

June 30, 2022



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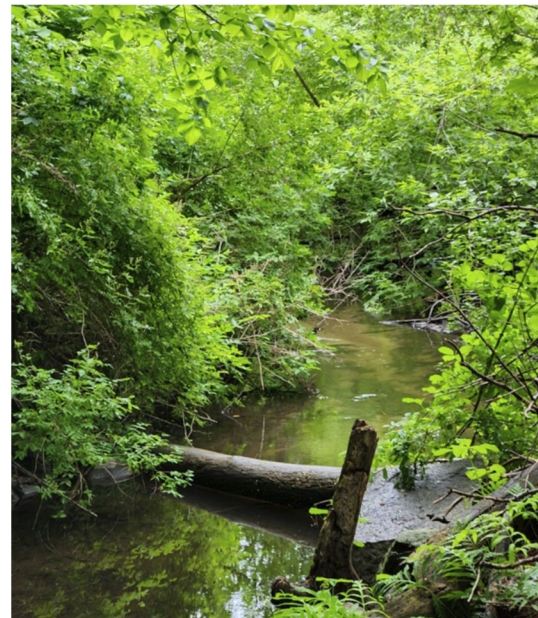
Lynnfield Conservation Commission
Town Hall
55 Summer Street
Lynnfield, MA 01940

Attn: Ms. Emilie Cadematori, Conservation & Planning Director
[\(781\) 334-9495](tel:7813349495)
ecademartori@town.lynnfield.ma.us

**RE: Riverfront Restoration & Management Plan
70 Walnut Street | Lynnfield, Massachusetts**

Dear Ms. Cadematori and Members of the Commission,

Our firm has prepared the following Riverfront Restoration and Management Plan for the property located at 70 Walnut Street in the Town of Lynnfield Massachusetts, known as Assessor's Map 41, Lot 1014 (the "Site"). This narrative contains information regarding the existing vegetation on site, and recommendations for the riverfront restoration and management plan including invasive species removal and native species planting.

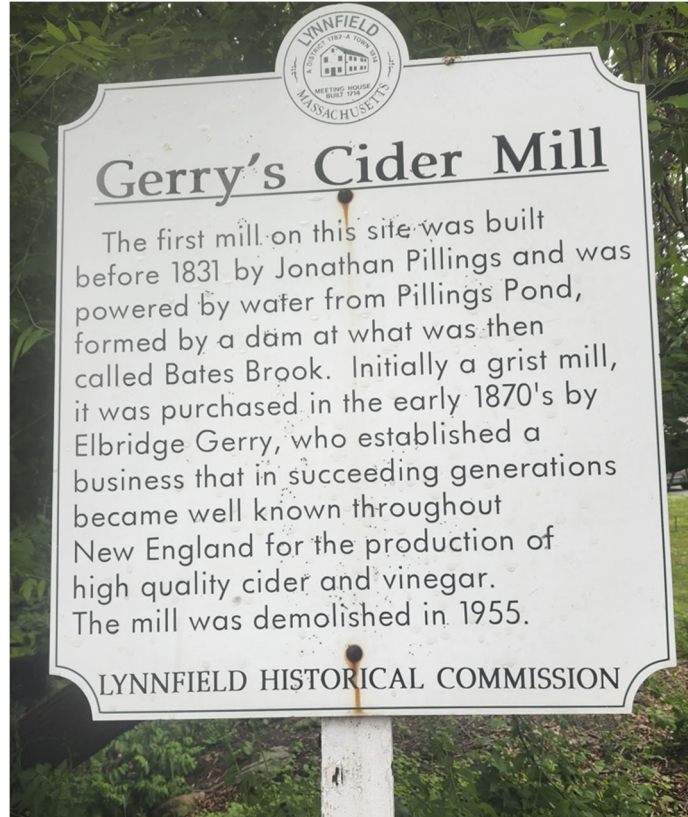


Representative photo of the 70 Walnut street with dense invasive plant growth

Executive Summary

Site Description

The property is located at 70 Walnut Street in the Town of Lynnfield and identified as Map 41 Lot 1014. The Site is an approximately .803-acre parcel located east of Walnut Street. An unnamed perennial stream flows through the property from Pillings Pond to Reedy Meadow through a culvert beneath Walnut Street. The Site has historical elements as it is the site of the former Gerry's Cider Mill. The proposed ecological restoration project has been designed to provide the Town of Lynnfield with recommendations for removal and management of invasive plant species and replacement with native species plantings in order to improve the overall site conditions. Attached to this report is a photo appendix that depicts photos representative of the site and descriptions (Attachment 4).



Initial Site Visit

Our firm conducted a site visit on June 2, 2022 to inventory the existing vegetation on site. It is important to note that we could not access the rear of the site to perform a thorough inventory. The only way to get to the rear of the property was blocked by densely vegetated areas, and a debris pile that was not stable enough to walk on. In order to go around these obstacles, we would have had to go on to the abutting property in which we did not have permission to do so. From the areas that we could access, it is assumed that the same plant community exists throughout the property. The majority of the vegetation found on site consists of invasive species, including but not limited to:

- European Buckthorn: This is a woody invasive plant species that has high seed production and high seed viability.
- Asiatic Bittersweet: This is a woody invasive plant species whose vine sprawl threatens native plants from the ground to the canopy.
- Multiflora Rose: This is a woody Invasive plant species that produces an excessive amount of fruit and grows in great density.
- Japanese Honeysuckle: This is a woody invasive plant species that replaces native woody plants and creates shade over ground cover.
- Black Swallow-wort: This is an invasive vine that spreads very aggressively and outcompetes all other herbaceous vegetation.
- Japanese Knotweed: This is a harmful invasive species to riverbanks. This plant spreads through its rhizomes and grows in large patches that erode riverbanks.
- Japanese barberry: This is a woody invasive plant that creates thorny thickets that outcompete other shrubs and herbaceous plants.
- Garlic mustard: This is an invasive herbaceous plant that outcompetes wildflowers. Its seeds spread very easily.
- Norway Maple: This tree creates dense shade under its canopy reducing the ability of understory plants to survive, making what is sometimes referred to as a “Norway Maple Desert”.

In order to restore the riverfront area, we recommend that the invasive species be removed. This includes the Norway Maple trees. The Norway Maples can be removed in their entirety or some can be cut, leaving a 12-15-foot high habitat tree.

We recommend manually removing the invasive species by hand and/or by machine using a whole plant removal technique by abstracting the plants directly from the roots. In our experience simply cutting these invasive plants is ineffective as this method simply stimulates the plant to generate recovery growth which can be more dense than the existing plant. The following report provides a detailed description of the recommended invasive species management plan and the whole plant removal process as well as a recommended native species planting plan.

