

More Than Just a Yard

Ecological Landscaping Tools for Massachusetts Homeowners



Commonwealth of Massachusetts
Governor Mitt Romney



Executive Office of Environmental Affairs

Secretary Ellen Roy Herzfelder

Dear Friend of the Environment:

Every year we anxiously await the spring and summer months, looking forward to spending more time outdoors. Our yards become an extension of our home, where we cook, play, and relax. We plant flowers and vegetables, mow the grass, add compost and fertilizer, and water it all. We do this against a backdrop of increasing concerns about water shortages in our communities. There are other environmental concerns, from the exhaust of gas-powered mowers, to pesticide and herbicide residues on the land and in ground and surface waters, to excessive nutrients in our lakes, ponds, rivers, and streams. Our traditional lawn and garden care replaces native forests, wetlands, and other wildlife habitats with monocultural landscapes.

This guide will help you make your yard fit into the larger ecological landscape around us. *More Than Just a Yard: Ecological Landscaping Tools for Massachusetts Homeowners* can help guide your efforts to preserve biodiversity, conserve water, and save yourself some time and money. Every yard is a small piece of the larger landscape in our communities, our watersheds, and our state. By creating a more natural yard, you can help protect the special features of Massachusetts.

The primary goal of this guide is to help you understand that your yard can be more than just the place where you hold your barbecues or just a patch of grass and some shrubbery that you maintain all summer. Each yard is connected with the environment around us through a fragile link with nature. As property owners, we have the responsibility of caring for, and improving, that link. With the help of this guide, you can take meaningful steps to restore and maintain an ecologically sustainable landscape.

Whether you take one small step, such as planting a blueberry bush that can provide food for yourself, birds, and other wildlife, or take a large step such as redesigning your whole yard, you can help the environment of your neighborhood and community. Please join me in changing the relationship we have with our yards, by working a little ecological landscaping into your piece of Massachusetts.

Regards,

Ellen Roy Herzfelder
Secretary of Environmental Affairs

Acknowledgements

This guide was the collaboration of many people at various Massachusetts state agencies including the Executive Office of Environmental Affairs (EOEA), the Department of Food and Agriculture (DFA), the Department of Fisheries, Wildlife, and Environmental Law Enforcement (DFWELE), the Department of Environmental Management (DEM), the Department of Environmental Protection (DEP), and the Coastal Zone Management Office (CZM). The primary author was Jessica Sprajcar, who spent countless hours while working at EOEA to research, write, and incorporate numerous revisions and comments. Jessica also drew most of the drawings in this guide, except where otherwise noted. Particular thanks go to Mark P. Smith and Sharon McGregor at EOEA who saw the need for this guide, with Mark Smith supervising its creation and both Mark and Sharon serving as chief editors. Special thanks also to Eric Friedman at EOEA, Ann McGovern at DEP, Gerard Kennedy at DFA, Nina Danforth and Ruth Helfeld at DEM, Andrea Cooper at CZM, and Sandra Piñeyro at EOEA, for their time and feedback.

The creation of this guide would not have been possible without the help of Russ Cohen at DFWELE with his expertise on edible plants of Massachusetts, or Paul Somers at DFWELE and Cynthia Boettner at the Silvio O. Conte National Fish and Wildlife Refuge for their contributions to the plant lists in Appendices 1 and 2. Many thanks go to Lou Wagner at the Massachusetts Audubon Society, Cathy Sergeant O’Neil and Frances Clark at the Ecological Landscaping Association, Peter Phippen at the Merrimac Valley Planning Commission, Marilyn Castriotta at the Northeast Organic Farmers Association, Rena Sumner at the Massachusetts Nursery and Landscape Association, Karen Connelly at the Massachusetts Association of Lawn Care Professionals, and Cheryl Lowe at the New England Wild Flower Society for their great wealth of knowledge on proper land care practices.

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1.1 Introduction

Whether you have four square feet of yard or 40 acres, this guide to ecological landscaping will provide the information necessary to transform your yard into a wildlife-friendly, water-saving, low-maintenance, naturally beautiful place in which to relax, play, and enjoy. This guide will work for people who want to complete one ecological landscaping step, such as planting Bee-balm to attract butterflies, or for those who want to have a complete ecological yard transformation. Ecological landscaping involves preserving existing native vegetation, landscaping with new native plants, shrubs, and trees, and, if desired, adding non-invasive ornamentals that complement and do not out-compete the



native vegetation. By achieving a harmonious mix of practical and user-friendly plantings, you will have an attractive, low-maintenance yard that restores, protects, and enhances the surrounding environment by blending seamlessly and naturally with it. Plants and animals will thrive in the neighborhood and act in harmony with surrounding natural lands.

This guide is written primarily for homeowners, although the principles outlined here can be applied by developers, professional landscape designers, and garden center employees. Basic information is provided on how to transform a yard from primarily turf to a low-maintenance, natural landscape. These simple tools will not only save time on lawn care, but should also save money in the long run and will preserve natural resources such as water and wildlife that are necessary for a healthy environment.

This guide was created in order to stress the importance of natural resource protection in our own back yards. Each yard occupies only a small piece of the entire community, but collectively they add up to a sizeable and influential component of the landscape. How homeowners choose to maintain their yards can have a profound effect on the quality of the larger environment. It is therefore important to think about and consider adopting ecologically-sustainable yard designs and maintenance practices. Remember, every little bit counts. Taking only one or two ecologically-sound steps in the design and maintenance of your yard can help the surrounding environment.



1.2 The Ecological Landscape Movement

Modern concerns about the environment are generally traced to the 1960's, when Rachel Carson's book Silent Spring was published. Her work focused on the link between the widespread use of pesticides and the great loss of bird and insect life occurring in so many places. Her book helped to increase public concern about artificially maintaining weed and pest-free yards as well as farm fields, especially when there were so many risks to our health and the ecosystems around us. As a result of this awakening, alternatives to chemical pesticides and fertilizers were developed, such as the use of beneficial insects to control pests and the use of compost as an organic fertilizer. Through research and education, these alternatives continue to grow in sophistication and in popularity.

Some people feel a need to actively seek a connection with nature because they sense a disconnection between themselves and the natural world. Many people spend so much time inside buildings and their vehicles that they forget what nature is all about. The ecological landscaping movement is another way people can actively connect to the natural world.

Ecological landscaping seeks to create a seamless transition from one backyard to another, and from one habitat to the next. By choosing native plants for the landscape, the amount of natural habitat is not only protected, but also increased. This promotes biodiversity, the natural variety of plants and animals, which is extremely important in maintaining a healthy environment.

Society is moving at a much faster pace now than in the nineteenth century, when turf grass lawns became the standard for suburban yards. Many people are finding that they do not have the time to devote toward maintaining a perfectly green and weed-free lawn. They realize that by converting some or all of their turf lawn to native grasses, perennials, and/or trees and shrubs, they eventually save themselves time and money.



1.3 Benefits of Ecological Landscaping

Ecological landscaping has many benefits over traditional lawn care practices. Primary among these benefits are environmental protection or enhancement, and time and cost savings. The combined cost of installation and maintenance of ecological landscaping practices over a ten-year period may be as low as one-fifth the cost of conventional landscaping.¹ These savings are achieved through fewer inputs such as store-bought fertilizers, which are replaced with homemade compost, or through lower water bills because of a greater reliance on rain for irrigation instead of sprinklers and hoses. Ecological landscaping has other less obvious benefits as well, including lower health risks from chemical

pesticides, fertilizers, and gasoline fumes because their use is limited or removed altogether. Peace and quiet cannot be measured in any concrete terms, but their value is of immense importance to homeowners. Ecological landscaping creates an environmentally safe haven away from the stress of daily life, where nature can be looked at, appreciated, and enjoyed.

Benefits of Ecological Landscaping

- *Better wildlife habitat* will be created, thus helping to protect biodiversity.
- Homeowners will enjoy *recreational opportunities*, such as bird and butterfly watching, gardening, and photography.
- Save money by growing some or all of your own fruits, nuts, and vegetables.
- Planting trees and shrubs on the north and west sides of buildings *reduces winter heating costs* by blocking cold winds.
- Having lots of plants around buildings provides shade that *lowers summer air-conditioning costs*.
- Plants along the perimeter of a yard add privacy from streets and neighbors, acting as a natural fence.
- Lower water use means *lower water bills*, more water left in the environment to sustain *healthy aquatic habitat*, and *higher ground water levels* for public water supply.
- There will be *little water, air, or soil pollution* from chemical pesticides and fertilizers because their use is minimized.
- Some native plants have deeper roots than turf grasses and can recover more quickly from drought conditions. Their use will increase *erosion protection*, especially near bodies of water or on steep slopes.
- There will be *less noise and air pollution* from lawn mowers, weed whackers, and leaf blowers.
- *A healthier place to live, work, and play* can be created.

1.4 The Traditional Lawn

Turf grass has become a staple in American life. It is what many people think should be around their homes. Some people look upon green grass lawns as a safe place for children to play, a haven away from stressful daily lives, and as a way to connect with nature and neighbors. What many people may not know is that the traditional turf lawn is not a naturally occurring phenomenon. So where, then, did the love of lawns come from?



It seems that America's love of lawns stems, in part, from early English gardens, which incorporated grass as an art form. In addition, British landscape painters such as William Kent and Lancelot Brown, who painted vast expanses of grass lawns as the ideal living situation, further entrenched the vision in our minds.¹ As the first European settlers crossed the Atlantic, they carried

those preferences with them. In addition, advertisements and television shows have highlighted lush green turf lawns and envious neighbors, making people believe that this is the only way to have an attractive yard. Whatever the origins of this preference, the expansive green lawn is still commonly viewed by many as the ideal home landscape.

1.5 The Life of a Highly-Maintained Yard in America

Drive down any residential street in America and there is likely to be yard after yard of green lawn, and perhaps a few trees, trimmed hedges, and flowers. Many people take pride in the appearance of their lawn, measuring the way theirs looks in comparison to their neighbor's or an ideal lawn pictured on television. Maintaining a lush green lawn can come with significant costs, however. When chemical fertilizers, pesticides, irrigation, and gas-powered lawn mowers are used, the environment can suffer, people may become ill, and money is unnecessarily spent.

The following boxes highlight many of the inputs that may go into maintaining a weed-free, closely-cropped, bright green turf lawn. While not every homeowner uses pesticides, fertilizers, and irrigation on their lawns, those that do may not realize the impact it can have on their surrounding environment.

<p style="text-align: center;"><u>Lawn Facts</u></p> <ul style="list-style-type: none"> • The average size of a home lawn is one-third of an acre. • Currently there are 40 million acres of lawn in the US, of which about 30 million are home lawns. • Planting sod costs \$12,000 an acre, grass seeds \$6,000 an acre, while native meadow plant seeds cost only \$3,000 an acre.¹⁶ 	<p style="text-align: center;"><u>Water-use Facts</u></p> <ul style="list-style-type: none"> • The average lawn consumes 10,000 gallons of water annually. • US homeowners use 40 to 60 percent of their household water on lawns. • That comes to 32 gallons of water per person per day on lawns. 	<p style="text-align: center;"><u>Lawn Equipment Facts</u></p> <ul style="list-style-type: none"> • There are over 40 million power mowers in the United States. • Homeowners spend the equivalent of a 40-hour workweek mowing the lawn each year. • Over 60,000 severe accidents a year involve lawn mowers. • Every summer, 60 million gallons of gasoline are used to power lawn equipment. • Motorized lawn equipment often uses two-stroke engines that release unburned gasoline into the land, air, and water. • Gasoline powered lawn mowers emit 11 times the air pollution of a new car for each hour of operation. • One person's time spent mowing the lawn over the course of one year generates the same amount of pollution created by driving a car 16,000 miles.
<p style="text-align: center;"><u>Fertilizer Facts</u></p> <ul style="list-style-type: none"> • The synthetic fertilizer industry earns over \$5.25 billion a year from the 100 million tons of fertilizer used on home lawns. • This equals about 20 pounds of fertilizer per property, per year. 	<p style="text-align: center;"><u>Pesticide Facts</u></p> <ul style="list-style-type: none"> • In 1997, over 80 million pounds of pesticides were used by homeowners, costing over \$2 billion. • Typically 5 to 10 pounds of pesticides are applied to each acre of lawn per year. • The National Academy of Science found up to 10-times as many pesticide residues per acre on lawns than on crops. 	

Landscaping offers numerous possibilities, from impervious concrete at one extreme, to a totally native ecological landscape. When compared to impermeable surfaces such as the pavement of driveways, sidewalks, and roads, turf grass lawns are a better choice. Lawns allow rainwater to sink into the soil to recharge groundwater, and grass roots prevent erosion. Turf grass can add to the biodiversity of a yard if it is used in conjunction with native shrubs and herbaceous perennials. However, when chemical fertilizers and pesticides are added, turf grass becomes ecologically unsound, as described below.

1.A. Environmental Impacts

The way many people maintain turf lawns can require intensive water, fertilizer, and pesticide use. This is especially true if lawns are planted on poor or thin soils, as is the case with many new developments where the original, rich topsoil may have been removed and sold commercially. Keeping yards alive artificially is not only potentially expensive, but the pesticides and nutrients can run off into our rivers, streams, lakes, ponds, and wetlands. The extra nutrients from fertilizers can cause algal blooms in these waters, and speed up the aggressive growth of invasive nuisance aquatic plants. Pesticide run-off is a concern for public and private water supplies, and can harm fragile natural plants and animals in and along our water bodies and waterways.

Another part of the lawn maintenance process is the use of lawn mowers and other power lawn care products used to maintain a close-cropped carpet of green grass. These tools are generally gasoline powered, and most often lack the emission controls that are included on cars and other vehicles. As a result, though small in size, these lawn care machines have significant adverse impacts on air quality.

1.B. Health and Safety Impacts

The application of pesticides (herbicides, insecticides, fungicides, and rodenticides) and synthetic fertilizers to lawns can present risks to water quality. A recent United States Geological Survey study showed that pesticides are widespread in streams and groundwater samples taken within urban and agricultural areas of the U.S. While the average concentration of pesticides in the samples was rarely above set health standards, at least one pesticide was found in nearly every stream sample, and in half of all well samples.² Improper disposal and storage, accidental spills, and excessive or inappropriate use are all ways in which pesticides can contaminate groundwater supplies, where many individual homes and communities get their drinking water.



Lawn sign warning of pesticide exposure (Medford, MA)

The traditional yard often consists of non-native Kentucky Bluegrass turf, with perhaps a few trees, shrubs, and flowers around the edges. This landscaping can limit habitat for native species of plants and animals, may require major inputs of water and nutrients, and can contribute to air, noise, and water pollution. There are alternatives, however, in the short or long run requiring less time or effort over traditional landscaping. In fact, once established, an ecologically landscaped yard may save both time and money.



