-sprouting.
- Herbicide can be effective.



References

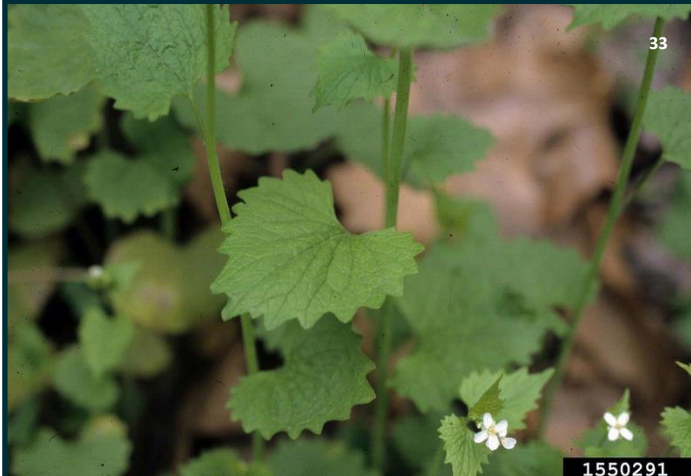
26. Paul Wray, Iowa State University, Bugwood.org
27. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
28. Chris Evans, University of Illinois, Bugwood.org
29. Paul Wray, Iowa State University, Bugwood.org

Garlic Mustard

Alliaria petiolate

Brassicaceae

Biennial Herb



Identification

- **Leaves:** *First year*- bean-shaped rosettes with round toothed edges. *Second year*- stem grows upright and has alternate triangular or heart shaped leaves with toothed edges and lengths between 1-6 in. When crushed, releases strong garlic odor.
- **Flowers and Seeds:** Clusters of 4 petal white flowers emerge between April and June. Thin, stem-like pods emerge in August and contain long, black seeds.

Habitat and Impacts

- Found in open fields, forest edges, roadsides, and flood plains.
- Outcompetes native species and releases chemicals into the soil to keep other species out.

Spread and Management

- Seeds spread by water, humans, and wildlife.
- Hand-pull entire plant before seed production. Repeat multiple times per year for at least 3 years to achieve local eradication.
- Repeated cutting and mowing when in flower can prevent the spread by stopping seed production.
- Herbicide can be effective.



References

33. Chris Evans, University of Illinois, Bugwood.org
34. Theodore Webster, USDA Agriculture Research Station, Bugwood.org
35. Chris Evans, University of Illinois, Bugwood.org

Bush Honeysuckle

Lonicera spp.

Caprifoliaceae

Woody Shrub



Identification

- **Stem:** Hollow, woody with fine hairs and shredded appearance.
- **Leaves:** Opposite, oval shaped leaves, with fine hairs on both faces.
- **Flowers and Fruit:** Fragrant, elongated, white flowers grow on axils of leaf pairs between May and June. Develops pairs of small, round, red berries along the stem in late fall.

Habitat and Impacts

- Found in disturbed areas, forest edges and flood plains.
- Outcompetes native understory plants.

Spread and Management

- Spreads by extensive rhizome system, wildlife dispersal and humans.
- Repeated hand pulling of small, young infestations can reduce population size.
- Dig out large plants, taking care to remove entire root system, between August and October.
- Herbicide can be effective.



References

8. Ryan Armbrust, Bugwood.org
9. David Cappaert, Bugwood.org
10. Chris Evans, University of Illinois, Bugwood.org

Japanese Barberry

Berberis thunbergii

Berberidaceae

Deciduous Shrub



Identification

- **Stem:** Thin, spiny and grow in dense thickets reaching anywhere between 2- 8 ft. tall. Color varies from grey/brown to red/brown. Beneath bark is bright yellow.
- **Leaves:** Small, thin, 1-1.5 in. long oval shaped with single spine at the base of the leaf stem. Color varies from green to deep purple, depending on the season.
- **Flowers and Fruit:** Small, pale yellow flowers bloom between April and May along the stem. Shiny, red, elongated berries emerge in late summer and can persist through winter.

Habitat and Impacts

- Found in open fields, forest and wetland edges, and floodplains.
- Changes soil composition and outcompetes native plants. Also harbors tick populations.