Invasive Species Management Plan | Woody Invasive Species

Targeted Invasive Species

We have identified multiple dominant invasive species within the project area and have mapped their approximate distribution on the landscape (Attachment 1). The property has become occupied with Asiatic bittersweet (*Celastrus orbiculatus*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), European buckthorn (*Rhamnus cathartica*), Japanese Barberry (*Berberis thunbergii*), Burning Bush (*Euonymus alatus*), Japanese knotweed (*Polygonum cuspidatum*), garlic mustard (*Alliaria petiolata*), black swallow-wort (*Cynanchum louiseae*), and Norway maple (*Acer platanoides*). These species will be the targeted plants for the restoration portion of the project.

To assist with invasive plant identification and descriptions, we have attached “A Guide to Invasive Plants in Massachusetts” by the Massachusetts Division of Fisheries and Wildlife (Attachment 3).

Materials & Methods

Whole Plant Removal

The techniques of whole plant removal intend to remove the entire invasive plant including standing plant material, as well as roots and rhizomes of the invasive species. In this way, the entire plant is removed and re-colonization of the treatment area is substantially reduced. Simply cutting the standing vegetation will only stimulate coppice reproduction and a dense re-growth of the very invasive species intended to be removed. That said, 100% removal is rarely achievable, even in an excavation effort with machinery and labor. Accordingly, professional judgment is necessary to determine when to cease removal activities in any particular area. Typically, this work is conducted in the fall and winter, or early spring, before the ground freezes and requires additional hand pulling of newly sprouted seed material during the following spring and summer months. Summer work is also effective especially when the season is dry and reduced impact to soils is achievable. We endeavor to work after nesting season is completed to reduce impacts to songbirds, in particular. Whole plant removal can be achieved by hand, however, due to the established invasive material it is recommended that a machine be used to ensure complete removal of the plants. If a machine is used, then an Order of Conditions should be applied for.



Whole Plant Removal techniques employed using a mini excavator

Initial removal with equipment or weed wrench

Standing vegetation should be cut, removed, and stockpiled for burning or chipping for compost. A mini-excavator and/or flail mower should be used to remove the targeted species from the restoration area. This will leave the exposed roots and stumps of the invasive species accessible for removal. The area can be cut with a machine as well during this phase of work. If heavy machinery is used for removal of root material, mats should be placed to minimize the disturbance of the soils by dispersing the weight of the equipment over a larger surface area, decreasing the compression of the soils. The entire restoration area will be cleared of the invasive woody species and maintained from the re-invasion of the targeted invasive plant species.

Removal of root ball and trailing roots and rhizomes

Care must be used in pulling the root balls of invasive shrub species. The use of a mini-excavator or flail mower, described above, as well as weed wrenches, will facilitate the removal of the root balls of these species. Carefully lifting and shaking the root ball as it is extracted from the soil facilitates the removal of the trailing roots and rhizomes. The soil is then released from the root ball by vigorous shaking by the machine operator. These root balls can be stockpiled and burned during the burning season. Ashes are a good amendment for fields and planting areas as they contain phosphorus and other nutrients. Alternatively, the root balls can be transported to an offsite facility for grinding and chipping, and/or, composting. Standing plant material is chipped separately for wood chips and is usually completed on site to reduce the volume of material that will need to be transported from the site.

Hand clearing and grubbing of broken roots and rhizomes

Hand clearing and removal of broken root parts is important for invasive species management, as these shoots will re-sprout if any viable rootlets remain at the site. These collected roots can be stockpiled and burned during the local brush burning season or composted offsite for later use as a soil amendment. Personnel should follow the excavator operator and clear the restoration area of root fragments and rhizomes by hand. All collected roots are removed along with the collected root balls for offsite composting.

Final disposition of removed plant material

Once the invasive plant material is harvested, the material can either be burned onsite or chipped and removed from the site for composting. If the harvest occurs during the burning season there are several reasons to burn most of the material on site. Firstly, burning on site reduces costs of chipping and offsite transport of harvested material. Second, the burning of woody material returns valuable nutrients to the soil structure, principally phosphorus, which in many systems has been depleted by plant growth and microbial activity. If possible, we prefer to burn the harvested material in small manageable brush piles to facilitate these benefits to the local ecosystem.

If the work is conducted out of the burning season the harvested material can be chipped on site and removed to an offsite composting operation for composting and subsequent use as a soil amendment. Chipping the plant material before it develops seeds or flowers renders the plant unviable, especially once the material has completely dried. Then, composting the chipped woody plants becomes a

sustainable use for the harvested material. Once composted, this material will return valuable nutrients to the soil, which will eventually be used by other plants for growth.

Aftercare & Maintenance

After the initial removal of the woody invasive species, the restoration area should be surveyed monthly to remove sprouting invasive species (e.g., seed material is still present in the thatch and surface soils of the disturbed areas). Some of these seeds will germinate and sprout. It is very important to conduct these monthly surveys and to harvest by hand any sprouting invasive materials. During the first growing season most of this material is hand-picked. We typically use our summer interns for this work, but the Town may use Town staff or volunteers. Each will carry a 5-gallon pail and fill it with new invasive seedlings for disposal. Each month there are fewer and fewer seedlings to harvest and by the end of the first season the seeded area has become dense with new growth of desirable native species and the invasive seedlings are practically eliminated. The second growing season will typically only require three (3) surveys, one in the early spring, then mid-summer and mid fall.

Long Term Maintenance Plan

We have developed a long-term maintenance plan specifically for invasive species management projects that require longer care and maintenance than typical ecological restoration efforts. In this way the project goals can be maintained over time in perpetuity and not left to be reinvaded by invasive species through the reseeding by wind dispersal or bird transport. Any invasive species that is identified as part of the routine maintenance and vegetation management of the restoration area must be removed using whole plant removal strategies and techniques. We anticipate that most of the invasive species that come to be found within the restoration area will be woody invasive species including, but not limited to black swallow wort, honeysuckle, glossy buckthorn, and Asiatic bittersweet. Early colonization of these plant species should be removed as soon as practicable and removed from the site to a composting operation to be turned back into soil. All invasive plants should be removed before going to seed. If plants go to seed then flowers and seed capsules should be separately cut and bagged for disposal. The vegetative material can be removed and composted without risk of re-invasion.

Routine surveys of the restoration area should occur monthly during the first six months after initial removal of the invasive species material. Inspections will be focused on removal of new invasive material principally starting from seed sprouts remaining from the plant extraction process. Seedlings should be handpicked and placed in plastic bags or use 5-gallon plastic buckets to contain the material. Harvested material should be either composted or burned according to local fire department rules and regulations. Routine surveys and harvests of invasive species should be made monthly for the first 6 months, post removal and quarterly thereafter until such time that the environmental monitor is confident that invasive species are controlled, and new invasions are limited. Annual inspections should then follow in perpetuity utilizing the same inventory and harvesting protocol as in the initial inspection process.

Recommended Native Species Planting Plan

Following the removal of invasive species the exposed soils should be seeded with a native seed mix and monitored for a year to ensure the native seed has established and the majority of invasive species have been eliminated. We recommend using red fescue (*Festuca rubra*) seed as a groundcover. This species is low maintenance and creates a dense groundcover that will grow fast and in almost any landscape.