2.1 Key Principles of Ecological Landscaping

There are several overarching principles that provide the general guidance for ecological landscaping. These principles can be applied in any number of ways, from taking a few easy steps to a complete redesign of a yard or landscape. These principles can be used alone or in combination to create the ideal yard a homeowner may be looking for. While the use of all the principles would create the most productive ecological landscape, following any of these principles will help build an ecological landscape that integrates itself with the surrounding environment.

- A. Maintain as much as possible the pre-existing landscape, including soil, rocks, native vegetation, and contours during new construction.
- B. Integrate landscape components with surrounding natural vegetation to rejoin native habitat.
- C. Retain buffers of natural vegetation to any surface water body, including wetlands and vernal pools.
- D. Identify and remove non-native invasive plants, where possible.
- E. Choose native plants for landscaping.
- F. Use plants that are appropriate for the soil type, moisture content, and climate conditions of the area.
- G. Use water-efficient/drought-tolerant plantings.
- H. Ensure proper soil characteristics so that soils hold water and contribute appropriate nutrients.

- I. Provide a variety of plant species of different height levels – grasses, flowers, shrubs, and trees – to provide food, hiding places, nesting and overwintering sites for different wildlife species.
- J. Use integrated pest management approaches that minimize the use of pesticides to control weeds and pests.
- K. Use compost and other natural products for fertilizer and mulching needs, which will feed the plants and the soil.

2.2 Landscaping to Attract Wildlife

Depending on where you live in Massachusetts, there may be different types of wildlife: from white-tailed deer and spotted salamanders, to squirrels and pigeons. No matter the location, homeowners can turn their yard into a haven for creatures of all shapes and sizes. Biodiversity, the variety of living things, is a necessary element of a healthy environment. Ecological landscapes seek to promote this natural biodiversity. Many species of plants, even some so-called weeds, provide food or cover for some wildlife species. By providing a diversity of plants that offer food, hiding places, nesting, and overwintering, a yard that once attracted only a few species can begin to attract many more.

There are four basic needs of all wildlife that include the above.³ In order to make a yard more attractive to wildlife, it will be helpful to have these needs met. Try to keep these in mind during the design and maintenance process.



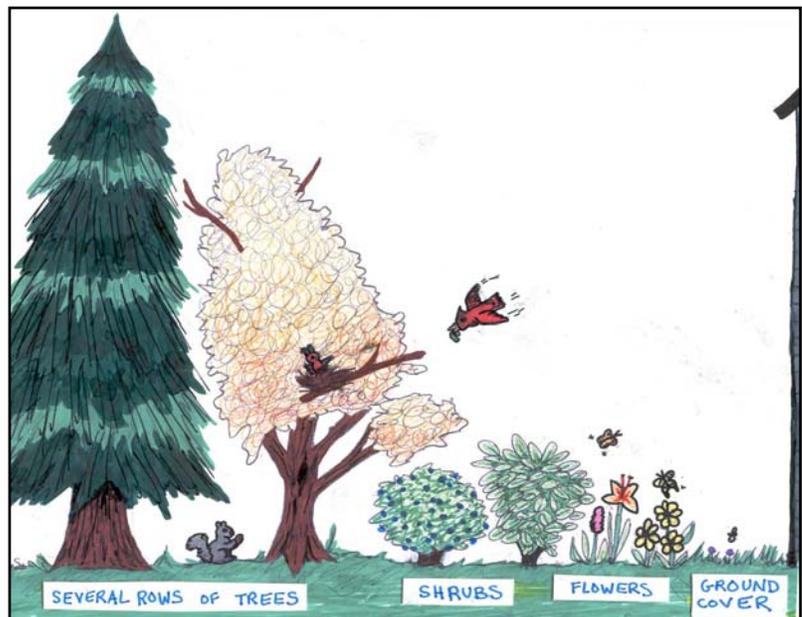
1. **Food:** Choose native plants that offer one or more of the following: fruits such as berries, seeds such as nuts or acorns, grains, and nectar. Not only will these plants provide food for animal visitors, but many will provide food for humans as well. Appendix I lists some plants native to the northeastern United States that provide wildlife and human benefits. For a more complete listing of sources, please see the Reference section on the last page of this guide. Feeders may also be used as a supplemental food source for animals.

Attracting Birds²³

- There are over 282 species of birds seen in Massachusetts. Some are year-round residents, such as the Black-Capped Chickadee and the Cardinal, while others spend only part of the year here, like the Eastern Kingbird and the Yellow Warbler.
- Many birds, such as the Downy Woodpecker, nest in trees, so leave dead trees standing, unless they pose a hazard.
- Use bird feeders, suet (during the winter only) and birdbaths.
- When using bird houses and boxes, keep them well above the ground, near sufficient hiding places, and keep them clean and dry to prevent disease.
- There is only one kind of hummingbird found in Massachusetts, the Ruby-Throated Hummingbird. To attract them²⁴, hang hummingbird feeders full of a 20% sucrose solution (one part cane sugar to 4 parts water) that is changed weekly, or plant some of these flowers:
Wild Columbine
Cardinal-Flower
Bee-Balm
- Hummingbirds also eat small insects, so do not use chemicals on your yard if you want to attract these birds.

2. **Water:** Every living thing needs water in order to survive. If there is no pond or stream on the property, consider including a birdbath in the landscape design. However, if there are cats in the neighborhood, birdbaths should be placed safely out of their reach. Be sure to change the water regularly to keep mosquitoes from breeding in the standing water. If there is a body of water on the property, consider planting native wetland plants alongside it to help keep the water clean and provide habitat for wetland creatures.

3. **Cover:** All animals need a place to hide from predators, raise their young, or overwinter. Try planting in multiple layers: tall trees, then shrubs, and finally grasses and low-lying flowers (see the picture below). This diversity will provide cover for many different animals, while looking attractive. Try not to remove dead trees, logs, and leaves unless they present a safety hazard. This organic debris provides food, shelter, and nesting cavities for numerous birds, small mammals, and beneficial insects.



Attracting Butterflies²²

- There are 126 types of butterflies found in Massachusetts, all of which can add color and excitement to a landscape design.
- The key to attracting butterflies is knowing which types live in the area, and choosing the right plants. Books and the Internet are good sources of information on this subject.
- Caterpillars, the juvenile form of butterflies, tend to eat the leaves from trees, shrubs, and some herbaceous plants. Adults tend to drink the nectar from flowers. Make sure to include food for both their life stages.
- Butterflies like to stay warm, so place a few rocks or garden sculptures in your yard that they can rest on. They will also need water to drink, so place a shallow dish of water near their source of food.
- Here is just a small sample of Massachusetts' butterflies and their food preferences:
 - **Tiger Swallowtail** (wild cherry, birch and willow trees, various flowers)
 - **Clouded Sulphur** (various flowers)
 - **Great Spangled Fritillary** (violets, thistles)
 - **Monarch** (milkweed, lilac, thistles, goldenrod)

4. **Space:** Different species of animals require different types and sizes of territory to find cover, food, and water. The more a yard is left in a natural state, the more animals it will attract. Any part of a yard that is not used for human activities can be devoted to wildlife habitat.

In the end, the kinds of animals attracted to the yard will depend on its location, the natural habitats in the surrounding landscape, the species of plants and their abundance in the yard, the size of the yard, and an amount of patience.

A word of caution, however, when attracting animals to a yard. Some animals are considered to be nuisances at times, such as deer, raccoons, and skunks. Appendices 1 and 2 list some plants that are deer-resistant. In order to protect property from animal damage, make sure there are no holes or cracks leading into the basement, attic, or underneath stairs. This will keep the animals outside where they can be appreciated. Also, if there is a fence around the yard, make sure it is as easy for animals to leave the yard as it is for them to enter. If an animal feels trapped in the yard, they may act in unpredictable ways.



2.3 Landscaping to Conserve Water

Although Massachusetts is blessed with relatively abundant rainfall and numerous rivers, lakes, and ponds, many cities and towns face voluntary or mandatory outdoor water restrictions each year. Towns put these in place to protect their water supplies and natural resources. The Ipswich River, for instance, runs dry or backwards at times due to the pumping of water from nearby town wells.

Many people falsely believe that lawns need to be watered every day to remain healthy. **Most lawns require a maximum of 1 inch of water per week from all sources (rain or irrigation).** In Massachusetts we receive four inches of rain a month, on average, thus most lawns in Massachusetts should be able to stay healthy with minimal (if any) amounts of additional watering. When a more extended dry period occurs, generally at the end of summer, it is normal for most species of turf grass to turn brown. Many grasses are not dead when they turn brown. They are merely dormant, and will turn green again after the rainier and/or cooler weather returns. Many yards suffer not because of a lack of water, but because they were planted on thin or inadequate soils. The best way to ensure a healthy and water saving yard is to ensure that there are adequate, nutrient-rich soils for the plants, and soils deep enough to retain water naturally.

Homeowners can reduce water use by reducing the amount of turf in their yards. For areas where a lawn-like look may be desired, use of native species of grass, such as various fescues, or low-lying herbs and mosses, can help to ensure a resilient, more drought-tolerant ground cover. For other parts of a yard or landscape, perennials, trees, and shrubs may need to be watered regularly during the first several years after they have been planted, but once established should survive on an average yearly amount of Massachusetts' precipitation without additional watering.

Water Saving Techniques

- Soaker hoses and drip irrigation systems for flower and vegetable gardens. These irrigation systems, which are available at many local garden centers, reduce the amount of water used on a yard. Soaker hoses look like a typical garden hose, yet they use up to 70% less water than conventional irrigation systems.⁴ Soaker hoses are made of a material that lets water soak out of the entire length of the hose, providing moisture to 18" of soil on each side of the hose. A 25-foot long soaker hose may cost under \$10, while a traditional garden hose could cost between \$15 and \$20. Drip irrigation systems are similar, except that they use small holes along the length of the hose to target particular plants along the way. Both these methods of irrigation work well in flower and vegetable beds, as well as rows of plants. They are not particularly useful for large grass lawns.

As stated earlier, there may be no need to water a lawn once it is established, depending on the species of grass and current precipitation rates. Installing a sprinkler or other irrigation system is not necessary for most Massachusetts homes. If an irrigation system is used, install a **rain gauge** and **cut-off valve**, which will help ensure the sprinklers do not operate if the lawn is wet enough from rain or previous watering. An installed **timer**, when used correctly, will limit the amount of time the

sprinklers are running, thus reducing unnecessary water use. As with any piece of technology, following the instructions that come with the device will help ensure that it is used properly.

- Rain barrels and cisterns, which are available at many local garden centers and cost between \$40 and \$100, can help reduce water bills. Place these under gutter downspouts and use the water for various plantings in the yard. Care should be taken, however, to prevent mosquitoes from breeding in the rain barrel water. One way is to add a thin layer of vegetable oil to the surface of the water, which will kill any existing eggs. Covering the rain barrel with a lid or screen is a good idea if the water will not be used right away. Scrub the barrel once a week to remove any mosquito eggs that may be attached. A typical rain barrel may not hold enough water to meet all watering needs, however, so place several around the home, or consider installing a larger (but more expensive) cistern system. Cisterns are underground tanks that store rainwater from roofs and other impervious surfaces for later use. These systems can be installed by many companies that are easily located on the Internet or Yellow Pages.

- Graywater can be used for irrigation of non-food plants, if done carefully. Graywater is water collected from sinks, bathtubs, showers, clothes washers, etc., and then placed on flowers, trees, or shrubs. Do not use graywater on anything humans might consume, or in lawn areas where people tend to gather, because it may contain a high amount of bacteria. Contact the Massachusetts Department of Environmental Protection^A for more information on operating a graywater system, or read up on a new state law pertaining to graywater.^B

- Xeriscaping^{TMC} is a landscaping process that incorporates plants and design features adapted to a specific region in order to conserve water. In short it means, ‘the correct plant in the correct place.’ In response to water shortages all over the country, many ecological landscapers are using native plants that have adapted to the precipitation rates of their surroundings. Xeriscaping can reduce outdoor water use by one-third.

2.4 Integrate Into the Surrounding Environment

^A www.state.ma.us/dep

^B www.state.ma.us/legis/laws/seslaw02/s1020176.htm

^C XeriscapeTM is a registered trademark of the National Xeriscape Council, Inc.

Fragmentation of natural habitats is a serious problem all over the world. Numerous plants and animals are threatened or endangered because of new human developments. One way to overcome this destruction of valuable ecosystems is to mimic the natural landscape of the surrounding area in the yard's landscape design. Habitat restoration can begin in anyone's yard. Look at the types of local plant species that currently exist and those that have been planted historically. These may give a good sense of the appropriate plants to use. For instance:

- ❖ Is there a wetland or other body of water on the property? If so, consider planting a buffer zone of plants around the water body, if one does not already exist. Choose appropriate non-invasive wetland plants, some of which can be found in Appendix 1. A list of all wetland plants in Massachusetts can be found on the Internet,^D or through the Massachusetts Association of Conservation Commissions (MACC).^E Invasive plants are included in the list, yet are unmarked as invasive, so use Appendix 3 to avoid the invasives. Wetland plants will help to stabilize the soil (thus preventing erosion), absorb any pollutants that could enter the water, and contribute habitat for wildlife.
- ❖ Is there a forest next to, or on, the property? Look at the types of trees growing there and consider planting more of the same, or other native trees that grow under the same conditions. By expanding the forest into the yard, there will be more space for wildlife and other forms of biodiversity.
- ❖ What part of Massachusetts is it? People that live on the coast have different environmental surroundings than those that live in the Berkshires or those that live in downtown Boston. For example, coastal areas should be planted with sand and salt tolerant plants such as Switch Grass, Seaside Goldenrod, and Bearberry, while yards in urban areas would benefit from pollution tolerant plants such as Elderberry, Sugar Maple, and Bee-balm.

^D Wetland Plants in Massachusetts: www.ipswichriver.net/hamiltoncc/sname.pdf

^E www.maccweb.org

No matter the location and existing surroundings, invasive species should not be planted. Decades of their use have turned many forests and wetlands into unnatural and undesirable areas. If invasive plants, such as the ones listed in Appendix 3, are found in the yard, they should be properly removed immediately.

2.5 Native Plants

Consider using native plants whenever possible. Native plants have adapted to the climate, insects, and soil types found in Massachusetts. Because of this, they may reduce the amount of pesticides, fertilizers, and water needed for a yard, as well as contribute to a more natural habitat for animals and other plants. Native plants may support 10 to 50 times as many species as non-native plants.⁵ Using native plants will also help to reduce pollution. By replacing traditional turf species, the need to use a gas-powered lawn mower will be reduced, thus lowering greenhouse gas emissions. A list of some of the plants that are native to the northeast can be found in Appendix 1. For a more complete listing of plants in Massachusetts, consult The Vascular Plants of Massachusetts, listed in Appendix 5.