Spread and Management

- Spreads by wildlife dispersal and nursery trade.
- Small, young plants can be hand pulled. Be sure to wear personal protective equipment.
- Mowing or cutting multiple times during growing season can suppress the population.
- Herbicide can be effective.

References

23. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
24. Chris Evans, University of Illinois, Bugwood.org
25. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org



Japanese Knotweed

Reynoutria japonica

Polygonaceae

Herbaceous Shrub



Identification

- **Stem:** Hollow with distinct nodes and often purple blotches.
- **Leaves:** Large (3-6 ft. x 2-4 in.) heart-shaped leaves with flat base grow in an alternate pattern.
- **Flowers and Fruit:** Vertical spikes of small white flowers emerge from nodes between August and September. Develops shiny, triangular winged fruit in fall, but most are nonviable.

Habitat and Impacts

- Found in wet soils along roadsides, parking lots, streambanks, and wetlands.
- Extensive root system allows it to outcompete native species. Bare soil beneath infestations allows for increased erosion.

Spread and Management

- Spreads by rhizomes and fragmentation.
- Avoid mowing as it can increase the size and spread of the invasion.
- Small and young populations can be hand pulled. Ensure all fragments are removed and disposed of in a black garbage bag and left to solarize for 2-3 weeks.
- Herbicide can be effective.

References

1. Jan Samanek, Phytosanitary Administration, Bugwood.org
2. Jan Samanek, Phytosanitary Administration, Bugwood.org
3. Ansel Oommen, Bugwood.org
4. John Cardina, The Ohio State University, Bugwood.org



Multiflora Rose

Rosa multiflora

Rosaceae

Perennial Shrub



Identification

- **Stem:** Smooth, green with curved brown thorns along the length.
- **Leaves:** Compound with 5-11 toothed edge leaflets. Eyelash-like structures (petioles) sit at the base of the leaves.
- **Flowers and Fruit:** 5-petal white flowers with yellow center bloom between late April and June. Red fruits develop in early fall and overwinter.

Habitat and Impact

- Found along roadsides, forest edges, and fields.
- Outcompetes native shrubs and thorns are hazardous to people and wildlife, Seeds remain viable in the soil for over 20 years.

Spread and Management

- Spread by wildlife dispersal, humans, or weather.
- Hand pull or dig up small plants, taking care to remove root stock and wear protective equipment.
- Cutting stems off multiple times per year can prevent seed production.
- Place removed material in black bags and solarize for 2-3 weeks.
- Herbicide can be effective.



References

15. James H. Miller, USDA Forest Service, Bugwood.org
16. Chris Evans, University of Illinois, Bugwood.org
17. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
18. James H. Miller, USDA Forest Service, Bugwood.org

Oriental Bittersweet
Celastrus orbiculatus
 Celastraceae Woody Vine



Identification

- **Stem:** Greyish-brown bark with white lenticels throughout. Will grow around itself to form strong hold. Distinct orange roots.
- **Leaves:** Alternate, smooth, round or egg-shaped leaves 2-5 in. long with distinct veining.
- **Flowers and Fruit:** Develops small, green flowers in May found in clusters of 3-7. Yellow capsules develop in August. Burst open in fall to show bright red fruit. Fruits last through winter.

Habitat and Impacts

- Grows primarily along edge habitat of forests and roadsides. Finds trees, shrubs, and even man-made infrastructure to wrap around.
- Large infestations can damage trees and infrastructure.

Spread and Management

- Spread by wildlife dispersal, fragmentation, and humans.
- Young plants can be hand pulled or dug out.
- Older plants can be cut at ground level and chest height to reduce chance of going into seed.
- Herbicide can be effective.



References

5. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
6. Chris Evans, University of Illinois, Bugwood.org
7. Chris Evans, University of Illinois, Bugwood.org

Common Reed

Phragmites australis

Poaceae

Perennial Grass



Identification

- **Stem:** Tall, hollow, ribbed stems that grow in dense stands. Can reach heights of 15 ft.
- **Leaves:** Long, stiff leaves grow alternately and wrap around the stem, creating nodes.
- **Flower and Seeds:** Large, fluffy-looking flowering heads bloom between July and September and develop gray seeds with silky hairs for wind dispersal.