After the seed has established and the majority of the invasive species have been eradicated, subsequent planting of various species adapted to the local habitat should be installed according to the “Recommended Planting Plan” (Attachment 2). Specific locations of these plantings will be chosen on site at the time of installation, but all should be within the designated restoration areas and interspersed not in a uniform “on-center” planting schedule (Attachment 2). Plant material can be distributed equally within the restoration area with guidance from professional wetland scientist at time of plantings. All plantings are to be installed by hand.

We recommend installing shrub and herbaceous layers of plant species to model a working ecological system. A canopy layer should be included if the Norway Maples are removed.

The intent of the proposed planting plan is to provide greater species diversity as well as structural diversity within the restoration areas.

We recommend a native shrub and herbaceous planting palette that includes similar species to what already exists, that are adapted to the local habitat, and resilient to climate change and also species that are thought to be resilient to climate change and consistent with observed species migration.

We have identified native species on site including but not limited to Eastern American black walnut trees (*Juglans nigra.*), arrowwood (*Viburnum dentatum*), sweet pepperbush (*Clethra alnifolia*), mapleleaf viburnum (*Viburnum acerifolium*), sensitive fern (*Onoclea sensibilis*), and alder (*Alnus incana*). These existing native species will benefit from the invasive removal because their competition will be removed. They will have the opportunity to spread and further occupy the area. The recommended planting plan is intended to enhance and build upon these naturally occurring plant communities.

Canopy Layer

Canopy structure plays an important role in the ecosystem dynamic. The canopy layer will be a preferred habitat and nesting ground area for north American songbirds in particular, provide shade and cover for sufficient plant growth, and add to species diversity. For these reasons, if the Norway Maples are removed, we recommend installing different canopy species within the restoration planting area such as:

1. Red Oak (*Quercus rubra*)
2. Shagbark Hickory (*Carya ovata*)
3. American Beech (*Fagus grandifolia*)
4. Tupelo (*Nyssa sylvatica*)

5. Silver Maple (*Acer saccharinum*)

All five (5) of these species are native to Essex County and well adapted to riparian areas.

Shrub Layer

This planting palette includes native shrubs and also herbaceous species that will create habitat value as well as increase plant and wildlife diversity within the general area. Given that invasive plant material will be removed from this area, it is important to provide vertical structure, as well as species diversity to re-establish the understory and groundcover plant communities with native species. For this reason, the plant community proposed for the wooded wetland area consists of both shrub and herbaceous plant material.

The proposed native shrub species will provide natural forage for wildlife species, especially native birds, as well as cover and nesting grounds. There are a variety of shrubs that we recommend for the riverfront area:

1. Gray Dogwood (*Cornus racemosa*)
2. Sheep Laurel (*Kalmia angustifolia*)
3. American Elderberry (*Sambucus canadensis*)

All shrubs should be installed by hand. Shrubbery should be placed strategically to restore the ecological value of the Site and not in a gridded, on center, configuration. This will better replicate a naturalized landscape and grow to provide greater edge effect and ecosystem services.

Herbaceous Layer

The dense, native herbaceous community is recommended to consist of perennial riverfront wildflowers, grasses and ferns.

1. Red columbine (*Aquilegia canadensis*)
2. Star Flower (*Thalictrum thalictroides*)
3. Foam-flower (*Tiarella cordifolia*)
4. White wood aster (*Aster divaricatus*)
5. Woodland sunflower (*Helianthus strumosus*)
6. Boneset (*Eupatorium perfoliatum*)
7. Cardinal flower (*Lobelia cardinalis*)
8. Bottle Gentian (*Gentiana andrewsii*)
9. Cinnamon fern (*Osmunda cinnamomea*)
10. Riverbank wildrye (*Elymus riparius*)
11. Interrupted fern (*Osmunda claytoniana*)
12. Red fescue (*Festuca rubra*)



Cinnamon fern (Osmunda cinnamomea) grows well in moist soils. Fertile, spore-bearing fronds grow in the center of the plant.

13. Oak sedge (*Carex pensylvanica*)

The herbaceous layer can be installed as one-gallon or one-quart containerized nursery stock as well as native seed.

This planting plan will create a dense, vegetated layer across the wetland that will substantially improve the function and value of this area by providing nesting areas, food, and cover for wildlife. The rush plantings in particular will create habitat benefiting small mammals and native songbirds. The wildflower plantings will not only function well as groundcover, but will also provide habitat for our pollinators and butterflies. All species to be installed are native to this region and are adapted to the surrounding soils and hydrology.

Irrigation During Establishment

Planting of new nursery stock should be followed by routine watering-in (at least on a weekly basis) to establish good root contact with soil and root development. It is likely that irrigation will be necessary for plants to successfully establish. The area should be irrigated, as needed, for at least the first growing season or until plantings become established.

Summary of Recommendations

In summary, in order to restore the riverfront area at 70 Walnut Street to improve the ecological habitat of the site, we recommend the following restoration plan:

1. Remove the invasive species by whole plant removal techniques. For best results, use a mini-excavator and pull any missed roots by hand.
2. Stabilizing exposed soils with red fescue seed and salt marsh hay.
3. Let the red fescue seed establish, and monitor the restoration area for 1-2 years; pull any emerging invasive species by hand
4. Install native canopy, shrubs, and herbaceous material by hand to re-occupy the restoration area with species adapted to the local habitat
5. Irrigate the plants as needed for the first growing season or until established

Should you have any questions or would like to arrange a site walk to review the project, please don't hesitate to call us at (978) 948-7717.

Respectfully,

DeRosa Environmental Consulting, Inc.