If a non-native species is planted, make sure that it is not on the list of invasive species found in Appendix 3. These plants are capable of rapidly taking over a backyard and spreading to neighboring yards and parks, while pushing out existing plants and destroying habitats. Once they become established, invasives are very difficult and costly to remove. Fortunately many plants, even ones that are not native to the northeast, are not invasive. Many of them can be used in Massachusetts, but keep in mind that these plants generally do not provide food, cover, and nesting habitat for native wildlife. A partial list of plants that are not native to the northeast, but are nonetheless low-maintenance and not aggressive in the Massachusetts climate, is provided in Appendix 2. When selecting plants for the yard, make sure that they will tolerate the specific soil, sun, and moisture conditions. Choose plants wisely, and do not be afraid to ask a horticulturalist or native plant specialist for advice. The Massachusetts Horticultural Society has a Master Gardener hotline,^F which can offer suggestions. The New England Wild Flower Society staff is another valuable resource.^G

CHAPTER 3 DESIGN GUIDE

3.1 A Few Simple Steps



^F Master Gardener hotline, (781) 235-2116

^G NEWFS, (508) 877-7620

Ecological landscaping can be as involved as a homeowner desires. What this means is that an entire yard can be changed to incorporate ecological principles, or one or two small steps can be taken to add to the environmentally-friendly nature of the yard. The following suggestions are included for those people who may not have the time or desire to change their entire landscape, but who still wish to protect the environment in some small way.

- If you have a turf lawn, stop adding water, chemical fertilizers and/or pesticides. Leave clippings on the lawn, mow high (3 inches), and use ¼ inch of compost. DEP's "Don't Trash the Grass" brochure^H can give advice on recycling grass clippings.
- Plant a tree or shrub that bears fruit or nuts. Appendices 1 and 2 list several such plants. These plants may not only provide food for wildlife, but for people as well. Consult the New England Wildflower Society for information about which fruits/nuts are safe for human consumption and which are not. Avoid planting fruit- or nut-bearing trees and shrubs near sidewalks or driveways, because the fruits or nuts can be messy and/or dangerous to passersby.
- Plant some flowers that are known for their nectar. Plants in Appendices 1 and 2 that have an "I" next to their name are good for attracting butterflies and other beneficial insects, as well as an occasional hummingbird.
- Place a rainbarrel under a gutter downspout. This will lower the amount of household water needed for irrigation.
- If there are household pets, especially cats, keep them inside. Birds and other animals may not last long in a yard where there is a cat or dog roaming around.
- Buy a hand-powered push mower, electric lawn mower, or leaf rake to reduce air pollution emissions from gasoline.

^H www.state.ma.us/dep/recycle

- Visit a library, nursery or garden center, botanical garden, extension service, and the *Helpful Web sites* listed in this guide to learn more about native plants, or take advantage of the many workshops and courses offered by local organizations listed in Appendix 4.
- Tell friends, family, neighbors, and community members about ecological landscaping, and show them the environmentally friendly changes made in your yard.

3.2 Considerations for the Design Process

Perhaps the most important step of ecological landscaping is the design phase. In this phase, you maximize existing opportunities and evaluate how you might build on them in an efficient and effective transformation of your yard. The following considerations will aid in the creation of a successful ecological landscape.

- ✓ *Conserve the local biodiversity.* Biodiversity conservation is the ultimate goal of ecological landscaping. Whether you are a developer planning a landscape for a brand new home or an amateur gardener converting a yard into a wildflower garden, keep as many existing plants as possible (unless they are on the list of invasive species in Appendix 3 and should be removed). Why spend money removing a plant, just to put something new in the ground that may not live more than a few years? This is especially important when it comes to trees, which are costly to purchase, take many years to grow to maturity, and are susceptible to damage when young. If the tree is not in the way of a building or utility, keep it. These existing plants will give you a sense of what else to plant. If something is already growing and well established in a yard, it will usually require less care and expense to maintain than new plants.
- ✓ *Choose a sensible time to plant.* In order to promote optimum root establishment and receive enough precipitation, the best months for planting are September through October for trees and shrubs, and April through May for herbaceous plants. If plants are placed in the ground during the summer months, there may not be enough precipitation, and the heat could dry them out. Planting after October may not give the plant enough time to settle in and develop roots to survive the winter.

- ✓ *Protect the surrounding environment.* If there is a stream or pond on the property, establish or retain a naturally vegetated buffer between it and the home. If your yard is near wetlands or a local waterway, be sure any landscaping project undertaken is in compliance with the Massachusetts Wetlands Protection Act and River Protection Act. These laws require a permit to make changes within 100 feet of a wetland, and 200 feet from a stream or river. The local Conservation Commission can be of assistance. Make sure that the construction process does not contribute to erosion, by covering exposed sites using silt retention barriers.

- ✓ *Retain the existing soils.* During the development of a new home, stockpile and re-use the existing topsoil instead of removing it. Having good soil is one of the strongest keys to growing good plants. By bringing soil in from somewhere else, invasive weed seeds may accidentally be spread into the yard, and plants growing from these seeds will be hard to remove once established. Keeping the existing soil in place also saves money. If the home is located in a natural setting, try to continue the woods, meadow, etc., into the landscape, instead of trying to create a whole different “unnatural” habitat. Ecological landscaping seeks to achieve harmony between nature and house yards.

3.3 Complete Design Process Steps

The following steps will provide a homeowner with some models of ecologically landscaped yards. Remember, any step taken in the right direction benefits the homeowner and the natural world, such as reducing lawn watering, reducing pesticide and fertilizer application, removing invasive plants, and planting a few wildlife-friendly food plants. The entire yard need not be transformed, nor must all the steps listed below be followed, to make a beneficial difference.



STEP 1. Map out the yard

Some factors to take into consideration when mapping out the yard include the amount of sun or shade, the direction of the wind, the steepness of the terrain, whether the area is well drained or collects water after rainfall, the plants that are already growing naturally, and the type of soil (sand, clay, loam). Be sure to draw in existing buildings, installations such as septic tanks and gas lines, and other features such as streams, ponds, log piles, etc. Keep in mind the land outside of the yard as well. Is the yard near a stream, woods, or an urban neighborhood full of buildings? This should influence how and what

to plant. For instance, if there is a stream nearby, consider planting a buffer of trees and other native plants to protect the water from run-off and to create habitat.

STEP 2. Test the soil

Good quality soil is the basis for a healthy and successful landscape. Soil conditions not only vary from state to state, but also vary from one area of a yard to another. Plants require various nutrients in order to grow strong and healthy. Nitrogen, phosphorus, and potassium are nutrients required in various levels for different plants. Determining the pH level – whether the soil is acidic, basic, or neutral – is important because the pH level determines what nutrients are available to the plants. Certain plants will only grow in acidic soils. It is also highly recommended to test for lead and other pollutants in the soil, especially if the homeowner has children or plans to grow edible plants. While home soil testing kits are available at garden centers, and cost between \$10 and \$20, they are not very effective. They will only give a general sense of the quality of the soil and cannot give information about which nutrients are missing. An alternative approach is to send soil samples to the University of Massachusetts Cooperative Extension in Amherst.¹ They will be able to provide information on the organic content, and analyze micronutrients such as zinc, iron, and copper upon request. Basic soil testing through their program costs \$8 per sample. A more in-depth analysis may cost more. Several soil samples may need to be taken, depending on the plants that will be used and the makeup of the yard. Once the soil conditions are known, add organic fertilizers and other soil amendments as needed, based on the results of the soil test.

STEP 3. Design for Do-it-Yourselfers and Landscape Designers

There is no rule of thumb behind hiring a landscaper or doing the work yourself. Many landscapers that use ecologically sound practices can be located on the Internet, or through local garden centers. The Ecological Landscaping Association^J can be of assistance in locating a knowledgeable landscaper.



Remember that a yard can be broken into small, manageable sections in order to convert it over time. Do not set goals too high, or the project may become overwhelming. Whether the work is done by the homeowner, or with the help of professionals, there are several design elements to consider.

¹ Umass Soil Testing Lab, (413) 545-2311, or soiltesting@hotmail.com

^J ELA, (617) 436-5358, or www.ela-ecolandscaping.org

Design Considerations

- Yard Use
- Mulch
- Terraces, raised beds, and planters
- Sample designs

• **Yard Use**

Again, consider what the yard is used for, and future plans for the yard. If children will be using the yard, will they need to have room to run around and play? Are there pets in the household? Does the homeowner want room to barbeque and throw parties? If not much human activity occurs in the yard, the amount of lawn can be reduced to a minimum. Because the way a yard is designed will determine the benefits it offers – whether it contributes to reduced pollution, food for wildlife, a savings of time and money, or visual beauty – the design process should be a thoughtful one. While it may involve on-going modifications over several seasons, there is no substitute for careful planning up front.

• **Mulch**⁶

Mulch has many benefits. Not only does it look attractive, but it also keeps the soil moist and its temperature moderate, prevents erosion, and suppresses weed growth. A thin layer of mulch, preferably laid down in the fall, will help retain soil quality and minimize potential drought damage in the summer.



• **Terracing,⁷ Raised Beds, and Planters**

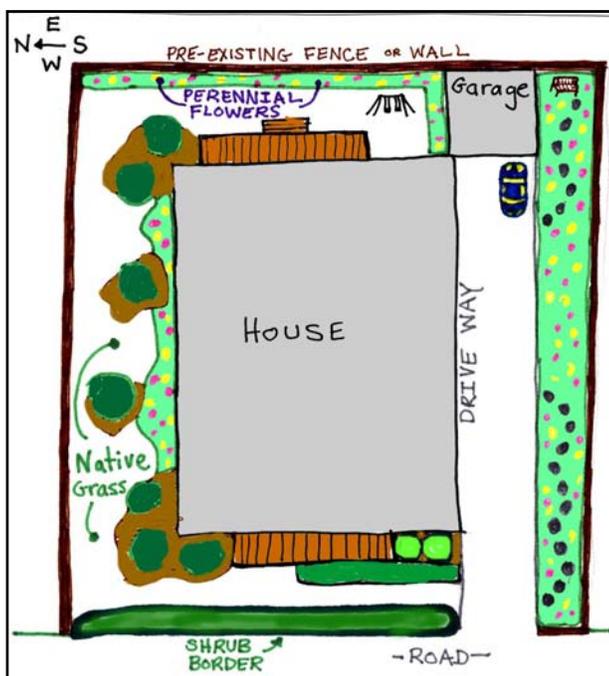
Terraces are particularly useful on steep slopes where they prevent erosion, but they can also add attractive dimensions to any yard. Terrace walls, raised beds, and planters can be constructed from many substances, including stone, brick, concrete, recycled plastic, and wood. Avoid chemically treated wood, especially around vegetables and fruits, because the chemicals could affect the surrounding soil and water quality. Terraces, raised beds, and planters can be especially useful for plants that have a tendency to spread if not contained, like strawberries.

• **Sample Designs**

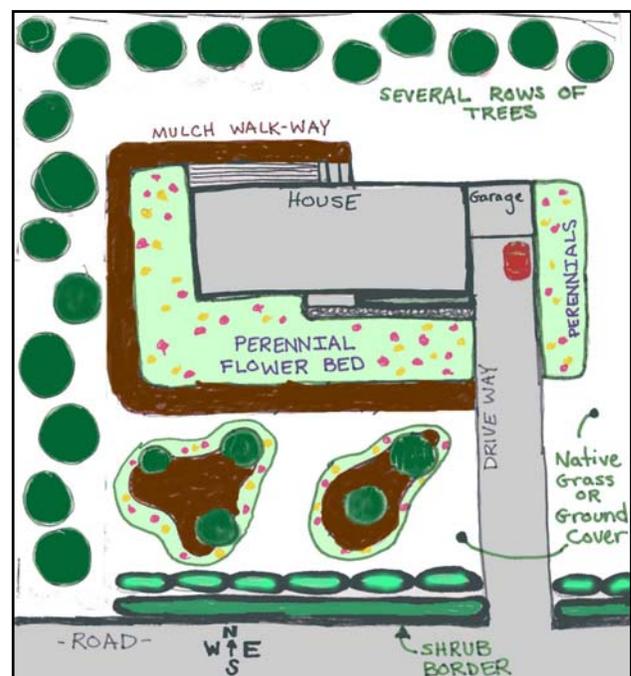
The illustrations below show possible landscaping designs. Notice the use of varying layers of plants, from tall trees to low ground covers. Diversity in the vegetative structure serves several purposes, such

as diverse habitat for various animals, an attractive screen for privacy or to hide unsightly views, and as a barrier to wind. By planting trees on the north and western sides of a home, cold winter winds will be reduced, thus lowering the amount of money spent on heating by as much as 25%.⁸ Be sure to plant small trees a minimum of 5 feet away from the house, and medium to large trees a minimum of 15 to 20 feet from the house. These distances will protect the house from roots and branches. Two rows of evergreen trees work best to block the wind, but five to six rows of deciduous trees (those that lose their leaves during the cold months) will work just as well. If there is not enough room in the yard for this many rows of trees, plant as many as possible to maximize their wind blocking results. Use imagination and creativity when designing the yard, and remember that the design can be implemented slowly over time to accommodate money and time constraints.

In the small and large yard drawings, the square footage of the houses are the same. What differs is the amount of yard space available. Regardless of how much yard space there is to work with, ecological landscaping can be done.



Small Yard Design



Large Yard Design

STEP 4. Select the Plants

Choosing the proper plants is an essential step in any form of landscape design. Different varieties of plants grow under different soil, water, slope, and sun conditions. By selecting the appropriate plant for a specific location in your yard, there is a higher chance of the plant growing successfully.