Habitat and Impacts

- Prefers moist soils along roadsides, waterways, and wetlands.
- Outcompete native plants, like cattails, and impede on water-based recreation.

Management

- Majority of seeds are non-viable yet spreads quickly by extensive rhizome system.
- Cut or mow multiple times during growing season for a few consecutive years to reduce population size.
- Stands in full sun can be covered with dark tarp or geotextile after cutting/mowing to solarize on site.
- Grazing by livestock and herbicide are also effective.



References

38. Rob Routledge, Sault College, Bugwood.org
39. Caleb Siemmons, National Ecological Observatory Network, Bugwood.org
40. Steve Dewey, Utah State University

Purple Loosestrife

Lythrum salicaria

Lythraceae

Herbaceous Perennial



Identification

- **Stem:** Woody and square with fine hairs. Mature plants can have up to 50 stems.
- **Leaves:** Opposite or whorled lance-shaped leaves with fine hairs grow 1.5 – 4 in. long.
- **Flower and Seeds:** Stems end in spikes of small, 5-7 petal purple flowers. Produces thousands of small (<1 mm) seeds starting in late July.

Habitat and Impacts

- Found on along the banks of waterbodies, wetlands, and roadside ditches.
- Forms dense patches that outcompete native plants. Poor source of nutrients for wetland species and pollinators.

Spread and Management

- Seeds spread by water and remain viable for 2-3 years.
- Hand pull or dig up small, young populations and bag removed material to solarize.
- Cut or mow multiple times per year before going into seed to reduce seed production.
- Biological control, *Galerucella spp.*, is effective at reducing spread. Contact Regional Biologist for information on obtaining colony.
- Herbicide can be effective.

References

30. Rob Routledge, Sault College, Bugwood.org
31. Rob Routledge, Sault College, Bugwood.org
32. Ohio State Weed Lab, Ohio State University, Bugwood.org



Wild Parsnip

Pastinaca sativa

Apiaceae

Herbaceous Biennial



Identification

- **Stem:** Deeply grooved, celery-like. Can grow up to 5 ft. tall.
- **Leaves:** *First year*– rosettes with serrated edges grow between February and April. *Second year*– begins to grow vertically. Compound leaves with lobes and toothed edges.
- **Flower and Seeds:** Umbel of small yellow flowers blooms from mid-June to August. Small, flat, round seeds that remain viable in the soil for up to 4 years.

Habitat and Impacts

- Found along roadsides, open fields, pastures. Prefers full sun.
- **Human health hazard** as sap can cause severe burns and blistering when exposed to UV rays.
- Forms dense patches that outcompete native plants.

Spread and Management

- Spread by human dispersal and weather/water.
- Use PPE when managing. Frequent manual removal and bagging material to solarize can reduce population size.
- Cutting umbel and bagging to solarize can reduce spread. Avoid mowing. Herbicide also effective.



References

35. Chris Evans, University of Illinois, Bugwood.org
36. John Cardina, Ohio State University, Bugwood.org
37. Ohio State Weed Lab, Ohio State University, Bugwood.org

Emerging Terrestrial Invasive Species



Identification

- **Leaves:** Variable shape, 3-4 in. long. Generally elongated oval that comes to sharp point that grow opposite on stem. Milky sap.
- **Flower and Seeds:** Small, star-shaped dark purple flowers with white hairs appear in early summer. Long seed pods develop and release seeds with white fluffy hairs in late summer.

Habitat and Impacts

- Tolerant of many soil and environment conditions.
- Typically found in upland fields, both natural and agricultural, or woodland areas.
- Outcompetes native species, harmful to monarch butterflies, and does not support diverse insect community.

Spread and Management

- Manual removal can be difficult due to extensive root and rhizome system. Best to remove when young.
- Repeated mowing 3-5x per year for 3-5 years can reduce seed production. Avoid mowing when in seed, as this can aid in dispersal. Bag and solarize all material. Burn plants in seed.
- Herbicide can be effective.



References

7. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
8. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
9. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
10. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Himalayan Balsam

Impatiens glandulifera

Balsaminaceae

Herbaceous Annual



Identification

- **Stem:** Smooth, hollow, with purplish-red color and enlarged nodes that can reach heights between 3-6 ft.
- **Leaves:** Large, 2-9 in. long, with toothed edges grow opposite or in whorls of 3 around stem.
- **Flower:** Five-part flowers ranging from white to pinkish-red develop between July and September. Resemble a policeman's helmet, which is another common name for this plant.