Evin Guvendiren
Natural Resource Economist
MJD/eeg



Michael J. DeRosa, Principal
Wetland Ecologist, LSP, LEED AP, PWS



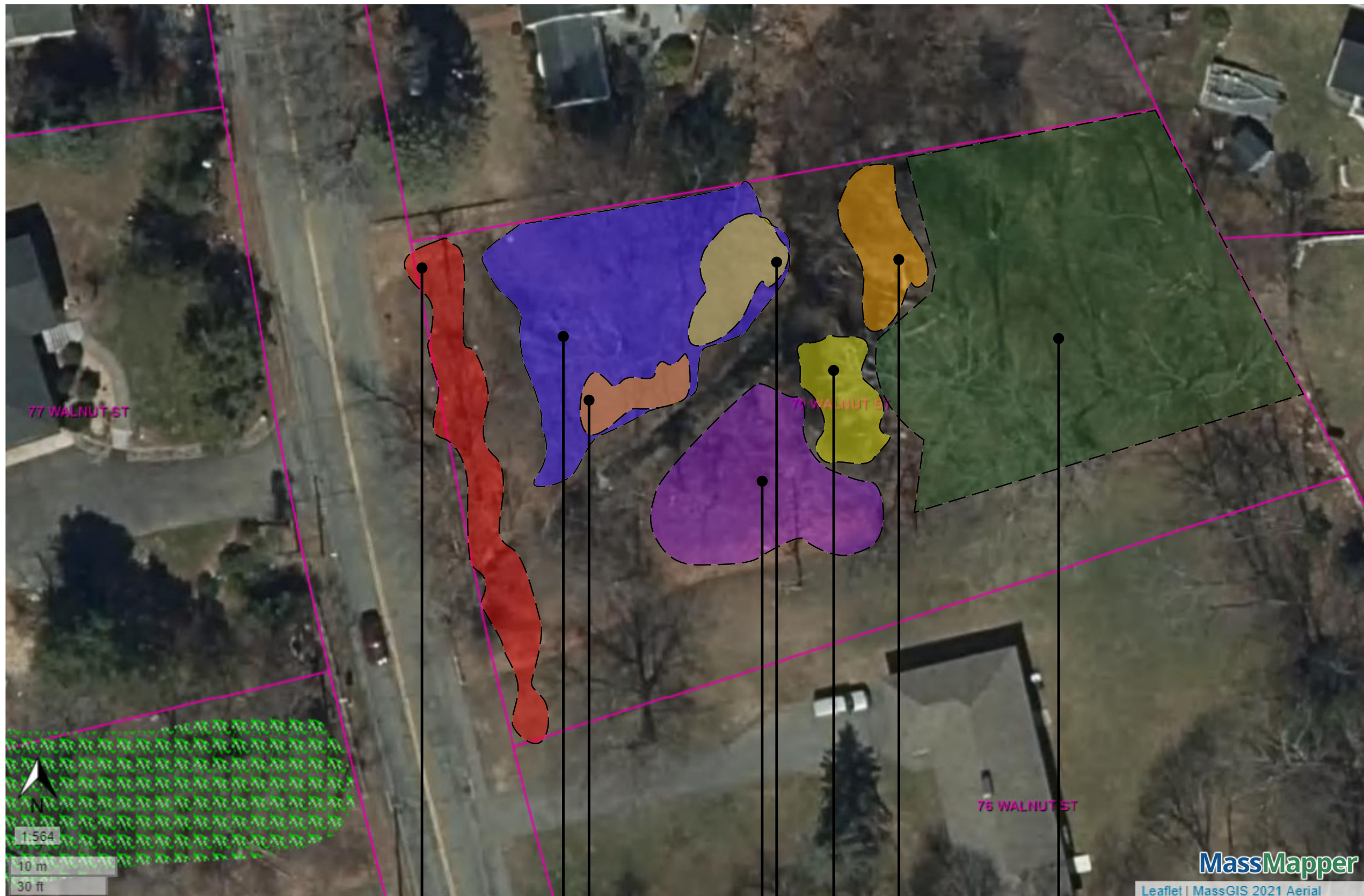
Attachments:

1. Vegetation Inventory & Invasive Management Plan
2. Recommended Planting Plan
3. Invasive Species Identification Guide
4. Photo Appendix
5. Professional Qualifications

Vegetation Inventory & Invasive Species Management Plan

General Notes:

1. All plant removal activities to follow whole plant removal techniques avoiding the use of chemical treatment.
2. Work can be conducted with a mini-excavator (permit may be required as it is within River-front Area) and by hand.
3. Removal of targeted invasive plant species should be overseen by a professional wetland scientist.
4. All harvested material should be removed from the site to a local composting operation (e.g., Brick Ends Farm, Hamilton or Marshall Farm, Gloucester, or equal). If work is conducted during the burning season then slash can be burned on site to reduce the volume of material required to be removed from the site and costs.
5. Any disturbed soils should be stabilized with red fescue and salt marsh hay to avoid the effects of erosion and maintain moisture and protection for the seeded areas.
6. Trees to be removed by professional tree services. Stumps to be ground.



Multiflora rose
Virginia creeper
Bittersweet
Eastern Black Walnut

Garlic mustard
Swallow wort
Bittersweet
Multiflora rose
Honeysuckle
Norway maple

European buckthorn
Garlic mustard
Sensitive fern
Skunk cabbage
Japanese barberry
Jewelweed

Alder
dumped debris piles
Japanese knotweed

Euonymus

Unable to access back portion of property due to thick vegetation, dumped debris piles, and not having authorization to enter abutting property