- Native plants, those that have grown in Massachusetts since before the first European settlers arrived, have become adapted to the variable climate, soil conditions, and pests that inhabit this region. They tend to require less water and fertilizers, and may be more disease resistant than their non-native counterparts. A list of plants that are native to the northeastern United States can be found in Appendix 1. These plants are available at local garden centers and nurseries, either the original variety or hybrids and cultivars of the native species. Hybrids and cultivars hold one or more characteristics that the natives do not have, such as pest resistance or a brighter flower. While you may be tempted to purchase these hybrids or cultivars, truly native strains are better for the environment, particularly from plants originating in Massachusetts or the northeastern U.S. Native plants have evolved to fit in well with the existing ecosystem. Similar hybrids or cultivars may not be as well adapted and will not represent conservation of the local plants of the region. In any case, when purchasing natives, make sure they will grow under the conditions of the yard.
- Be aware that some native plants are collected from the wild, thus threatening their populations. When buying a native plant, be sure to ask where it came from. Was it propagated on-site, or supplied by a company that collects plants from their wild habitats? The Massachusetts Endangered Species Act (MGL Ch. 131A) and its regulations (321 CMR 10.00), prohibit over 250 species from being collected in the wild, and a couple of older state laws prohibit wild collecting of any native orchids, wild azaleas, cardinal flower, or mayflowers (i.e., trailing arbutus) without written permission of the landowner. Nevertheless, there are still over 1250 native species that can be collected legally in the Commonwealth with landowner permission and used for landscaping purposes. While the Massachusetts laws do not prohibit the legal purchase and importation of regulated species from other states or countries, conservation biologists prefer that this not be done for a number of reasons, including the potential for disease introduction or the mixing of gene pools (nonindigenous plants crossing with indigenous ones). The New England Wild Flower Society^K can provide information about obtaining ethically propagated seeds and plants. Other sources of information on

^K www.newfs.org, (508) 877-7630

obtaining native plants are the Massachusetts Horticultural Society,^L the Arnold Arboretum in Jamaica Plain,^M and the Berkshire Botanical Gardens.^N

- Non-native plants have been brought to New England from all over the world, including countries with tropical or subtropical climates. Some or many of these plants require additional resources in order to survive through Massachusetts' highly variable climate. Plants that are not native to the northeastern United States should be avoided whenever possible, unless they have been shown to grow in the New England climate without needing extra water or other valuable resources. Appendix 2 presents a short list of non-native plants, and some hybrids, that will survive in Massachusetts. In addition, invasives, those non-native plants that spread quickly and displace native plants and animals, should not be used. A list of some plants that are invasive in Massachusetts can be found in Appendix 3. Many invasives are still sold in garden centers, nurseries, and on the Internet. Therefore, learn how to identify them and choose native alternatives. Pictures and descriptions of invasive plants can be found in plant field guides.

- In selecting plants, choose perennials over annuals as much as possible. Annuals are plants that live for one year. While some annuals self-seed, they generally need to be replanted each year. Perennials, on the other hand, are plants that will continue to grow for many years and generally provide the greatest habitat value. These may be trees, shrubs, vines, or even herbaceous plants that die back to the ground in winter and grow again the next spring. Because perennials require less gardening effort, they should be the mainstay for creating a low-maintenance landscape.

- The information presented in Appendices 1 and 2 should help in the plant selection process. Compare the results of the soil test to the descriptions in the Appendices. Make sure to choose plants that tolerate the pH, nutrient, light, and moisture levels of the yard. In addition, consider the uses for which the yard will be used. Areas where there will be a lot of foot traffic should be planted with grasses or other hardy ground cover. On steep

^L www.masshort.org

^M www.arboretum.harvard.edu

^N www.berkshirebotanical.org

slopes, use plants with deep or thick mats of roots. That will help stabilize the soil and prevent erosion.

CHAPTER 4 MAINTENANCE GUIDE

Once the ecological landscape is in place, how can its health and beauty be maintained while minimizing the time and money put into it? This section describes simple methods for easy maintenance of your ecological landscape.



a) Watering

Yard Maintenance

- a) Watering
- b) Regulating nutrient levels
- c) Composting
- d) Mulching
- e) Mowing and Raking
- f) Pruning and Weeding
- g) Pest management
- h) Costs and benefits

Normally, if native plants have been appropriately chosen for existing soil, moisture, and light conditions, they should need to be watered only during the first several years after planting. Since water restrictions during times of drought can limit public water supplies to essential water uses, such as drinking, bathing, and fire protection, be sure to save rainwater in barrels. Avoid planting or transplanting during the summer months when water is less available.

If the yard is watered, make sure to water deeply. One inch of water per week on a yard will sink to a depth of 4-6 inches, depending on the soil type. Watering deeply during the spring and fall growing seasons encourages plant roots to grow deeper and keeps plants healthier. Deep roots also help prevent

erosion.

Remember, if it has rained at least an inch in the previous week (this can be determined by water levels in a bucket placed in the yard), watering is not necessary. If there are automatic sprinklers in the yard, be sure to install a rain gauge, which will help prevent the sprinklers from going on during or after a rainstorm.

The amount of water you use on a yard will also depend on the soil content. Clay soils do not allow much water to seep through, while sandy soils drain water very quickly, thus requiring more water. To improve the quality of irrigation in a yard, placing 6" of loam (soil with adequate organic material) on the ground will help hold water and add nutrients for the plants.

The best time to water a yard is the early morning. Watering during midday or the afternoon is less effective, because the sun will evaporate much of the water, thus increasing humidity and drying out your plants. Watering in the evening raises the chances of fungal disease developing; but if the yard cannot be watered during the early morning, evening is preferable over midday and the afternoon. Placing mulch around plants, at least one inch away from trunks, will help to retain moisture, thus reducing the amount of water required.

For more information on lawn watering, please refer to The Massachusetts Executive Office of Environmental Affairs' *Guide to Lawn and Landscape Water Conservation*.^O

b) Regulating Nutrient/Fertilizer Levels

After the initial testing, test the soil every three years. Soil composition may change over time, thus affecting the plants in the yard. If the pH needs to be raised, work some lime or wood ash into the soil with either a spade (for small areas), or a rototiller (for larger areas), based on recommendations from the soil testing lab. Be sure to follow the instructions on the organic fertilizer bags to ensure the recommended dosage is used. Leaving grass clippings on a lawn, or using compost, can help keep nitrogen and other macronutrients at optimum levels. Leaving clover in a yard will also provide a valuable supply of nitrogen. If these sources do not work well enough, use vegetable meal or fish emulsion.

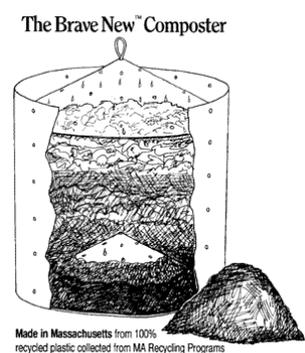
To increase the phosphorous level of soil, use compost. To increase the potassium level, use compost or seaweed. There are various ways to increase the micronutrient levels of your soil. Please refer to the NOFA Organic Land Care Standards⁹ or UMass Cooperative Extension,^P for suggestions.

Typically, most native plants do not need fertilizer once they are established and growing well. However, if fertilizers are applied, apply these forms of nutrients only once or twice a year. Make sure not to over-do it, as any excess may run into and pollute the groundwater or other bodies of water. Even organic fertilizers can cause problems for plants and the surrounding environment when they are used in excess. Too much fertilizer can burn a plant, and/or cause it to become dependent on the fertilizer.

c) Composting

^O www.state.ma.us/envir

^P www.umass.edu/umext/programs/agro/ipm



Composting is an easy way to add nutrients to your soil, improve its structure, and help it retain some of its moisture. Compost, which is the result of a controlled process of decomposition, can consist of many materials, such as grass clippings, dead leaves, fruit peels, eggshells, shredded newspaper, paper towels and napkins, and coffee grounds. Do not compost poison ivy, for the toxic oils may survive the composting process and cause itchy rashes if touched. Home composting is also not recommended for invasive plants, because the conditions may not be adequate enough to fully destroy the seeds, thus leading to a potential outbreak of the invasive plants. Compost bins can be bought at various garden centers ranging in price from \$30 to \$150, or made at home using chicken wire or garbage cans with holes drilled in them. Many towns offer residential composting pick-up or low-cost compost bins, as shown in the drawing above, supported through a grant from DEP. Please refer to DEP's "Home Composting: A Guide to Composting Yard and Food Waste" for easy composting instructions^Q.

Composting: Three Easy Steps

1. Add three parts "browns"...

Fall leaves, straw, salt marsh hay, shredded paper and cardboard (newspaper, paper towels, paper plates, paper bags), chipped brush, sawdust, pine needles (pine needles should not make up more than 10% of total material in pile)

...and one part "greens"...

Grass clippings, vegetable and fruit wastes, seaweed, eggshells, coffee grounds and filters, tea bags, manure (horse, cow, rabbit, chicken, goat, gerbil, etc., NOT dog or cat).

2. Mix or layer materials...

After every 12" or so, add a few shovels full of rich soil or compost.

3. Keep it damp and aerated. Within a few months, there will be compost for your soil.

d) Mulching

Mulching will help keep the number of weeds in a yard to a minimum. It will also reduce the amount of time spent watering. Periodically check the thickness of the mulch. Refresh mulch on occasion if spots of the ground can be seen through the mulch. Remember to pile no more than 2-3 inches total, because excess mulch can damage plant stems or prevent water from entering the ground.

There are many types of mulch available, some of which are listed below. When possible, choose recycled mulches or make your own out of shredded leaves. Recycled mulches not only cost less

Types of Mulch

1. Bark
2. Wood chips
3. Leaves
4. Newspaper
5. Hay and straw
6. Buckwheat hulls

^Q www.state.ma.us/dep/consumer/compost.htm, or (617) 292-5834.

than virgin material mulches, but reduce the amount of materials going into landfills and use less natural resources when they are produced.

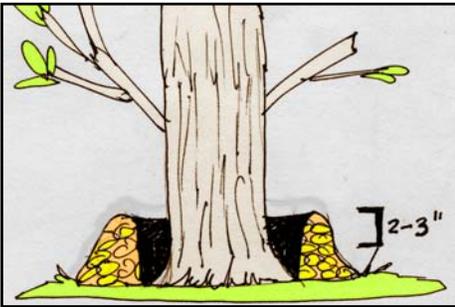
1. Bark mulch

Apply no more than 2-4 inches of this around trees, shrubs, and perennial gardens. As with all mulch, leave at least one inch of space between the mulch and the tree, as shown in the top illustration. Do not pile the mulch against the base of trees or homes. Known as donut mulching, the wrong way to mulch is shown in the bottom illustration. If the decomposing mulch covers the tree's base, it can rot away the bark of the tree, exposing it to insect damage, disease, and possible death. The mulch could also cause rot or other damage to the foundation of a home, if placed up against it.

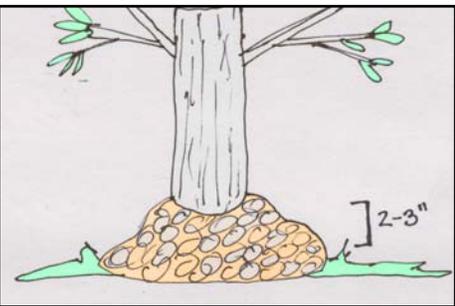
2. Wood chips

Like bark mulch, no more than 2-4 inches is necessary. While wood chips are commonly used as mulch, there are drawbacks. Ants and other insects may be attracted to the wood chips. Fresh wood chip mulch can deplete the nitrogen in soil, instead of allowing the plants to take it into their roots.

The correct way to use mulch



The wrong way to use mulch.



3. Leaves

Chop autumn leaves and spread them 3-4 inches deep. Running over leaves with a lawnmower will help create this mulch.

4. Newspaper

Lay down no more than ¼ of an inch of black and white paper. As this type of mulch can easily blow away, make sure to cover it with 3 inches of other mulch material or stones. Do not use colored pages, as they will bleed dyes into the soil.

5. Hay and straw

Works particularly well for vegetable gardens, but straw may harbor weed seeds. Choose a salt marsh straw or hay to avoid this problem. Hay and straw break down easily, so more will have to be added frequently.

6. Buckwheat hulls¹⁰

Half an inch of this mulch will keep soil moist and block weeds. This mulch is not always readily available at garden centers, can easily blow away, and is expensive for large areas.

e) Mowing and Raking

If some traditional lawn is kept in the yard, it will probably need to be mowed. Here are some guidelines to help ensure healthier grass with minimal energy inputs. If the yard is small, consider buying a hand-powered push mower or electric mower, in lieu of the typical gas-powered mowers. Traditional forms of turf grass are healthiest when kept at a height of at least 2-3 inches. Try to remove only 1/3 of the plant height at a time, and keep mower blades sharp to avoid unnecessary tearing. When using a gas-powered mower, try to mow during the early morning or late evening to avoid contributing to smog during the heat of midday. When mowing tall grasses, consideration should be given to nesting birds and mammals in the spring, and to flowering plants in the summer. Fall or late winter mowing allows plants to go to seed and minimizes impacts to animals.

For dead leaves, use a lawnmower to shred the leaves and leave them on the lawn where they will decompose. Or, rake them into a compost bin where they will become a nutrient-rich source of humus for your spring plantings. Refrain from using a gas-powered leaf blower.

f) Pruning and Weeding

Pruning helps prevent diseases from spreading. Prune any dead or diseased branches. Keep the blades sharp and sterile to avoid damage to the plants. Refer to specific plant books on the proper pruning season and correct way to prune individual species. Ecological landscaping uses different principles of plant maintenance from those applied to traditional yards. While in a traditional yard the hedges may be pruned into box or even animal shapes, for an ecological landscape, allow the plants to retain their original shape. Natural forms are more likely to support wildlife, as nesting sites and food sources.

Weeding is not a necessary part of yard maintenance, but may be important in order to maintain a certain landscape effect. What constitutes a weed in a yard will depend on the homeowner's opinions of what is an unwanted plant. If possible, handpick weeds and all invasives before they go to seed, so that further outbreaks of these plants may be avoided. Place the weeds in a black or clear garbage bag and let them sit out in the sunlight for a week or more before sending them to a municipal compost center. This will ensure that the weed seeds are destroyed before they are composted. If there are too

many weeds to handpick, use a hoe, rotoliller, or the least toxic herbicide available and follow the instructions on the label or ask Department of Food and Agriculture^R for advice.

g) Pest Management

As there are over 900,000 known species of insects,¹¹ homeowners can expect to find many different insects in their yards. While some insects can be considered pests, because they eat perennials or turn your grass brown, the majority of insects in a yard are harmless or beneficial. If a chemical pesticide is used on a yard, both the “bad” and the “good” insects are likely to be killed. Fortunately, there are alternative strategies to pest management that are more ecologically sound.

Integrated Pest Management, or IPM, is an ecologically based approach to yard care that helps minimize pest problems by maintaining strong, healthy plants. IPM is a practice frequently used by landscapers, but is not so complicated that homeowners cannot learn to use it as well. The key to a successful IPM system is keeping plants healthy from the beginning, before problems show up. Healthy plants originate in part from healthy soil, so be sure to feed the soil by using compost and mulch. Also, having a diversity of healthy plant life in a yard will help to ensure that major pest outbreaks are minimized.

The DFA’s Pesticide Bureau has released a booklet on Integrated Pest Management, entitled, *A Homeowner’s Guide to Environmentally Sound Lawncare: Maintaining a Healthy Lawn the IPM Way*.^S While the DFA’s guide focuses on turf care, the same principles can be used for an ecologically landscaped yard. Another good source of IPM

Attracting Bats

Bats have a bad reputation among many people, but they are actually quite helpful to humans. One bat will eat up to 600 mosquitoes in one hour.²⁵ Bats are also helpful pollinators of many flowering plants.