Habitat and Impacts

- Typically found along roadsides, stream sides, moist forests, and wetlands.
- Form monocultures and outcompete native plants.

Spread and Management

- High seed production (>1000 seeds per plant). Spread by weather, water, wildlife and humans.
- Hand-pull or dig up plants in early spring before the plant develops seeds. Repeated mowing can reduce seed production.
- If removing while in flower or in seed, place flowering heads and seed pods in bag to solarize before disposal.
- Herbicide can be effective.

References

27. Barbara Tokarska-Guzik, University of Silesia, Bugwood.org

28. Tom Heutte, USDA Forest Service, Bugwood.org

29. Rob Routledge, Sault College, Bugwood.org



Japanese Angelica Tree

Aralia elata

Araliaceae

Deciduous Tree



Identification

- **Stem:** Trunk has sharp prickles and can grow up to 40 ft. tall.
- **Leaves:** Large (2-4 ft. long) compound, prickly leaf with up to 80 teardrop-shaped leaflets and fine hairs on underside of leaflets.
- **Flowers and Fruit:** Inflorescence branches from the base and develops many clusters of small, white, 5-petal flowers in late summer that turn into dark colored round fruits in the fall.

Habitat and Impacts

- Forest edges, tree-fall gaps, wetlands and riparian zones.
- Outcompetes native species, forms monocultures and poses a human health threat if one comes in contact with the sharp trunk.

Spread and Management

- Spread by cloning and seed dispersal.
- Hand pull or dig up small individuals and place in bag to solarize before disposal. Take caution when removing if in seed as the disturbance can spread the seeds.
- Mowing is NOT very effective due to aggressive re-sprouting.
- Herbicide can be effective.



References

19. Dr. Nick V. Kurzenko
20. John M. Randall
- 20a. Louis M. Candry

Japanese Hops

Humulus japonicus

Cannabaceae

Annual Vine



Identification

- **Stem:** Coarse, hooked hairs and distinct bracts where leaves attach.
- **Leaves:** Rough, 2-5 in. long, grow opposite on stem and are palmately divided into 5-7 lobes with toothed edges. Other hops spp. have 3 lobes.
- **Flowers and Seeds:** Both male and female plants produce flowers in mid to late summer. Males have panicles while females have short spikes of greenish flowers. Develops small, brownish seeds that are dispersed by wind.

Habitat and Impacts

- Found in moist soils in woodlands, riparian areas, roadsides, and fields.
- Grows very dense which can crowd and choke out native plants. Early season growth can prevent native species from emerging.

Spread and Management

- Small infestations can be hand-pulled, with care to remove entire root stock to prevent re-sprouting. Wear PPE to prevent irritation.
- Repeat cutting can prevent seeding. Bag or burn any removed material.
- Herbicide can be effective.



References

30. Wikimedia, 2007
31. Carole Ritchie, USDA NRCS Plants Database
32. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org



Identification

- **Stem:** Covered in stiff orange hairs and can root at the nodes reaching between 30-100 ft. long. They can form very large taproots.
- **Leaves:** Dark green, alternate, compound leaves with 3 rounded or heart shaped leaflets that are either slightly or entirely lobed. 2-8 in. long with hairs on the underside.
- **Flower:** Purple, blue, or red flower spikes develop along main stem during its 3rd year; strong grape smell.

Habitat and Impacts

- Typically found along roadsides, right-of-ways, woodland edges, and fields.
- Outcompetes native species and changes soil composition.

Spread and Management

- Spreads by rhizomes. Rarely produces viable seeds.
- Mowing and cutting every two weeks can prevent regrowth if continued for multiple years. Avoid cutting or mowing when in seed. If you do be sure to bag all material and solarize.
- Prescribed burning or grazing can control young plants between July and September. Herbicide can also be effective.