Michael J. DeRosa
Michael J. DeRosa
PWS No. 2250
MJD/reg/ledr
June 3, 2022

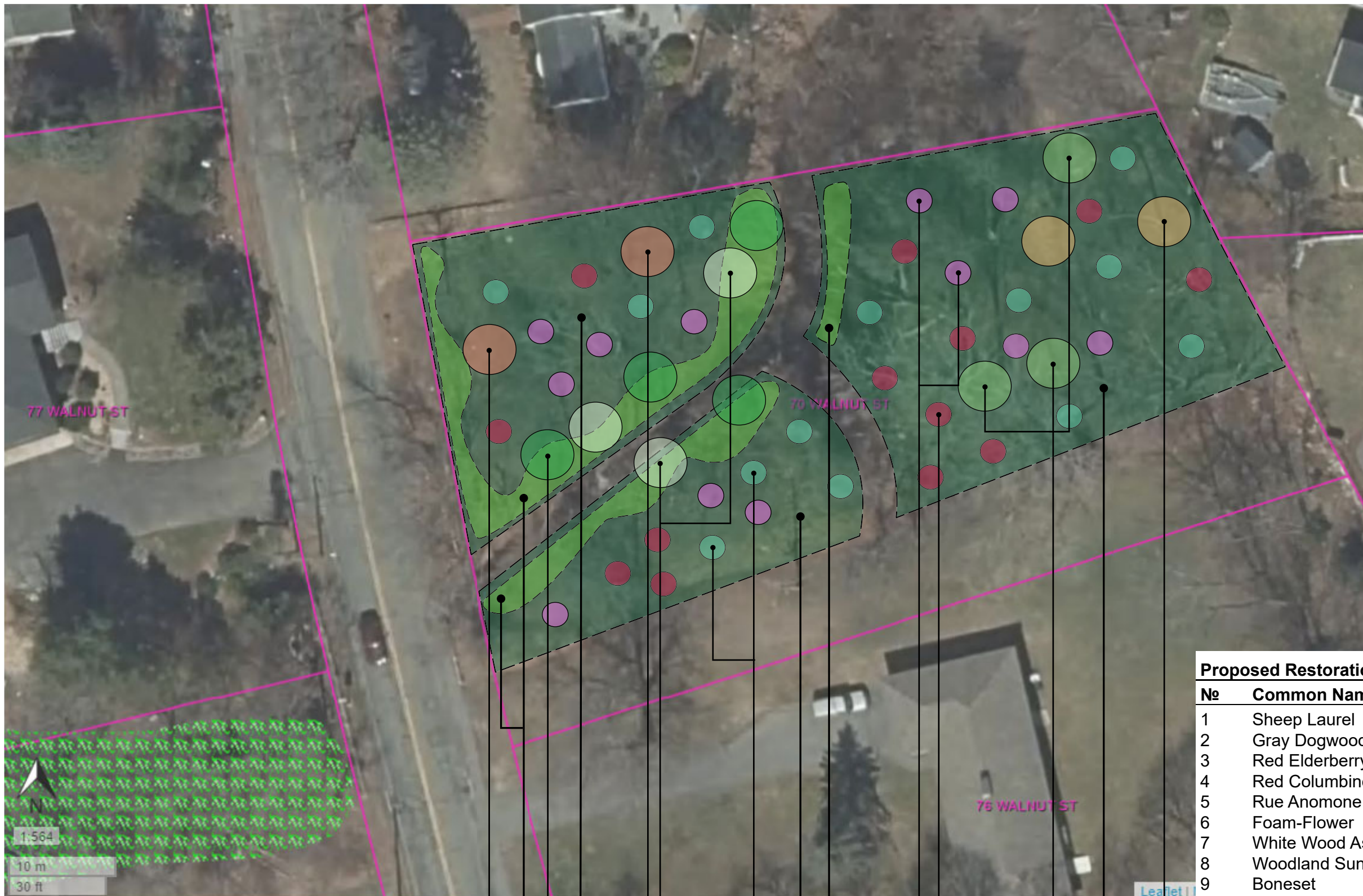


Recommended Planting Plan

70 Walnut Street | Lynnfield, MA

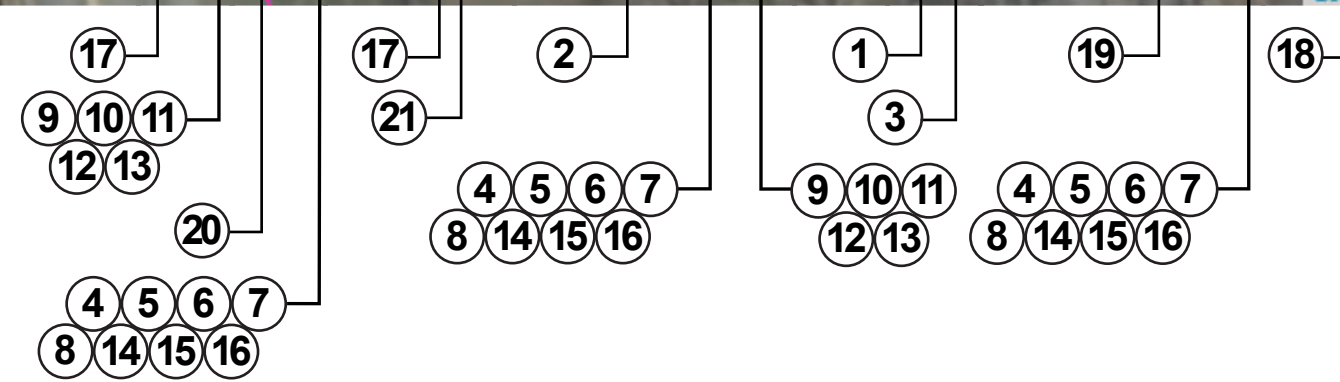
Notes:

1. Specific locations of individual plants are approximate and subject to change based on site specific conditions at the time of planting.
2. Soils may be augmented as needed with 1 part loam, 1 part organic compost, and 1 part sand, as needed.
3. All plant installation is to be completed by hand.
4. Exposed soils will be seeded with a native grass seed mix, then hay-mulched with salt marsh hay.
5. If needed, irrigation shall be provided by the property owner as needed during the first growing season or until plants are established.
6. Monthly inspections should be conducted for the first growing season to ensure establishment of the plantings and seed material.



Proposed Restoration Plant List | 70 Walnut | Lynnfield MA

No	Common Name	Scientific Name	Indicator Status
1	Sheep Laurel	<i>Kalmia angustifolia</i>	FAC
2	Gray Dogwood	<i>Cornus racemosa</i>	FAC
3	Red Elderberry	<i>Sambucus racemosa</i>	FACU
4	Red Columbine	<i>Aquilegia canadensis</i>	FACU
5	Rue Anomone	<i>Thalictrum thalictroides</i>	FACU
6	Foam-Flower	<i>Tiarella cordifolia</i>	FACU
7	White Wood Aster	<i>Aster divaricatus</i>	UPL
8	Woodland Sunflower	<i>Helianthus strumosus</i>	FACU
9	Boneset	<i>Eupatorium perfoliatum</i>	FACW
10	Cardinal Flower	<i>Lobelia cardinalis</i>	FACW
11	Bottle Gentian	<i>Gentiana andrewsii</i>	FACW
12	Cinnamon Fern	<i>Osmunda cinnamomea</i>	FACW
13	Riverbank Wildrye	<i>Elymus riparius</i>	FACW
14	Interrupted Fern	<i>Osmunda claytoniana</i>	FACU
15	Red Fescue	<i>Festuca rubra</i>	FACU
16	Oaksedge	<i>Carex pensylvanica</i>	FACU
17	Red Oak	<i>Quercus rubra</i>	FACU
18	Shagbark Hickory	<i>Carya ovata</i>	FACU
19	American Beech	<i>Fagus grandifolia</i>	FACU
20	Tupelo	<i>Nyssa sylvatica</i>	FACW
21	Silver Maple	<i>Acer saccharinum</i>	FACW



A Guide to **INVASIVE PLANTS** in Massachusetts



Photo by Bill Byrne

by

Pamela B. Weatherbee, Paul Somers and Tim Simmons

The Massachusetts Biodiversity Initiative



Massachusetts

Division of Fisheries & Wildlife

Why Are Some Non-Native Plants a Serious Threat?

Plants introduced from somewhere else leave behind the diseases and herbivores that kept them under control in their native habitats. This provides them with an advantage that allows some of them to crowd out native species.

Some non-native plants were introduced deliberately for their vigorous, growth potential: exceptional for erosion control, but a big problem for slower growing native plants. A few were selectively bred to produce abundant fruits and seeds attractive to birds and other wildlife — and thus are readily spread by these animals into many habitats. Others arrived unintentionally in a variety of ways and their spread has been accelerated by human activities and pathways of transportation. Most of these plants thrive in disturbed areas: roadsides, abandoned fields, right-of-way corridors and ditches.

These invasive, typically non-native species (also called “exotics” or “alien weeds”) often occur in huge patches — one species taking the place of a great variety of native plants — thus reducing the biodiversity of natural areas.

Why do we need biodiversity? Our plants and animals have evolved together for thousands of years, developing into a closely interwoven web of life, with many animals and plants dependent on specific species for their survival. Invasive plant populations change the characteristics of these complex webs and can lead to the elimination of many plants and animals. For example, some butterflies require a specific food plant, and many plants re-

quire specific pollinators. If invasive plants crowd out the species the butterfly needs, or the ones the special pollinators need, whole sections of the web can collapse, diminishing the wildlife community. Do we really want a world of just starlings and dandelions?