There are nine species of bats in Massachusetts.²⁶ In order to attract them to a yard, it will be helpful to build a bat house.²⁷

Place this simple wooden box at least 15 feet above the ground, in an area of the yard that receives at least 6 to 10 hours of sunlight a day. Keep the box away from hanging branches, but near a good source of drinking water. These houses can be bought already made, or created at home. Either way, make sure the wood has not been chemically-treated. Instructions on how to build a bat house can be found in the MassWildlife Homeowner’s Guide to Bats, available for free online at www.masswildlife.org, or by calling (508) 797-7270.

Because bats eat insects, do not use insecticides in the yard. The bats should take care of many pest problems.

Bats are afraid of humans and will only attack if trapped or picked up. As with all wild animals, bats should be looked at, not touched.

^R www.mass.gov/dfa

^S www.state.ma.us/dep/pesticides/publications/homeowners.htm

information is available on the Cornell Cooperative Extension Agency web site.^T

The following text box gives some information on deer tick prevention. In Massachusetts, over 1,100 people (18.3 cases per 100,000 people) contracted Lyme disease in 2001. That is three times the national average of 6.3 cases per 100,000 people.¹² Any yard could potentially harbor deer ticks, but those that attract wild animals in nuisance numbers are more likely to do so. Care should be taken during the design period to minimize the risks, while still creating a safe natural environment. As stated earlier, Appendices 1 and 2 list some plants that deer do not like to eat or that will keep them out of a yard. If there is a deer problem in the area, consider planting these species.

Protection from Deer Ticks²⁸

- Deer ticks are transmitted mainly by deer and white-footed mice. Both of these animals need to be present in order for deer ticks to thrive. The larvae live on the mice, while the adult ticks live on the deer.
- If deer ticks bite and remain on your body for 12 hours or more, they could possibly transmit Lyme disease.
- Deer ticks like moist areas, so keep areas where people will be sunny and dry.
- Ticks tend to live in dense shrubs and tall grass. If deer are a problem in the area, keep heavily used areas of the yard mowed regularly, and use those plants listed in Appendices 1 and 2 that are shown to be deer tolerant.
- **The best protection from deer ticks and Lyme disease is to inspect yourself frequently while outside, and then again once inside. Get checked by a doctor if you have flu-like symptoms or if you are out in the landscape frequently.**
- The use of pesticides should be considered only in extreme tick infestations.
- Having wildlife in a yard does not necessarily mean there will be deer ticks, but remain alert to the possibility.

h. Costs and Benefits

As with any new yard, during the first year or two of a more ecologically-designed yard, more time and money may have to be spent watering the new plants, adding organic fertilizers or compost, and revising the landscaping plan. After this initial effort, a more naturalized yard will require less maintenance than a typical lawn. Instead of mowing every week or two as is typical for the traditional turf grass species, a natural meadow may only have to be mowed once or twice a year.



^T www.hort.cornell.edu/gardening/fctsheet/

Because large grass lawns are so common and appreciated by homeowners here in the United States, there may be some opposition if a homeowner suddenly stops mowing the grass and starts planting tall wildflowers. Town officials may tell them to cut the grass or pay a fine for violating the town’s “weed law.” Before starting a significant conversion to ecological landscaping, consider looking into what is and is not allowed in the local community. While EOEA and other organizations are working to encourage local governments to modify their weed laws to incorporate ecological landscaping, this may not happen overnight in all Massachusetts cities and towns.

Once municipal requirements have been determined, consider listening to the feelings and concerns of the neighbors. There are several things you can do to help them appreciate, and even learn from, these landscaping changes.¹³

- Placing a border around a yard makes it clear that the yard is a result of planning and design, not just laziness. This border can be made of lawn, a neatly trimmed hedge, a row of perennials, or a stone or woodchip path. This border can help keep the plants in one yard from creeping over into the neighbors’ yards, and act as a frame for a picture-perfect yard.
- The key to winning neighbors’ support is to remember that everyone has different likes and dislikes. One person may prefer asters and dogwoods, while others may prefer roses and rhododendrons. Do not try to force them into liking the yard. Instead accept these differences and let them know how much their support would be valued.



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- Before beginning, consider letting the neighbors know what is being planned, and why. Let them know there are benefits of ecological landscaping. Get a survey done through the local zoning or planning board to figure out property boundaries. That way, there will be no mistake as to where things can and cannot be planted. Once the yard is complete, a homeowner can continue the educational process by placing a sign in the yard, such as the one shown on the left. Make one, or join one of the many ecological organizations around the country that supply their own signs, such as the Environmental Protection Agency’s Wild Ones Program¹⁴ or the National Wildlife Federation’s Backyard Wildlife Habitat Program¹⁵.

- Remember that the entire yard does not need to change all at once. In fact, by starting small, expenses can be reduced, time outdoors can be enjoyed more, and the possibility of angering the neighbors will be reduced. Nature often works slowly over time. Homeowners can do the same.
- Adding some human touches to the yard will make people feel more comfortable in and around it. Stone or gravel paths, benches, and bird feeders serve a purpose, and welcome people to enjoy and explore the natural setting.
- Working in conjunction with neighbors can help save them money too. Trees in a yard may act as a windbreak for the neighbor’s house as well as yours, reducing their winter heating costs. Share with them the opportunity for potential savings and see if they are willing to share in the landscaping responsibilities. Working together, plants can be purchased in bulk, and ecological design and maintenance services may be obtained at a discount for multiple properties, thus saving money for all the homeowners. If the neighbors realize the benefits, they may be more willing to participate.

CHAPTER 6 MASSACHUSETTS CASE STUDIES

There are numerous examples of beautiful ecological landscapes throughout Massachusetts. Here are case studies of successful ecological landscaping to highlight a few of these efforts. In addition, Appendix 6 summarizes the work of other organizations around the state to encourage ecological landscaping, whether through educational programs, demonstration landscapes, or changes in government policies. Feel free to contact these organizations for more guidance and information.

6.1 Organizations

The Marblehead Pesticide Awareness Campaign (MPAC)

MPAC’s “Living Lawn” program focuses on creating healthy lawns and gardens by reducing the use of synthetic chemical pesticides. MPAC created a 2,000 square foot demonstration lawn and garden in Marblehead, where people can visit and get ideas for their own yards. They have a brochure entitled, “Simple Steps to a Living Lawn,” which can aid homeowners in creating a similar site for their own homes. MPAC’s program has been so successful that it has been duplicated in other towns, including Wellesley, Swampscott, and Andover. More information can be obtained online,^U or by visiting the Living Lawn on Everett Paine Boulevard in Marblehead, MA.

^U www.livinglawn.org

The New England Wild Flower Society (NEWFS)

This organization owns and manages Garden in the Woods, a botanical garden specializing in native plants and has New England’s largest native plant nursery and arboretum. In addition to selling native plants and seeds to homeowners and landscapers from mid-April through September,



their wildflower gardens, which showcase over 1500 different kinds of plants, are open to visitors. The gardens range from wildflower meadows to rock gardens to shady hillsides covered with native shrubs, trees, and perennials. For a small admission fee, spend the day walking the winding paths getting inspiration for your own yard, or check out their exceptional library. At different times of the year there are workshops covering such topics as “Residential Landscape Design,” “Aggressive Invaders,” and “Plants and Landscaping that Save Water.” For more information, look online,^v or travel to Garden in the Woods, located at 180 Hemenway Road in Framingham, MA.

The Easton Water Department



Picture by Mike Walsh

This organization created a garden at their headquarters at 417 Bay Road, Easton, MA in 1982 that focuses on the principles of xeriscaping, using native perennials that require little to no water. This garden acts as a model for homeowners all over the Commonwealth and was featured on the Garden Federation of Massachusetts garden tour in 2000. The garden features wide walking paths, a rain gauge, an information kiosk, an arbor, and two benches. For more information, please contact John Marsh.^w

The Ipswich River Watershed Association (IRWA)

The IRWA has several ecological landscaping sites that demonstrate the variety of possibilities available to homeowners. At a Habitat for Humanity site, the IRWA is partnering with the Executive Office of Environmental Affairs’ Coastal Zone Management Office, to create a site in Ipswich, MA that will include signs about native plants, rainbarrels, infiltration devices, and interactive gardens. In Essex, MA, the IRWA worked with homeowners to create an educational garden. Turf and impervious surfaces were removed and pasture plants, ferns, and other native species were planted in their place.

^v www.newfs.org, or (508) 877-7630.

^w johnmarsh@easton.ma.us or (508) 238-3641.

What makes this site so unique is an underground piping system that infiltrates roof and driveway runoff, channeling it to a 10,000-gallon underground cistern that is used to water the vegetable garden. This alleviates the water problems on the site, preserving the tap water for drinking and other indoor uses. All the costs of this system were paid for by the homeowners, not by the IRWA. Another special element of this site is the fact that many of the existing plants were left intact, not removed during the renovating process. This kept costs down, and retained the natural characteristics of the area. To learn more about these sites, you can call or visit IRWA's Web site.^x

6.2 Homeowners

- **Vicki Gartland**, a resident of Newton, MA, turned her front and side yards from a water-intensive lawn into a garden of flowers, shrubs, and trees. In May of 2001, Vicki hired environmental landscapers to design and install various plants that would require less water and maintenance. The installation took four days to complete, and the results have been well worth it (see pictures below). Among the creeping phlox, bearberry, river birch, and sedum are walkways and a bench that helps “break up the yard, making it feel more inviting to walk through.” Vicki decided to change her lawn because the sandy soils required that she water her lawn at least two to three times a week in order to keep it green. Now she collects rain water in rain barrels and waters the plants by hand on an infrequent basis. Although Vicki's new yard is atypical of the other yards in her neighborhood, she has received many compliments from passersby, and not one single complaint. Vicki said that, “People are amazed by my yard.” She also recommends that people who are planning on changing their yard take their time, alter small areas at a time, and find a good nursery that supplies native and drought tolerant plants.

BEFORE



AFTER



Pictures by Vicki Gartland

^x www.ipswichriver.org or (978) 356-0418.

- **Peter Phippen** and wife **April Bowling** purchased a 200 year old home that was in need of some serious structural changes. Plans for the renovation included as many sustainable building practices and materials as possible given their budget and time frame. “It only seemed right to extend that philosophy to the grounds and landscape,” said Peter, “since much of it was disturbed prior to and during the renovation anyway.” They saw the use of native landscaping of their two acres as an opportunity to create a low-maintenance and low water use yard that would demand less time and resources. They were also sure to make use of existing vegetation whenever possible, such as an infiltration trench that channels runoff into a submerged 10,000-gallon underground cistern, which stores water for garden uses. Benches and a split-rail fence add to the aesthetic beauty of their butterfly bushes, weeping cherry trees, daylilies, and hostas. Some areas of lawn and driveway asphalt were replaced with native plants such as winterberry, foam-flower, viburnum, and mountain laurel. Those areas that remain lawn are composed of pasture and meadow mixes, most of which are not mown. All the changes took about one year, working off and on as time allowed. The response from neighbors has been “completely positive.” They held a landscaping workshop at their house as a demonstration model, and all 20 spots were filled. The Boston Globe has run two articles on their property (12 May 2002 and 29 August 2002), and it has received coverage on the Weather Channel regarding its benefits during drought. Peter has several suggestions for those considering an ecological approach to landscaping:

-
1. Make your landscape changes a part of your lifestyle – make sure they work for you and improve your overall quality of life.
 2. Tackle it in doable pieces with a coherent overall vision or design.
 3. Maximize wildlife habitat where possible – it adds immeasurable amounts of joy to see butterflies, rabbits, and birds that you have never seen before make your property their home.
 4. Use common sense – do not feel like you have to do it all or have a perfect landscape. Such high expectations paralyze you and make the project’s costs prohibitive.
 5. When possible, make changes in concert with other planned, major projects when equipment is on site and parts of your yard will be “torn up” and need replanting anyway.
-

- State Representative **Jim Marzilli** and his wife **Susan Shaer** bought their Arlington home in 1993, thinking that their 2000 square foot side yard would make a nice badminton and bocce court, the front lawn could be rejuvenated and the back yard would be their garden. Progress was made on the front and back, but nothing had changed on the side yard in four years. Jim then started to remove the lawn and replace it with a mix of plants native to the east coast, and their cultivars.



The first attempt to remove a portion of the lawn exposed old weed seeds, which germinated. The second attempt involved spreading newspaper five sheets thick over the lawn and covering the paper with soil and mulch to raise the level to the desired height, smothering the grass in the process. Holes were roughly cut in place for plants, which were added as the project gradually spread over the entire side and front yards.

Soaker hoses are placed throughout the property, and sprinklers are used only a few days each year during heat waves (always in the morning) to minimize water consumption. No chemical fertilizers or pesticides are used and compost plays an important role in the garden. Much of the spent plant material is left in place in the fall to maintain winter interest, and provide food and habitat for wildlife.

Jim and Susan's eight thousand square foot property no longer has turf grass. The side yard is a thriving mix of herbaceous plants and shrubs that provide year-round interest (see picture to the right). The front yard is a seven month long riot of color. The back yard is a cool woodland garden with a mix of unusual natives and exotics. The property is a haven for birds, butterflies, beneficial insects, and salamanders have returned to this densely populated suburban neighborhood.



Pictures by Jim Marzilli

Jim is working with his neighbors to create seamless gardens that spread across property lines and into public areas. In addition, Jim serves on two public-private partnerships organized by the U.S. Fish and Wildlife Service, working to restore native plant species and remove non-native invasive species. He initiated the "Green Streets, Green Cities" program whose volunteers are restoring urban green areas using volunteers and native plants.

You may have never stopped to notice it before, but many people around Massachusetts have been turning their yards into a more naturalistic setting, as the previous case studies have illustrated. The photos shown on this page were taken in the greater Boston area. Some homeowners have large yards to work with, while others have only a few square feet. Ecological landscaping can be done for any size yard. Homeowners all over are concerned with saving time and money, making their yards more attractive, and enhancing and protecting their little piece of the environment. Use this guide as a helpful reference for making your yard more ecologically friendly.



Some lawn can be replaced with attractive native shrubs (Medford, MA)



Vegetable gardens can be included in an ecological landscape (Sudbury, MA)

Appendix 1: NORTHEASTERN US NATIVE PLANTS²⁹

This is by no means an all-inclusive list of appropriate native plants for ecological landscaping. The plants listed here have been chosen for either their drought tolerance or wildlife benefits. For a greater selection of available choices, please contact a local botanical garden, extension agency, or native plant specialist. When choosing plants, always take into consideration the characteristics of your yard and soil.