References

1. James H. Miller, USDA Forest Service, Bugwood.org
2. David J. Moorhead, University of Georgia, Bugwood.org
3. Peggy Greb, USDA Agriculture Research Service, Bugwood.org

Lesser Celandine

Ficaria verna

Ranunculaceae

Herbaceous Perennial



Identification

- **Leaves:** Glossy, kidney-shaped leaves (1.5-3.5 in. wide) with wavy edges grow in mats along the ground.
- **Flower:** Small, light green buds emerge in early spring and develop into bright yellow flowers by May. Number of petals varies.
- **Stem:** By June, the above ground material becomes dormant and tubers and bulbils form for reproduction. Petioles are deeply grooved and U-shaped in cross section

Habitat and Impacts

- Found in moist, sandy soils in wetlands, flood plains, and riverbank. Has also been found in urban areas due to garden escape.
- Early spring growth shades out spring ephemerals and early die off creates open space for other invasive species to invade.

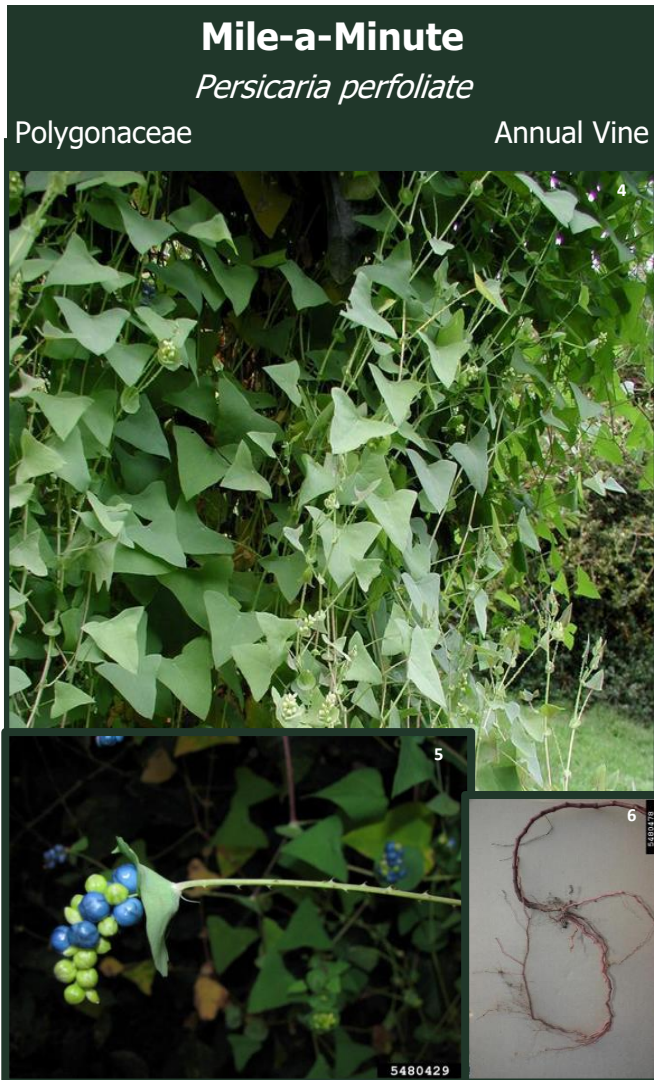
Spread and Management

- Hand pull entire plant, including bulbils, when soil is wet and ideally before the plant is in flower. Bag and solarize all removed material.
- Early season, repeated mowing can prevent flowering but can spread bulbils if not careful.
- Herbicide can be effective.



References

24. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
25. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
26. Catherine Herms, Ohio State University, Bugwood.org



Identification

- **Stem:** Barbs present along stem and underside of leaves. Roots are reddish-pink color.
- **Leaves:** Alternate, triangular leaves (1-3 in. wide); additional circular leaves (ocreae) grow around the stem.
- **Flowers and Fruit:** Small white flowers appear between June and October that turn into round, blue fruit. Fruits ripen in mid-summer and seeds remain viable for up to 6 years.

Habitat and Impacts

- Disturbed or open areas. Roadsides, wetlands, stream banks, forest edges. Prefers full sun.
- Outcompetes native species due to ability to grow 6 in. per day.