Plants have been moving around the landscape and evolving since life began. However, these current invasions of aggressively spreading plants are not natural range extensions (which would include natural control agents and give native species time to develop competitive strategies). They are moving so fast and are so overwhelming that many native species simply cannot contend with them. All too frequently, natural habitats are degraded by multiple invasive species.

Many of these “bad plants” are still being planted because they seem to fill a particular need for fast-growing erosion control, visual screening, windbreaks, wildlife foods, or even as garden plants. Native plants can and should be used to fill these needs. Some are available in nurseries and seed catalogs, and others are being studied for their potential uses.

Most introduced species, such as garden, meadow, and agricultural species, are NOT harmful. Only a few are troublemakers. If we know the characteristics of a plant we may be able to predict how it will behave; whether it will spread like wildfire or stay where it is planted. Responsible introduction of new species or varieties should involve careful research and testing before release.

A Typical Harmful Invasive Plant

1. Grows and matures rapidly
2. Spreads quickly
3. Can flower and/or set seed all season
4. Has no known diseases or pests to control it
5. Thrives in many habitats
6. Is difficult to remove or control

What Can We as Individuals and Organizations Do?

First, be aware of the value of our native habitats to wildlife and the dangers posed by invasive non-natives.

Join local groups that are introducing people to the enjoyment of local native habitats and wildlife communities.

Don't plant invasive species or spread them inadvertently (for instance, collecting oriental bittersweet for fall or winter decorations, and later discarding the stems, fruit and seeds outside).

Learn to identify the most invasive species. The ones featured on the following pages are among the worst currently found in Massachusetts.

If you notice new or small populations of invasive species on public land or nature reserves, notify the managers. Caught in time, the weeds may be controlled; otherwise it will involve expensive, arduous labor to remove them. Land managers are in a good position to take action against new invaders.

If you are a landowner or land-manager, be vigilant for the appearance of invasive species on your property. Learn how to eradicate or control them (this booklet should help), and take steps to do so **before** they become a serious problem.

Don't disturb soil or vegetation in natural areas unnecessarily. Undisturbed natural areas are resistant to invasion.

Encourage the planting of native species in municipal and town gardens, memorial sites, parks, traffic islands, etc. Ask your nursery to stock more native species; point out any plants for sale at your nursery that are known to be harmful invasives.

Contact the Division of Fisheries and Wildlife, The Wildflower Society, your local garden club and other environmental or agricultural organizations for information on what to plant. Join conservation organizations that are protecting natural habitats, plants and wildlife.

Control of Invasive Plant Species

An exotic plant invasion can move through an area with the speed of an epidemic. Like a disease, eliminating it right away, or better yet, preventing its introduction in the first place, is always the best medicine. Pulling or killing a few stems, saplings or seedlings when they first appear may prevent an insurmountable problem later. **(Make sure you've correctly identified the plant first; don't destroy native species by mistake!)**

Attacking the problem by hand with the aid of a few gardening tools is least destructive to the habitat; plants can be pulled, mowed, or cut. Always keep in mind that each species will respond differently to each control method. Some sprout prolifically when cut, for instance, and may require multiple cuttings for

several years before their roots will finally die. Find out what works for the species you are dealing with, and what methods may make matters worse.

Treating invasive plants with herbicides is often an effective control method, but it should be used cautiously and with discretion. Other alternatives should always be considered first. Be sure to read and follow instructions on herbicides sold over the counter at stores and garden centers. Consider seeking professional advice from licensed applicators or the state Pesticide Bureau in the Massachusetts Department of Food & Agriculture. When considering application in or near wetland areas, town conservation commissions or administrators must be consulted.



Photo by Paul Somers

Trees

Black Locust

Robinia pseudoacacia

Not a native of the New England region, Black Locust has been extensively planted for wood, fence posts and landscaping in Massachusetts. It becomes a problem when large patches formed by root sprouts choke out other vegetation. It forms large colonies in grasslands and pine barrens in southeastern Massachusetts. Cutting, then herbiciding the freshly cut stumps, has proven to be an effective method of control.



Artwork by Walter Lincoln Graham,
courtesy The New York Botanical Garden



Photo by Bill Byrne

Norway Maple

Acer platanoides



Widely planted as an ornamental and street tree, this maple has seeded into roadsides, wetland edges and forests, and may outcompete our native Sugar Maple. Dense shade under its canopy reduces species of wildflowers and other tree seedlings. Easily overlooked by its similarity to Sugar Maple, identify it by its wide leaves with milky sap (tear a leaf or its stem and check the broken veins) and regular furrowed bark. Saplings can be pulled and large trees cut.

Artwork by Eduardo Salgado,
courtesy The New York Botanical Garden



Photo by Frank Bramley,
courtesy New England Wildflower Society

Shrubs and Vines

Oriental Bittersweet

Celastrus orbiculata



Artwork by Eduardo Salgado,
courtesy The New York Botanical Garden,
and Nancy Childs (lower illustration)

A fast growing vine, Oriental Bittersweet can wind around young trees, choking them, or spread over vegetation, smothering it. Similar to the now-scarce native bittersweet, it differs by having flower clusters all along the stem. The vine interferes with forest regeneration, kills trees, covers fields and hedgerows, and displaces native plants. Once established, it is extremely difficult to eliminate, but mowing, cutting or hand-pulling of vines may help. Due to extensive below-ground "runners" (rhizomes) that sprout prolifically, herbicide treatments applied to cut stems at the time of the first killing frost are often necessary to achieve control.



Photo by Bill Byrne

Japanese Barberry

Berberis thunbergii

Japanese Barberry has spread from plantings, taking over pastures, woodlands, ledges, and floodplains. It forms thorny thickets in young woodlands, preventing native herbaceous and shrub growth. Although it provides food for wildlife, the damage it does outweighs the good. Common Barberry, *Berberis vulgaris*, is also an invasive, non-native shrub in open, disturbed habitats across Massachusetts. Young plants can be pulled easily; cutting alone does not work.



Artwork by Walter Lincoln Graham, courtesy The New York Botanical Garden, and Nancy Childs (lower illustration)



Photo by Pamela B. Weatherbee

Black Swallow-wort

Cynanchum louiseae

A charming little vine related to the milkweed, this aggressive plant can spread explosively, covering open areas, edges and hedgerows, and eliminating all other vegetation. Small maroon flowers soon produce wind-borne seeds that drift everywhere, making this species hard to control. A closely related species with paler flowers known as “dog-strangling vine,” *Cynanchum rossicum*, behaves similarly and is now considered a weed in parts of Connecticut.