PLANT SPECIES	COMMON NAME	WILDLIFE BENEFIT	EDIBLE BY HUMANS	DROUGHT-TOLERANT	POLLUTION TOLERANT	GOOD GROUND COVER	SHADY SOIL	SUNNY SOIL	COASTAL/ SALT TOLERANT	WETLANDS	MAXIMUM HEIGHT	SOIL CONDITIONS	ALTERNATIVE TO THIS INVASIVE SPECIES:
<i>Andropogon gerardii</i> *	Big Bluestem (G)	FH		✓	✓	✓	✓	✓		✓	5-8 FT	MOST soil types, acidic to neutral	
<i>Typha latifolia</i> *	Common Cattail (G)	FH	✓							✓	10 FT	Wet	
<i>Carex crinita</i> *	Fringed Sedge (G)	FH				✓		✓		✓	4 FT	Moist to wet	
<i>Schizachyrium scoparium</i> *	Little Bluestem (G)	FH		✓		✓	✓	✓	✓	✓	3 FT	MOST soil types, acidic to neutral	Smooth Brome, <i>Bromus inermis</i>
<i>Carex pennsylvanica</i> *	Pennsylvania Sedge (G)	FH		✓		✓	✓	✓			8 Inches	Dry, MOST soil types	
<i>Eragrostis spectabilis</i> *	Purple Love grass (G)	FH		✓		✓		✓	✓	✓	1-2 FT	Tolerant of sandy/ poorly drained soil	
<i>Festuca rubra</i>	Red Fescue (G)	FH		✓		✓	✓	✓	✓	✓	Several FT	Dry, not wet	
<i>Panicum virgatum</i> *	Switch/ Panic Grass (G)	FH		✓		✓	✓	✓	✓	✓	4-8 FT	Sand to clay, very tolerant	Japanese Silver grass, <i>Miscanthus sinensis</i> and Smooth Brome, <i>Bromus inermis</i>
<i>Tiarella cordifolia</i> *	Allegheny Foam Flower (P)	I				✓	✓				6-36 Inches	Moist	
<i>Monarda didyma</i>	Bee Balm/ Bergamot (P)	IF	✓		✓		✓	✓			2-3 FT	Moist	
<i>Sanguinaria Canadensis</i> *	Bloodroot (P)						✓			✓	3-8 Inches	Moist	
<i>Maianthemum canadense</i> *	Canada Mayflower (P)	F	✓			✓	✓				3-6 Inches	Moist	
<i>Phlox stolonifera</i>	Creeping Phlox (P)	I			✓	✓	✓	✓			6-12 Inches	Well-drained, moist	

PLANT SPECIES	COMMON NAME	WILDLIFE BENEFIT	EDIBLE BY HUMANS	DROUGHT-TOLERANT	POLLUTION TOLERANT	GOOD GROUND COVER	SHADY SOIL	SUNNY SOIL	COASTAL/SALT TOLERANT	WETLANDS	MAXIMUM HEIGHT	SOIL CONDITIONS	ALTERNATIVE TO THIS INVASIVE SPECIES:
<i>Maianthemum racemosum</i> **	False Solomon's Seal (P)	F	✓				✓			✓	1-4 FT	Moist	
<i>Phlox subulata</i>	Moss Phlox (P)	I		✓	✓	✓		✓			6-12 Inches	Well-drained, moist or dry	
<i>Aster novae-angliae</i> *	New England Aster (P)	I		✓			✓	✓		✓	4 FT	Moist	Japanese Knotweed,
<i>Helianthus annuus</i>	Common Sunflower (A)	iF	✓					✓		✓		Sandy to loam, acidic to neutral	
<i>Iris versicolor</i> *	Northern Blueflag Iris (P)							✓		✓	3-4 FT	Moist to wet	Yellow Flag Iris, <i>Iris pseudacorus</i>
<i>Viola sagittata</i> *	Ovate-leaved Violet (P)	I					✓	✓		✓	3-6 Inches	Tolerant of poor conditions, dry or moist	
<i>Solidago sempervirens</i> *	Seaside Goldenrod (P)	I						✓	✓	✓	2-4 FT	Well-drained, sandy soils only	
<i>Solidago bicolor</i> *	Silver-rod Goldenrod (P)	I	✓					✓		✓	2-3 FT	Moist to dry	
<i>Polygonatum biflorum</i>	Small Solomon's Seal (P)	I F	✓				✓			✓	1-2 FT	Moist	
<i>Liatris spicata</i>	Spike Gayfeather (P)			✓				✓		✓	3/4-2 FT	Dry	
<i>Solidago rigida</i> *	Stiff Goldenrod (P)	I		✓				✓	✓	✓	2-5 FT	Moist to dry	Garlic Mustard, <i>Alliaria petiolata</i>
<i>Comptonia peregrina</i> *	Sweet Fern (P)		✓	✓				✓			4 FT	Sandy	
<i>Solidago odora</i> *	Sweet Goldenrod (P)	I	✓	✓				✓			2-5 FT	Moist to dry	Garlic Mustard, <i>Alliaria petiolata</i>
<i>Coreopsis verticillata</i>	Thread-leaf Coreopsis (P)			✓				✓	✓	✓	9-15 Inches	Well-drained	
<i>Potentilla tridentata</i> *	Three-toothed Cinquefoil (P)			✓				✓	✓		4 Inches	Acidic, rocky/sandy and dry areas, well-drained	
<i>Aster divaricatus</i> *	White-wood Aster (P)	I		✓			✓	✓		✓	1-3 FT	MOST soil types	
<i>Asarum canadense</i> *	Wild Ginger (P)	F	✓	✓		✓	✓			✓	6-8 Inches	Moist	

PLANT SPECIES	COMMON NAME	WILDLIFE BENEFIT	EDIBLE BY HUMANS	DROUGHT-TOLERANT	POLLUTION TOLERANT	GOOD GROUND COVER	SHADY SOIL	SUNNY SOIL	COASTAL/SALT TOLERANT	WETLANDS	MAXIMUM HEIGHT	SOIL CONDITIONS	ALTERNATIVE TO THIS INVASIVE SPECIES:
<i>Gaultheria procumbens</i> *	Wintergreen (P)	F	✓	✓		✓	✓	✓		✓	3-6 Inches	Moist to dry, acidic	
<i>Amelanchier laevis</i>	Allegheny Serviceberry(S)	FH	✓	✓			✓	✓			13-30 FT	Acidic to neutral pH	
<i>Arctostaphylos uva-ursi</i> *	Bearberry (S)	F	✓		✓		✓	✓		✓	6 inches	Acidic to neutral pH	
<i>Aronia sp.</i> *	Chokeberry (S)	FHD		✓	✓		✓	✓		✓	6-10 FT	Dry and acidic, well-drained	
<i>Clethra alnifolia</i>	Clethra (S)							✓	✓		4-8 FT	Sandy, acidic	
<i>Vaccinium corymbosum</i> *	Common Highbush Blueberry (S)	F H	✓				✓	✓		✓	3-9 FT	Acidic, moist	Burning Bush, <i>Euonymus alata</i>
<i>Juniperus horizontalis</i>	Creeping Juniper (S)	F D		✓		✓	✓	✓	✓		1 FT	Tolerant of most pH's	
<i>Sambucus Canadensis</i> *	Elderberry (S)	F H	✓				✓	✓	✓		4-9 FT	Moist	Bush Honeysuckle, Lonicera tatarica, maackii
<i>Cornus florida</i> *	Flowering Dogwood (S)	F					✓	✓		✓	20-35 FT	Well-drained, most pH's, moist	Glossy Buckthorn, <i>Rhamnus frangula</i>
<i>Viburnum lentago</i> *	Nannyberry (S)	F H I	✓				✓			✓	12 FT	Moist	<i>Rhamnus frangula</i>
<i>Sambucus pubens</i> *	Red-berried Elder (S)	FHD					✓				12-25 FT	Moist, acidic	
<i>Hibiscus moscheutos</i> *	Rose Mallow (S)	H I	✓					✓	✓	✓	5 FT	Moist	Glossy Buckthorn
<i>Cornus racemosa</i> *	Silky Dogwood (S)	F H					✓	✓			6-9 FT	MOST soil types	Burning Bush, <i>Euonymus alata</i>
<i>Potentilla fruticosa</i> *	Shrubby Cinquefoil (S)	H D	✓	✓	✓			✓	✓	✓	1-5 FT	Very tolerant of MOST soil types	
<i>Viburnum dentatum</i> *	Southern Arrowwood (S)	FH					✓	✓	✓		6-15 FT	Moist, acidic	
<i>Linera benzoin</i> *	Spicebush (S)	FH						✓		✓	6-10 FT	Moist, well-drained, acidic	
<i>Rhododendron viscosum</i> *	Swamp Azalea (S)	H					✓	✓		✓	3-8 FT	Moist acidic soils	
PLANT SPECIES	COMMON NAME	WILDLIFE BENEFIT	EDIBLE BY	DROUGHT-TOLERANT	POLLUTION TOLERANT	GOOD GROUND	SHADY SOIL	SUNNY SOIL	COASTAL/SALT	WETLANDS	MAXIMUM HEIGHT	SOIL CONDITIONS	ALTERNATIVE TO THIS

SPECIES			HUMANS			COVER			TOLERANT			INVASIVE SPECIES:	
<i>Myrica gale*</i>	Sweet Gale (S)	FHD						✓	✓	✓	204 FT	Wet, acidic, mostly clay	
<i>Rosa virginiana*</i>	Virginia Rose (S)	I	✓	✓						✓			
<i>Ilex verticillata*</i>	Winterberry (S)	F					✓	✓	✓	✓	6-9 FT	Moist, acidic to neutral	Bush Honeysuckle, Linden Viburnum, and Japanese Barberry,
<i>Betula nigra*</i>	Black Birch (T)	FHD		✓	✓		✓	✓	✓		50-60 FT	Sandy to clay, moist to dry, acidic	
<i>Prunus serotina*</i>	Black Cherry (T)	F	✓					✓	✓	✓	80-100 FT	Moist, well-drained	
<i>Nyssa sylvatica</i>	Black Tupelo (T)	HD		✓	✓		✓	✓	✓		30- 50 FT	Dry, slightly acidic, poorly drained	
<i>Pinus strobes*</i>	Eastern White Pine (T)	FH	✓	✓				✓		✓	50-80 FT	Moist, well-drained, acidic	
<i>Betula Populifolia*</i>	Grey Birch (T)	HD		✓				✓	✓		20-40 FT	Sandy to clay, moist to dry	
<i>Ostrya virginiana*</i>	Ironwood/ Hop Hornbeam (T)	F		✓	✓		✓	✓	✓		30-40 FT	Anything but wet sites	
<i>Quercus rubra*</i>	Northern Red Oak (T)	FH		✓	✓			✓	✓	✓	70 FT	Well-drained, acidic/neutral	
<i>Betula papyrifera*</i>	Paper birch (T)	HD						✓		✓	60-70 FT	Moist, acidic	
<i>Asimina triloba</i>	Paw Paw (T)	HD	✓				✓	✓			20 FT	Moist, acidic	
<i>Quercus palustris*</i>	Pin Oak (T)	FH		✓	✓			✓	✓	✓	60-70 FT	Well-drained, acidic, moist	
<i>Acer rubrum*</i>	Red Maple (T)	FH	✓		✓		✓	✓	✓	✓	60-80 FT	Moist	Norway Maple, <i>Acer platanoides</i>
<i>Carya ovata*</i>	Shagbark Hickory (T)	F	✓	✓			✓	✓	✓	✓	60-80 FT	Well-drained, variable soil types	
<i>Acer saccharum*</i>	Sugar Maple (T)	FH	✓	✓	✓		✓	✓		✓	60-80 FT	Well-drained, acidic to neutral, moist	Norway Maple, <i>Acer platanoides</i>
<i>Quercus alba*</i>	White Oak (T)	FH	✓	✓			✓	✓		✓	80 FT	MOST soil types	Norway Maple
<i>Picea glauca</i>	White Spruce (T)	FHD		✓			✓	✓	✓	✓	50 FT	MOST soil types	
<i>Vitis labrusca*</i>	Fox Grape (V)	FH	✓	✓			✓	✓		✓	50+ FT on trees/walls	MOST soil types	
<i>Campsis radicans</i>	Trumpet Creeper (V)	F		✓				✓		✓	30+ FT on trees/walls	MOST soil types	
<i>Parthenocis sus quinquefoli</i>	Virgina Creeper (V)	FH		✓	✓		✓	✓	✓	✓	50+ FT on trees/walls	MOST soil types	Akebia, Porcelain Berry, Crown

a*														Vetch, and Oriental Bittersweet,
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* Native to Massachusetts

- (G) = Grass
- (P) = Perennial
- (S) = Shrub
- (T) = Tree
- (V) = Vine
- (A) = Annual

- F = Food for birds and other wildlife
- H = Shelter for birds and other wildlife
- I = Food for butterflies and other insects
- D = Deer-resistant plant
- E = Edible to humans



Appendix 2: NON-NATIVE PLANTS SUITABLE for MASSACHUSETTS³³

This list is not meant to be all-inclusive. The non-native plants shown here have been chosen for their drought tolerance and ability to survive the variable climate of MA without becoming invasive. While native plants are the ideal choice for ecological landscaping, if non-natives are used, consult with a horticulturalist or other knowledgeable source to determine what plant is right for your area.