Spread and Management

- Spread via wildlife and weather.
- Pull vine from root and either create a brush pile or solarize in a bag.
- Mowing small infestations between April and May can be effective at reducing seeds. Avoid cutting or mowing when in fruit. If you do be sure to bag and solarize all material.
- Biological control: *Rhinoncomimus latipes*.
- Herbicide can be effective.



References

4. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
5. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
6. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org



Identification

- **Leaves:** Elongated, 3-4 in. oval leaves opposite on stem. Milky sap.
- **Flower and Seeds:** Small, pale pink, star-shaped flowers emerge in early summer. Long, narrow pods appear after flowering and release seeds with white fluff in late summer.

Habitat and Impacts

- Typically found in disturbed upland areas like agricultural fields or woodlands.
- Outcompetes native plants and is poor food source for wildlife, especially butterflies.

Spread and Management

- Manual and mechanical removal can be difficult due to fibrous root system. Be sure to remove entire root crown if possible to prevent re-sprouting.
- Repeated mowing can reduce seed production.
- Avoid mow or cut when in seed, as this can aid in the spread. If you do, bag any mowed material to solarize. Plants with seeds should be burned rather than cut.
- Place any removed material in plastic bags to solarize for two weeks before disposal.
- Herbicide can be effective.

References

11. Rob Routledge, Sault College, Bugwood.org
12. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
13. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
14. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

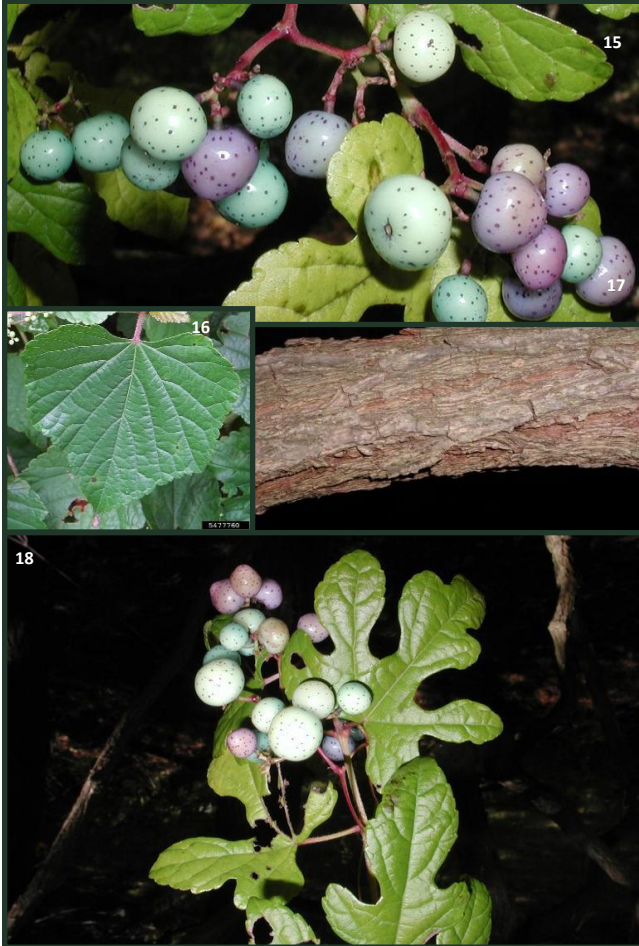


Porcelain-berry

Ampelopsis brevipedunculata

Vitaceae

Deciduous Woody Vine



Identification

- **Leaves:** Alternate, 3-5 deep lobed with toothed edges and hairy undersides.
- **Stem:** Young stem is hairy and develops into lightly colored bark that does not peel and has lenticels. White pith is continuous through nodes.
- **Flowers and Fruit:** Greenish-yellow blossoms appear above the leaves in mid-summer and eventually develop into a range of lilac and green-colored, speckled berries. Ripe berries are pink and bright blue.

Habitat and Impacts

- Found in open fields, forest edges, flood plains.
- Chokes out native trees and shrubs. Direct competitor with native grape species.

Spread and Management

- Seeds spread by wildlife, weather, and humans.
- Be sure to properly identify, as this plant looks very similar to native grape species.
- Hand pull young individuals and small infestations removing the root system. If removing when in seed, place all removed material into bags to solarize before disposal.
- Herbicide can be effective.