Artwork by Anne Rogelberg and Laura Vogel,
courtesy The New York Botanical Garden



Shining Buckthorn

Photo by Frank Bramley,
courtesy New England Wildflower Society

Shining and Common Buckthorn

Rhamnus frangula and *R. cathartica*

Shining Buckthorn is the more abundant of these two shrubs in Massachusetts. Although sometimes found in uplands, it typically invades marshes, swamps, bogs, wet meadows and the edges of beaver ponds, crowding out a variety of native species. Common Buckthorn is typically found on drier sites. Both shrubs are tolerant of dense shade. They flower and fruit all season and spread rapidly because birds eat their berries and thus spread seeds. Removal is difficult because stems resprout after cutting. If stems are cut and herbicide applied to their stump tops in winter, mortality is high. Young plants can be pulled by hand and older ones pulled mechanically. Because of regeneration from remaining root and stem, as well as dormant seed, follow-up work will be necessary in subsequent years.

Shining Buckthorn



Common Buckthorn
(with fruit)



Artwork by Anne Rogelberg,
courtesy The New York Botanical Garden



Photo by Paul Somers

Japanese Honeysuckle

Lonicera japonica

This climbing honeysuckle displays large white or cream-colored, fragrant flowers that occur in pairs. Each flower pair later forms two black, fleshy berries. The vine chokes supporting trees and shrubs by twining tightly around and over them, forming dense patches. Already a major pest from Connecticut southward, where it invades successional forest and fencerows, it is a localized problem in parts of Massachusetts. Early detection and control is imperative; once established, it is very difficult to remove.



Artwork by Eduardo Salgado,
courtesy The New York Botanical Garden



Morrow's Honeysuckle

Photo by Bill Byrne

Morrow's Honeysuckle and other shrub honeysuckles

Lonicera morrowii, *L. tatarica*, *L. maackii*, *L. xbella*

The red berries of the shrubby honeysuckles are spread by birds, and the resulting shrubs quickly form impenetrable thickets, displacing other vegetation in young forests and on floodplains. Morrow's and Amur (*L. maackii*) have white flowers fading to yellow; Tatarian and its hybrid with Morrow's, *L. xbella*, are pink. Morrow's is the most pervasive in Massachusetts and can be distinguished from Tatarian honeysuckle by its hairy leaves and shreddy bark. It appears that Tatarian honeysuckle is not as invasive. Amur honeysuckle (*L. maackii*) is not yet common in Massachusetts, but is the predominant weedy honeysuckle in some midwestern states. Young shrubs can be pulled by hand, but mechanical means are necessary for extracting established older ones. Before initiating control measures, be certain that the plants in question have been identified correctly: there are two native species of honeysuckle that **belong** in the New England plant community.



Morrow's Honeysuckle

Artwork by Eduardo Salgado,
courtesy The New York Botanical Garden



Photo by Bill Byrne

Autumn Olive

Elaeagnus umbellata

Until quite recently, fast-growing Autumn Olive and Russian Olive (*Elaeagnus angustifolia*) were considered ideal for screening. They have been used in wildlife plantings for decades because of their abundant, fleshy red fruits. On the negative side however, these shrubs (Autumn Olive in particular) spread rapidly into old fields and natural grasslands, creating dense thickets that crowd out native vegetation. Autumn Olive's distinctive scaly, silvery leaves soon become green on the upper side, whereas those of Russian Olive remain silvery on both surfaces. Small fragrant flowers, silvery without and pale yellow within, produce reddish berries. These are avidly eaten by birds, which spread the seeds far and wide. Control of established colonies may require a combination of mechanical means and herbicide treatments.



Artwork by Laura Vogel,
courtesy The New York Botanical Garden

Porcelain Berry

*Ampelopsis
brevipedunculata*

Currently most abundant along the coast, this vigorous vine can cover the ground and overwhelm trees and shrubs, especially in disturbed areas, along shorelines and around forest edges. The leaves, often three-lobed, are similar to grape, a close relative. The distinctive, small, grape-like berries start off lilac in color, then mottle, maturing to a bright blue with a waxy sheen. Climbing by tendrils, this plant is difficult to eradicate, but pulling the vines from trees and then repeatedly cutting or mowing the remaining plants will help control it.



Photo by Leslie J. Mehrhoff,
courtesy George Stafford Torrey Herbarium



Artwork by Laura Vogel,
courtesy The New York Botanical Garden

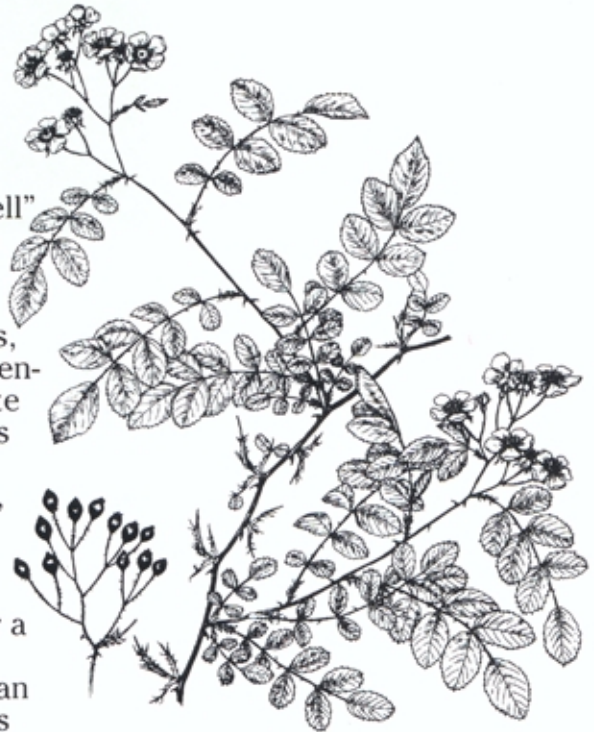


Photo by Bill Byrne

Multiflora Rose

Rosa multiflora

Originally promoted as a “living fence,” this aggressive shrub now creates a “living hell” of thorny thickets. Thriving in any habitat from pasture to forest, it can displace many native trees, shrubs and herbs, effectively thwarting their regeneration. Clusters of many white flowers produce tiny red fruits (hips) spread by birds. Hand-pulling works for small plants, but large ones will require other techniques such as repeated cutting or mowing during the growing season for a couple of years. Once established, mechanical pulling or an herbicide applied to cut stems late in the growing season or during the dormant season can be effective.