PLANT SPECIES	COMMON NAME	WILDLIFE BENEFIT	DROUGHT-TOLERANT	POLLUTION TOLERANT	GOOD GROUND COVER	SHADY SOIL	SUNNY SOIL	MAXIMUM HEIGHT	SOIL
<i>Carex oshimensis</i> 'Evergold'	"Evergold" Sedge (G)		✓	✓	✓		✓	16 Inches	MOST soil types
<i>Epimedium</i> sp.	Barrenwort (P)		✓		✓	✓		6-15 Inches	Lots of organic matter
<i>Rudbeckia hirta</i>	Black Eyed Susan (P)	I	✓			✓	✓	Several FT	Moist to dry
<i>Gaillardia aristata</i>	Common Blanketflower (P)		✓				✓	2-3 FT	Well-drained
<i>Euphorbia corollata</i>	Flowering Spurge (P)		✓			✓	✓	2-3 FT	MOST soil, dry
<i>Phlox paniculata</i>	Garden Phlox (P)	I		✓			✓	3/4-2 FT	Well-drained, moist
<i>Chrysogonum virginianum</i>	Green and Gold/ Goldenstar (P)		✓			✓	✓	6-12 Inches	Moist, well-drained
<i>Sempervivum tectorum</i>	Hens and Chicks (P)		✓				✓	8-12 Inches	Well-drained
<i>Hosta</i> sp.	Hosta (P)		✓		✓	✓		Varies with hybrid type	Well-drained, moist
<i>Echinacea purpurea</i>	Purple Coneflower (P)	I D	✓				✓	2-3 FT	Moist
<i>Cerastium tomentosum</i>	Snow-in-Summer (P)		✓				✓	6-12 Inches	
<i>Xanthorrhiza simplicissima</i>	Yellowroot (P)				✓	✓	✓	1 FT	Acidic, moist
<i>Castanea dentata</i>	American Chestnut hybrids (T)	F E					✓	120 FT	Well-drained, most pH's

<i>Juglans nigra</i>	Black Walnut (T)	FHE	✓			✓	✓	20-100+ FT	Neutral to acidic pH
<i>Malus floribunda</i>	Common Apple (T)	FHE					✓	10-25 FT	Neutral to acidic pH
<i>Cercis canadensis</i>	Eastern Redbud (T)	FHIE					✓	15 FT	MOST soil types, well-drained
<i>Magnolia x loebneri</i> *	Loebner Hybrid Magnolia (T)	F	✓				✓	30 FT	Moist, acidic
<i>Platanus x acerifolia</i>	London Planetree (T)		✓	✓			✓	50-60 FT	Moist, acidic, tolerant of wet and alkaline
<i>Ulmus Americana</i> *	American Elm Hybrid (T)	H	✓	✓			✓	80 FT	Acidic or alkaline, moist to wet
<i>Pyrus sp.</i>	Pear (T)	FHE					✓	10-30 FT	Neutral to acidic pH
<i>Clematis terniflora</i>	Sweet Autumn Clematis (V)						✓	20+ FT on wall/fence	Well-drained, 5.5-6.5 pH

Appendix 3: INVASIVE SPECIES OF MASSACHUSETTS

Listing taken from *Final Report: "Invasive and Likely Invasive Plants in Massachusetts"*
Presented by the Plant Evaluation Subcommittee of the Massachusetts Invasive Plant Working
Group March 14, 2003
Research sponsored by: Massachusetts Nursery and Landscape Association, Inc; Horticultural
Research Institute; MA Executive Office of Environmental Affairs

CRITERIA FOR EVALUATING NON-NATIVE PLANT SPECIES FOR INVASIVENESS IN MASSACHUSETTS THESE CRITERIA HAVE NO OFFICIAL STATUS FOR MASSACHUSETTS

Invasive plants, as defined by the Massachusetts Invasive Plant Group, are "*plants that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.*"

(Under this definition all synonyms, subspecies, varieties, forms, and cultivars of that species are included unless proven otherwise by a process of scientific evaluation.)

The following criteria are being used to objectively evaluate and categorize plant species suspected of being invasive in Massachusetts. They were developed by the George Safford Torrey Herbarium at the University of Connecticut and a subcommittee of the Massachusetts Invasive Plant Group representing science, nursery, and conservation professionals. A separate evaluation will be undertaken for plants not currently in the state, but predicted to become invasive here.

The criteria enable the separation of plants into the following categories:

- *Invasive Plants in Massachusetts*
- *Likely Invasive Plants in Massachusetts*

The process of reviewing individual plant species for their invasiveness in Massachusetts is ongoing and may result in a change in status pending new data and further review.

Tabular summary of how the criteria work.

To be considered	Criteria that must be met
Invasive	1-9
Likely Invasive	1-5, at least 1 of 10-12

THE CRITERIA

For a species to be included as a Non-native Invasive Species or as a Non-native Potentially Invasive Species in Massachusetts, it must be substantiated by scientific investigation (including herbarium specimens, peer reviewed papers, published records and other data available for public review) to be:

1. Nonindigenous to Massachusetts.
2. Naturalized in Massachusetts.

3. Have the biologic potential for rapid and widespread dispersion and establishment in minimally managed habitats.
4. Have the biologic potential for dispersing over spatial gaps away from site of introduction.
5. Have the biologic potential for existing in high numbers away from intensively managed artificial habitats.

Further, to be included as a Non-native Invasive Species, a species must be documented to:

6. Be widespread in Massachusetts, or at least common in a region or habitat type(s) in the state.
7. Have many occurrences of numerous individuals in Massachusetts
8. Be able to out-compete other species in the same natural plant community.
9. Have the potential for rapid growth, high seed or propagule production and dissemination, and establishment in natural plant communities.

If a species meets the initial 5 criteria but does not, at this time meet Criteria 6-9 (all), it may be considered to be a Likely Invasive Species in Massachusetts if it meets at least one of Criteria 10-12.

In the past, some of these species have been considered invasive in Massachusetts, at least in part because they are known to be invasive in other regions and thus expected to be so here.

10. Have at least one occurrence in Massachusetts that have high numbers of individuals forming dense stands in minimally managed habitats
11. Have the potential, based on its biology and its colonization history in the northeast or elsewhere, to become invasive in Massachusetts.
12. Be acknowledged to be invasive in nearby states but its status in Massachusetts is unknown or unclear. This may result from lack of field experience with the species or from difficulty in species determination or taxonomy.

DRAFT 9-02-02:

includes criteria changes voted upon on 2-12-02 and preamble voted upon on 6-12-02 and 8-22-02. Also see accompanying definitions from 9-02-02.

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**DEFINITIONS TO ACCOMPANY
“CRITERIA FOR EVALUATING NON-NATIVE PLANT SPECIES FOR
INVASIVENESS IN MASSACHUSETTS”**

The Problem: The biological invasion of native plant communities by non-indigenous species that proliferate, out compete native species, threaten endangered species and decrease biodiversity.

Invasive species - Plants that have spread into native or minimally managed plant systems in Massachusetts. These plants cause economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems. (Under this definition all synonyms, species, subspecies, varieties, forms, and cultivars of that species are included unless proven otherwise by a process of scientific evaluation.)

Indigenous species - A species that occurs natively in Massachusetts. Indigenous species often have a precolonial presence (pre 1500) or have arrived in the region more recently without the aid of human intervention. Synonymous with native species.

Non-indigenous species - A species that is not native or naturally occurring (based on its biology, phylogeny, distribution and current knowledge about the species) within Massachusetts. A species may be indigenous to North America but Nonindigenous in Massachusetts. Synonymous with non-native species.

Naturalized species - A non-indigenous taxon that occurs without the aid and benefits of cultivation in Massachusetts. Further, it implies two biological points: it freely and regularly reproduces in the wild, sexually or asexually, and occurrences persist over time.

Biologic potential - The ability of a species to increase its number, either sexually and/or asexually.

Spatial gaps - This term is used in reference to the ability of a species to disperse away from existing occurrences. The concept of crossing spatial gaps is used to distinguish those species that can disperse over discontinuities and become established elsewhere from species that spread across a habitat only by continual, uninterrupted growth.

Minimally managed habitats - Minimally managed habitats are habitats where management efforts and investments of time, money, and labor are infrequent or non-existent. These habitats may have been intensively managed for anthropogenic reasons at one time in their history. In some instances, management may be more intense but management is done for conservation purposes and is primarily aimed at preserving elements of biological diversity such as imperiled species or critical natural communities. Minimally managed habitats are similar to "natural areas" but the distinction is made in order to remove bias, misconceptions or ambiguities that surround the term "natural area".

Intensively managed habitats - Intensively managed habitats are habitats or land systems where management efforts and investments of time, money, and labor occur frequently. Examples include manicured lawns, landscaped grounds, gardens, roadsides, or agricultural lands for crops or livestock.

Occurrence - Existing example of a species on the landscape.

Natural plant community - A natural plant community is an association or assemblage of plant species that repeatedly occur together in reoccurring patterns in a specific type of habitat. This assemblage can be characterized by dominant species and biological properties. A natural plant community implies a minimally managed situation where all or most of the species that make up the assemblage are indigenous to the defined area.

Plants Voted as: INVASIVE

Aegopodium podagraria L. **Bishop's goutweed, bishop's weed, goutweed**

Form: growth habit – forb/herb; Habitat: region - entire state; environment – upland, wetland; light tolerance – all. Notes: Escapes from cultivation; spreads aggressively by roots; forms dense colonies in flood plains

Ailanthus altissima (P. Miller) Swingle **Tree of heaven**

Form: growth habit – tree/duration perennial; Habitat: region - entire state; environment - upland, wetland, & coastal; light tolerance – all. Notes: spreads aggressively from root suckers, especially in disturbed areas

Alliaria petiolata (Bieb.) Cavara & Grande **Garlic mustard**

Form: growth habit - forb/herb; duration - biennial Habitat: region - entire state; environment - upland; light tolerance - shade. Notes: spreads aggressively by seed, especially in wooded areas:

Berberis thunbergii DC. **Japanese barberry**

Form: growth habit - shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance – full sun to shade Notes: escaping from cultivation; spread by birds; forms dense stands

Cabomba caroliniana A.Gray **Carolina fanwort; fanwort**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - aquatic; light tolerance - not applicable Notes: common in the aquarium trade; chokes waterways

Celastrus orbiculatus Thunb. **Asian or, Asiatic bittersweet, oriental bittersweet**

Form: growth habit - vine; duration - perennial Habitat: region - entire state; environment - upland; light tolerance - full sun, partial shade Notes: escaping from cultivation; berries spread by birds and humans; overwhelms and kills vegetation

Cynanchum louiseae Kartesz & Gandhi **Black swallow-wort, Louise's swallow-wort**

Form: growth habit - vine; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, partial shade Notes: forms dense stands out-competing native species: deadly to Monarch butterflies.

Elaeagnus umbellata Thunb. **Autumn olive**

Form: growth habit - shrub; duration - perennial Habitat: region - entire state; environment - upland; light tolerance - full sun Notes: escaping from cultivation; berries spread by birds; aggressive in open areas; has the ability to change soil chemistry

Frangula alnus P. Mill. **European buckthorn, glossy buckthorn**

Form: growth habit - shrub, tree; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: produces fruit throughout the growing season; grows in multiple habitats; forms dense thickets.

Glaucium flavum Crantz **sea or horned poppy, yellow hornpoppy**

Form: growth habit - forb/herb; duration - biennial, perennial Habitat: region - southeastern; environment - coastal; light tolerance - full sun Notes: seeds float; spreads along rocky beaches; primarily Cape Cod and Islands

***Hesperis matronalis* L. Dame's rocket**

Form: growth habit - forb/herb; duration - biennial, perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: spreads by seed; can form dense stands, particularly in flood plains

***Iris pseudacorus* L. Yellow iris**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - wetland; light tolerance - full sun, partial shade Notes: found primarily in flood plains; out-competes native plant communities

***Lepidium latifolium* L. broad-leaved pepperweed, tall pepperweed**

Form: growth habit - forb/herb; duration - perennial Habitat: region - eastern, southeastern; environment - coastal; light tolerance - full sun Notes: primarily coastal at upper edge of wetlands; also found in disturbed areas; salt tolerant

***Lonicera x bella* Zabel [morrowii x tatarica] Bell's honeysuckle**

Form: growth habit - shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: part of a confusing hybrid complex of nonnative honeysuckle commonly planted and escaping from cultivation via bird dispersal

***Lonicera japonica* Thunb. Japanese honeysuckle**

Form: growth habit - vine; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: rapidly growing, dense stands climb and overwhelm native vegetation; produces many seeds that are bird dispersed; more common in southeastern Massachusetts.

***Lonicera morrowii* A.Gray Morrow's honeysuckle**

Form: growth habit - shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: part of a confusing hybrid complex of nonnative honeysuckle commonly planted and escaping from cultivation via bird dispersal

***Lysimachia nummularia* L. Creeping jenny, moneywort**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: escaping from cultivation; problematic in flood plains, forests and wetlands; forms dense mats

***Lythrum salicaria* L. Purple loosestrife**

Form: growth habit - forb/herb, subshrub; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, partial shade Notes: escaping from cultivation; overtakes wetlands; high seed production and longevity

***Myriophyllum heterophyllum* Michx. Twoleaved water-milfoil, variable water-milfoil**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - aquatic; light tolerance - not applicable Notes: chokes waterways, spread by humans and possibly birds

***Myriophyllum spicatum* L. Eurasian or European water-milfoil, spike water-milfoil**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - aquatic; light tolerance - not applicable Notes: chokes waterways, spread by humans and possibly birds

***Phragmites australis* (Cearv.) Trin. ex Steud. common reed**

Form: growth habit -graminoid (USDA lists as subshrub, shrub); duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: overwhelms wetlands forming huge, dense stands; flourishes in disturbed areas; native and introduced strains.

***Polygonum cuspidatum* Sieb. & Zucc. Japanese knotweed; Japanese Bamboo**

Form: growth habit -forb/herb, subshrub, shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: Spreads vegetatively and by seed; forms dense thickets.

***Potamogeton crispus* L. Crisped pondweed, curly pondweed**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - aquatic; light tolerance - not applicable Notes: forms dense mats in the spring and persists vegetatively

***Rhamnus cathartica* L. Common buckthorn**

Form: growth habit - shrub, tree; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: produces fruit in fall; grows in multiple habitats; forms dense thickets

***Robinia pseudoacacia* Black locust**

Form: growth habit – tree; duration – perennial Habitat: region – entire state; environment – upland; light tolerance – full sun, shade. Notes: While the species is native to central portions of Eastern North America, it is not indigenous to Massachusetts. It has been planted throughout the state since the 1700's and is now widely naturalized. It behaves as an invasive species in areas with sandy soils.

***Rosa multiflora* Thunb. Multiflora rose**

Form: growth habit - vine, shrub; duration - perennial Habitat: region - entire state; environment - upland, wetland, coastal; light tolerance - full sun, shade Notes: forms impenetrable thorny thickets that can overwhelm other vegetation; bird dispersed

***Trapa natans* L. Water-chestnut**

Form: growth habit - forb/herb; duration – annual Habitat: region - western, central, eastern; environment - aquatic; light tolerance - not applicable Notes: forms dense floating mats on water

Plants voted as: LIKELY INVASIVE

Centaurea biebersteinii DC. **Spotted knapweed**

Form: growth habit - forb/herb; duration - biennial, perennial Habitat: region - entire state; environment - upland, coastal; light tolerance - full sun Notes: aggressively grows in well-drained, disturbed soils; serious problem in western states where it out-competes native grassland species, literature reports are currently lacking for this in the northeast.

Cynanchum rossicum (Kleopov) Borhidi **European swallow-wort, pale swallow-wort** Form: growth habit - forb/herb, vine; duration - perennial Habitat: region - western; environment - upland; light tolerance - full sun, partial shade Notes: forms dense stands; found primarily in the lower CT River Valley.