References

15. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
16. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
17. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
18. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

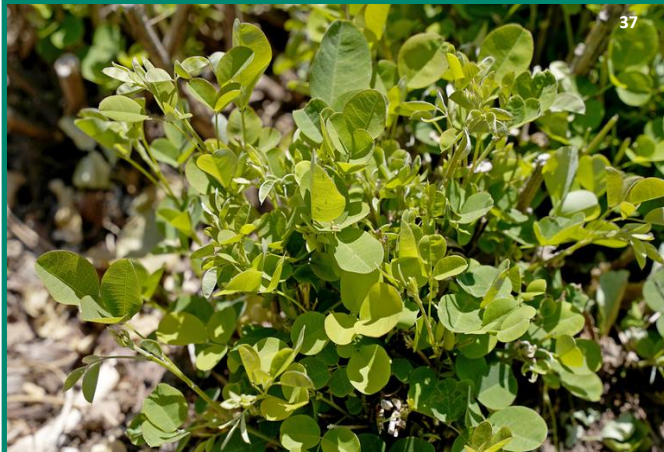


Shrubby Bushclover

Lespedeza bicolor

Fabaceae

Perennial Shrub



Identification

- **Leaves:** Alternate, trifoliate, 1-1.5 in. with 3 oval-shaped leaflets with light colored midrib. Underside of leaf is silver.
- **Stems:** Woody yet thin and can reach 10 ft. tall. Branches cascade downward.
- **Flower and Seeds:** Purplish-pink flowers that self-pollinate are present from June to September. Develop into flat seed pods between August and persist through March.

Habitat and Impacts

- Tolerant of various soil and water conditions, but is typically found in high sun areas like fields, roadsides, and forest edges.
- Forms dense stands that outcompete native field plants.

Spread and Management

- Seeds spread by wildlife, humans, and weather.
- Hand pulling young infestations can be effective but older infestations have extensive root system that makes it difficult to pull.
- Mowing multiple times during the growing season can reduce seed production.
- Herbicide treatment can be effective.



References

35. James H. Miller, USDA Forest Service, Bugwood.org
36. Paul Langlois, Bugwood.org
37. David J. Moorhead, University of Georgia, Bugwood.org



Identification

- **Stem:** Woody, appears red due to red hairs and narrow, sharp prickles.
- **Leaves:** Three leaflets with distinct white undersides, margins toothed; terminal leaflet rounded.
- **Flowers and Fruit:** Small, white flowers with hairy petals. Green sepals with red bristles enclose bright red berries that ripen by late summer.

Habitat and Impacts

- Found along edge habitat and highly disturbed area, including streambanks and roadsides.
- Outcompetes native raspberry and blackberry species and forms dense thickets.

Spread and Management

- Hand pull or dig out roots. Be sure to wear protective clothing to prevent getting stuck.
- If the plant is in fruit, fruits may be eaten and remaining material should be bagged to solarize. If removed before in fruit, create a brush pile from material.
- Monitor removal site for several years and repeat if necessary.
- Herbicide can be effective.



References

21. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
22. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
23. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Yellow Garden Loosestrife

Lysimachia vulgaris

Primulaceae

Herbaceous Perennial



Identification

- **Stem:** Soft, hairy stem can reach heights of 3 ft.
- **Leaves:** Hairy, lance-shaped, 2.75-4.75 in. grow in whorls and often have orange or black dots on underside
- **Flowers and Seeds:** Terminal clusters of 5-petaled yellow flowers develop between June and September. Develops pods containing seeds that open by valves in early fall.

Habitat and Impacts

- Prefers wet soils and is typically found in wetlands, marshes, and banks of rivers, lakes, ponds, and streams.
- Displaces and outcompetes native shoreline species that provide habitat for wildlife due to ability to form dense stands.

Spread and Management

- Spreads by rhizomes and seed dispersal by wildlife, humans, and weather.
- Hand-pulling is difficult due to extensive rhizome system, but is most effective for small or new populations.
- Solarization on site using a tarp is effective for small populations.
- Herbicide can be effective.



References

32. Leslie J. Mehrhoff, University of Connecticut, Bugwood.org
33. Washington State Noxious Weed Control Board, Bugwood.org
34. Washington State Noxious Weed Control Board, Bugwood.org