Egeria densa Planchon **Brazilian water weed**

Form: growth habit - forb/herb; duration - perennial Habitat: region - eastern, southeastern; environment - aquatic; light tolerance - not applicable Notes: common in the aquarium trade; chokes waterways; currently only found in a few MA ponds

Epilobium hirsutum L. **Codlins and cream, hairy willow herb**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - wetland; light tolerance - full sun Notes: seeds dispersed by wind and water; evidence currently lacking that this species out-competes other vegetation in minimally managed habitats

Euphorbia cyparissias L. **Cypress spurge**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - upland; light tolerance - full sun Notes: persists in open areas; evidence currently lacking that this species out-competes other vegetation in minimally managed habitats

Hydrilla verticillata (L.f.) Royle **waterthyme**

Form: growth habit - forb/herb; duration - perennial Habitat: region - southeastern; environment - aquatic; light tolerance - not applicable Notes: only found in one MA pond currently (2002); easily dispersed by birds and humans; chokes entire water bodies

Microstegium vimineum (Trin.) A. Camus **Japanese stilt grass, Napalese browntop**

Form: growth habit - graminoid; duration - annual Habitat: region - western; environment - upland, wetland; light tolerance - full sun, shade Notes: forms dense stands; currently localized in the lower CT River Valley; spreads in flood plains.

Myosotis scorpioides L. **Forget-me-not**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - wetland; light tolerance - full sun, shade Notes: escaping from cultivation; prolific in open wooded streams, stream-banks and wet meadows; evidence about its persistence needed

Najas minor All. **Brittle water-nymph, lesser naiad**

Form: growth habit - forb/herb; duration - annual Habitat: region - western; environment - aquatic; light tolerance - not applicable Notes: chokes waterways; spread by humans and possibly birds; currently found only in Berkshire County (2002)

Ranunculus repens L. **Creeping buttercup**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - wetland; light tolerance - full sun, shade Notes: common around springs and wetlands;

evidence currently lacking that this species out-competes other vegetation in minimally managed habitats

***Tussilago farfara* L. Coltsfoot**

Form: growth habit - forb/herb; duration - perennial Habitat: region - entire state; environment - upland, wetland; light tolerance - full sun, shade Notes: particularly problematic in lime seeps and disturbed sites; evidence currently lacking that this species out-competes other vegetation in minimally managed habitats

Appendix 4: HELPFUL WEB SITES

This is just a short list of the many useful Web sites on ecological landscaping, water conservation, choosing the right plants, and attracting wildlife. For further information, enter the term “ecological landscaping” into an Internet search engine.

1. American Water Works Association, www.awwa.org
2. Association for Biodiversity, www.natureserve.org
3. eNature, Backyard Habitats, www.enature.com/backyardwildlife
4. Garden Club of America, www.gcamerica.org
5. Invasive Species, www.invasivespecies.gov
6. Lady Bird Johnson Wildflower Center, www.wildflower.org
7. Massachusetts Association of Professional Foresters, www.massforesters.org
8. Massachusetts Executive Office of Environmental Affairs, www.state.ma.us/env
9. Massachusetts Horticultural Society, www.masshort.org
10. Massachusetts Natural Heritage and Endangered Species Program, www.state.ma.us/dfwele/dfw/nhesp
11. Massachusetts Nursery and Landscape Association, www.mnla.com
12. National Plant Database, <http://plants.usda.gov/plants>
13. National Soil Survey Center, www.statlab.iastate.edu/soils/nsdaf
14. Native Alternatives for Invasive Ornamental Plant Species, www.caes.state.ct.us/SpecialFeatures/NativeAlternatives.pdf
15. Nature Conservancy’s Wildland Weeds and Management Program, <http://tncweeds.ucdavis.edu/>
16. New England Water Works, www.newwa.org
17. Northeast Organic Farmers Association, <http://ma.nofa.org>
18. Permaculture, Appropriate Technology Transfer for Rural Areas (ATTRA), www.attra.org/attra-pub/perma.html
19. Pesticide Active Ingredient Information, <http://pmep.cce.cornell.edu/profiles/index.html>
20. Plant Conservation Alliance, www.nps.gov/plants
21. United States Environmental Protection Agency, www.epa.gov/greenacres
22. Wild Ones, www.for-wild.org
23. The Wild Gardener, www.thewildgardener.com
21. World’s Largest Plant Database, www.neoflora.com

Appendix 5: RELEVANT PUBLICATIONS

This is a short list of books and articles that may be of assistance in starting an ecological landscaping project, from selecting the proper plants, maintaining healthy soil, and environmentally-friendly yard maintenance. Many of the Web sites listed in Appendix 4 will give you links to additional helpful pamphlets, guides, and books.

1. Armitage, Arnold M. (1997) Herbaceous Perennial Plants: A Treatise on Their Identification, Culture, and Garden Attributes 2nd Edition, Stipes Publishing, Chicago, IL.
2. “Better Backyards: A Citizens’ Resource Guide to Beneficial Landscaping and Habitat Restoration in the Chesapeake Bay Watershed,” (2001) a Chesapeake Bay Program guide, November, www.chesapeakebay.net.
3. Carson, Rachel. (2002) Silent Spring, Houghton-Mifflin, Boston, MA.
4. Cullina, William. (2000) The New England Wildflower Society Guide to Growing and Propagating Wildflowers of the United States and Canada, Houghton Mifflin, Boston, MA.
5. Cullina, William. (2002) The New England Wildflower Society Guide to Native Trees, Shrubs, and Vines, Houghton Mifflin, Boston, MA.
6. Daniels, Steve. (1995) The Wildlawn Handbook: Alternatives to the Traditional Front Lawn, Macmillan USA, New York, NY.
7. Darke, Rick. (2002) The American Woodland Garden: Capturing the Spirit of the Deciduous Forest, Timber Press, Portland, OR.
8. Darke, Rick. (1999) The Color Encyclopedia of Ornamental Grasses, Timber Press, Portland, OR.
9. Flint, Harrison L. Landscape Plants for Eastern North America, 2nd Edition, John Wiley and Sons, Inc., New York, NY.
10. Gershuny, Grace. (1997) Start with the Soil, Rodale Press, Emmaeus, PA.

11. Hemenway, Toby. (2001) Gaia's Garden: A Guide to Home-Scale Permaculture, Chelsea Green Publishing Company, VT.
12. Hightshoe, Gary L. (1998) Native Trees, Shrubs, and Vines for Urban and Rural America: A Planting Design Manual for Environmental Designers, VanNostrand Reinhold, New York, NY.
13. Jenkins, Virginia Scott. (2000) The Lawn: A History of an American Obsession, Smithsonian Institute Press, Washington, DC.
14. Kenfield, Warren G. (1991) The Wild Gardener in the Wild Landscape: The Art of Naturalistic Landscaping, Connecticut College Arboretum.
15. Pollan, Michael. (1998) "Why Mow? The Case Against Lawns," in Against the Current: Readings for Writers, Prentice Hall Publishers, Boston, MA.
16. Roberts, Edith. (1996) American Plants for American Gardens, University of Georgia Press, Athens, GA.
17. Roth, Susan A. (2001) Taylor's Guides to Gardening: Trees, Houghton Mifflin, Boston, MA.
18. Stein, Sara. (1993) Noah's Garden: Restoring the Ecology of our Own Back Yards, Houghton Mifflin, Boston, MA.
19. Yepsen, Roger B. (1984) The Encyclopedia of Natural Insect and Disease Control, Rodale Press, Emmaeus, PA.

Appendix 6: MASSACHUSETTS ECOLOGICAL LANDSCAPING INITIATIVES

Acton Water District:

- organized a public presentation on ecological landscaping that included information on how to develop an environmentally sustainable yard (in conjunction with *the Organization for the Assabet River*)
- www.actonstreams.org

Arnold Arboretum:

- holds many spring and summer classes, including “Native Trees for New England” and “Bugs, Balance, and Biodiversity”
- www.arboretum.harvard.edu

Conway School of Landscape Design:

- trains graduate students in the field of ecological landscape design and the use of native plants for landscaping purposes
- www.csld.edu

Ecological Landscaping Association:

- holds educational winter conferences on ecological landscaping, co-sponsored with *UMass Extension* and the *New England Wild Flower Society*, highlighting an eco-marketplace of ecological products and services
- produced “Organic Lawn Care Standards” publication and a “Guide to Healthy Landscapes” which will be available in March of 2003
- distributes newsletters to members, and holds roundtable afternoon discussions and summer educational forums
- www.ela-ecolandscapingassn.org

Ipswich River Watershed Association:

- on their Web site they discuss lawn care to conserve water and ways to stop using chemicals to keep lawns green
- they have funded a project along with the *Parker River Clean Water Association* and the *University of Massachusetts* to educate homeowners on water conservation landscaping; the resulting publication is entitled, Environmentally Friendly Landscape Toolkit
- they worked with *Department of Food and Agriculture* on a handbook for recreation departments on their management of fields to reduce pesticide and water use
- www.ipswichriver.org

Massachusetts Audubon Society:

- on their web site they have a “Take Action Rivers Toolkit,” which addresses lawn care consumption issues, as well as a document entitled, “Healthy Lawns Without Chemicals,” which gives good growing practices
- they hold workshops on green lawncare practices in many communities, involving a panel of local landscapers answering questions, and well-known ecologists discussing the benefits
- the *Broadmoor Audubon Sanctuary* co-sponsors workshops with the *Ecological Landscaping Association* to educate people about alternative landscaping
- working on building a new preserve at the *New Bedford Audubon Center*, where they will focus on ecological landscaping
- www.massaudubon.org

Massachusetts branch of Northeast Organic Farmers Association:

- created “Standards for Organic Land Care: Practices for Design and Maintenance of Ecological Landscapes,” available for \$20
- created a professional accreditation program (30 hour course and exam) and public information workshops on the basics of organic lawn care
- compiled a list of retailers in Massachusetts that sell organic products and a list of organic landscapers
- <http://ma.nofa.org>

Massachusetts Coastal Zone Management (CZM):

- working towards making a demonstration model of ecological landscaping in Ipswich to protect water quality, water quantity, and native versus invasive species
- www.state.ma.us/czm/

Massachusetts Department of Environmental Protection (DEP):

- provides home composting workshops for the public each spring and fall
- www.state.ma.us/dep/recycle/compost

Massachusetts Division of Fisheries and Wildlife (DFW):

- lists native and introduced plant species for each county in, “The Vascular Plants of Massachusetts: A County Checklist,” by Bruce A Sorrie and Paul Somers
- created fact sheets on invasive plants and lists of native shrubs for landscaping
- www.state.ma.us/dfwele/dfw

Massachusetts Department of Food and Agriculture (DFA):

- created the “Homeowner’s Guide to Environmentally Sound Lawn care: Maintaining a Healthy Lawn the IPM Way” report, which gives information on insect, weed, and disease management practices for lawns
- created the 79 page report on “Turf Management for Municipal Fields”
- www.massdfa.org

Massachusetts Invasive Plant Group:

- formed in 1999 to begin addressing the invasive plant issue in MA by developing a strategic plan
- working towards educating people about invasive plants and their control, promoting alternatives, and promoting field research
- for more information, contact: Cynthia Boettner, Silvio O. Conte National Fish and Wildlife Refuge, (413) 863-0209, Ext. 6, Cynthia_boettner@fws.gov, or Rena Sumner, Massachusetts Nursery and Landscape Association, (413) 369-4731, r10sum@aol.com
- www.massforesters.com

Massachusetts Nursery and Landscaping Association:

- supplies an on-line list of their members, many of whom practice ecological landscaping
- www.mnla.com

Massachusetts Riverways Programs:

- puts out several papers promoting water conservation to safeguard natural water flows in rivers and streams
- in their Spring 2001 newsletter, pg. 5, there is a list of native plants suitable along waterways, all of which are edible by wildlife and/or humans
- www.massriverways.org

Metropolitan District Commission (MDC):

- created a pamphlet on landscaping activities that can protect the Quabbin and Wachusett reservoir watersheds
- www.state.ma.us/mdc/

New Ecology:

- consults on ways to integrate green design and planning into development projects
- presents forums, workshops, training sessions, and newsletters
- www.newecology.org

New England Wild Flower Society (Garden in the Woods):

- created the New England Plant Conservation Program in 1991, which promotes the use and protection of native plant species

- holds workshops on “Residential Landscape Design,” “Plants and Landscaping that Save Water,” “Aggressive Invaders,” and various wildflowers and shrubs of New England
- has the largest native plant nursery in New England where they sell native plants and seeds to the public
- created an on-line list of New England landscapers who use native plants
- www.newfs.org

Parker River Clean Water Association:

- gives an on-line guide on planting riparian buffer gardens to protect the watershed
- has a list of native plants for landscaping
- www.parker-river.org

University of Massachusetts, Amherst, Cooperative Extension:

- works with the *Massachusetts Association of Lawn Care Professionals* on educational programs about environmentally sound methods and practices on sustainable landscapes to prevent pollution and conserve natural resources
- created a 27 page document on “Trees, Shrubs, and Vines for Low Maintenance Landscapes”, available on the web, as well as numerous fact sheets on lawn and garden care
- holds a “Green School” program each year, which is a 60-plus hour training program for garden center employees, landscapers, nursery workers, and professional gardeners; teaches horticultural fundamentals to protect environmental quality, specializing in either turf management or landscaping
- www.umass.edu/umext

Waquoit Bay Reserve:

- holds periodic ecological landscaping workshops. Past topics included:
 - “An Overview to Ecological Landscaping: Creating Attractive Landscapes More in Harmony with Nature”
 - “The Real Dirt, From the Ground Up: Soil Improvement from an Organic Point of View”
 - “Landscaping Techniques to Protect and Enhance Wildlife Habitat in Your Yard”
- www.waquoitbayreserve.org

Wellesley Natural Resources Commission:

- created the “Beautiful Lawns, Naturally! Guide to Organic Solutions to Common Lawn and Yard Problems” brochure and web site in conjunction with *Northeast Organic Farmers Association*, which describes basic lawn care, soil testing, crabgrass and grub control, and watering guidelines
- www.ci.wellesley.ma.us/nrc/pesticide

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²⁹ The information listed in Appendices 1 and 2 were adapted from the **Relevant Publications #1, 4, 7, 8** in **Appendix 5**; The Lady Bird Johnson Wildflower Center’s “Northeast Recommended Native Plant Species List;” the University of Massachusetts Extension’s “Appropriate Landscaping to Conserve Water” Guide; the Massachusetts Audubon’s “Recommended plants for attracting birds in the Northeast” list; “Edible Plants Native to Massachusetts” list from the *Riverways* Spring 2001 newsletter, page 5; “Deer Resistant Plants” from Colorado State Extension; NeoFlora.com; the National List of Wetland Plants” Massachusetts; and additional suggestions from Russ Cohen of the MA Riverways Programs, Cynthia Boettner at the Silvio O. Conte National Fish and Wildlife Refuge, and Paul Sommers at the MA Division of Fisheries and Wildlife.

* All drawings and photographs by Jessica Sprajcar, unless otherwise stated.