Artwork by Regina O. Hughes,
courtesy Agricultural Research Service,
U.S. Department of Agriculture



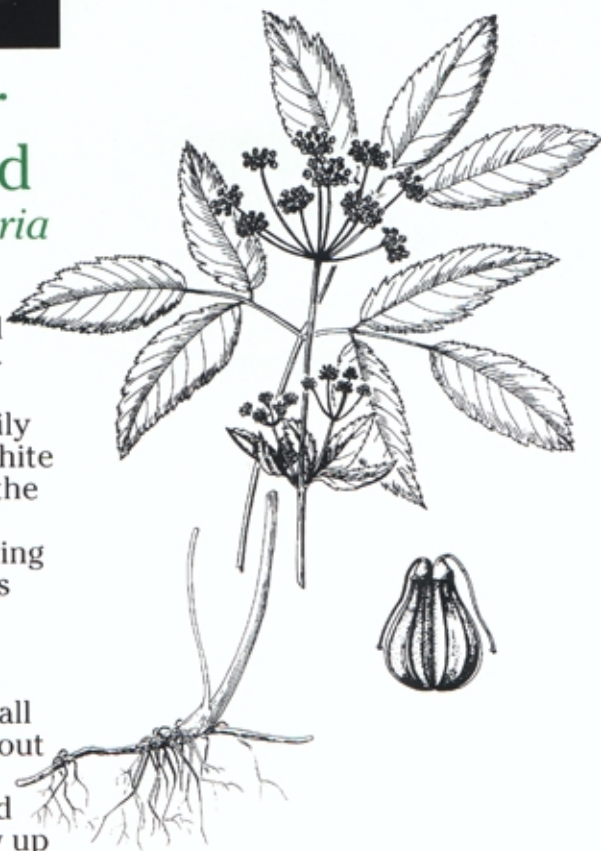
Photo by Paul Somers

Herbaceous Annuals and Perennials

Goutweed or Bishop's Weed

Aegopodium podagraria

An escapee from gardens, where it was a handy ground cover, Bishop's Weed has invaded floodplains, forming dense mats. In the same family as Queen Anne's Lace, the white flower cluster is similar but the leaves, instead of being lacy, have toothed leaflets appearing in threes. Some garden forms have variegated leaves with broad white margins (as in photo). It spreads by underground rhizomes. Even a small piece left in the soil may sprout into a plant, making it very difficult to exterminate. Hand pulling or raking, with follow up monitoring and removal of all new plants, is necessary.



Artwork by Lucille E. Blum and Laura Vogel,
courtesy The New York Botanical Garden



Photo by Pamela B. Weatherbee



Yellow Iris

Iris pseudacorus

Beautiful but aggressive, Yellow Iris will spread rapidly on pond shores and in wetlands and can pre-empt sites where native wetland plants, including two native iris species, would grow. It has also invaded rocky coastal shoreline habitat in northeastern Massachusetts. Pulling or digging it out when first seen may be preferable to pursuing herbicide usage in wetland settings.

Artwork by Mary C. Easton,
courtesy The New York Botanical Garden

Japanese Knotweed or Japanese Bamboo

*Polygonum
cuspidatum*

Most harmful to natural habitats on riverbanks, gravel bars and floodplains, this plant spreads by rhizomes up to 60 feet long. Rhizome fragments frequently are the source of new downstream colonies, since even a small piece can generate a new plant. Its hollow bamboo-like stems form large patches that eliminate all other vegetation. Also, the large, loose inflorescence of whitish-green flowers produce abundant, shiny black, triangular seeds that disperse easily. A minimum of four cuttings during a growing season are required to eliminate the underground reserves of a colony. With small patches, removal by digging may be a practical and effective option.



Photo by Paul Somers





Photo by Frank Bramley,
courtesy New England Wildflower Society

Purple Loosestrife

Lythrum salicaria

Although a showy wetland plant that many find beautiful, Purple Loosestrife forms impenetrable mats where few other plant species can live. By reducing the variety or abundance of native plants in the marsh, the survival or success of many animals that have evolved to use these plants for cover, food and nesting areas are affected. Purple loosestrife should be removed immediately when first noticed because it is almost impossible to exterminate. Each plant produces up to 2 million seeds each year which remain viable for many years in wetland soils. Biological controls may be the only practical way to control most infestations. Two Eurasian leaf-eating beetles and a weevil have been released in many areas following tests at Cornell University to determine how they might behave in natural environments; initial results seem promising with much reduction of Purple Loosestrife.



Artwork by Lucille E. Blum,
courtesy The New York Botanical Garden

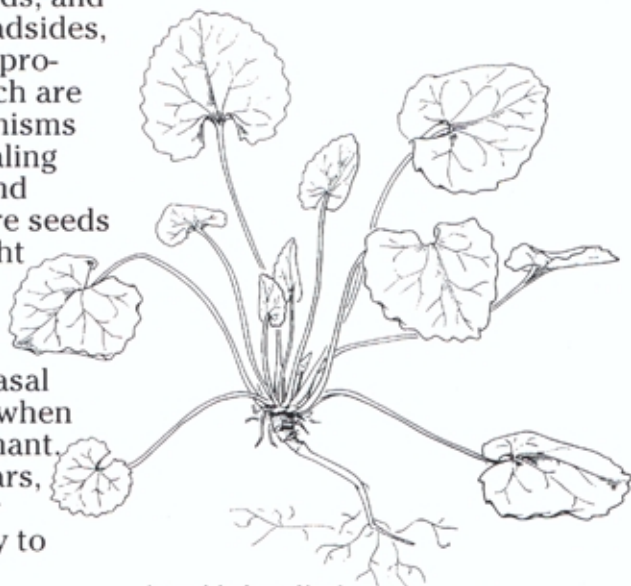


Photo by Paul Somers

Garlic Mustard

Alliaria petiolata

Garlic Mustard, an herbaceous biennial herb native to Europe, has garlic-smelling, round, toothed leaves and small flowers with four white petals. It outcompetes many native wildflowers in floodplains and woodlands, and is a pestiferous weed in roadsides, hedgerows and gardens. It produces abundant seeds which are easily dispersed by mechanisms such as flooding. When dealing with small populations, hand pulling all individuals before seeds ripen for several years might work, but with larger ones it will be necessary to augment this with herbicides applied to overwintering basal rosettes during the winter when most other plants are dormant. Seed remains viable 2-5 years, so follow-up treatments for several years are necessary to accomplish control.



Artwork by Laura Vogel,
courtesy The New York Botanical Garden



Photo by Bill Byrne

Phragmites or Common Reed

Phragmites australis

A 15 foot tall grass with plume-like seed heads, Common Reed spreads rapidly in wetlands by its extensive rhizomes. Originally a native species of brackish marshes in eastern Massachusetts, it now follows salt-laden highway margins and pipeline corridors, spreading into adjacent land. It chokes out all other vegetation and sharply reduces the value of wetlands habitat to most wildlife. Labor intensive cutting followed by the application of herbicide to stems is effective, but also quite costly. Hydrologic controls (e.g., flooding for four months during the growing season), dredging, and summer/fall burning are other techniques that have worked in particular situations. A combination of treatments is often a good approach.



Artwork by Mary C. Easton,
courtesy The New York Botanical Garden

Problem Plants to Watch For

The following species are presently not common in Massachusetts and are not causing any immediate, serious problems in the state. However, based on past experience and their record in other states, they are regarded as likely future pests.

Trees

Princess Tree

Paulownia tomentosa

A fast growing tree with large broad leaves, it is more of a problem in the mid-South, where it out-competes native trees. While only known from a few sites in Massachusetts, at present it is regarded as invasive in Connecticut. Its soft, white wood is prized in the Orient for use in traditional wedding boxes, so even in this country it brings a good price on the market. In the spring it has upright clusters of velvety, deep blue, fragrant flowers.

Western Catalpa or Cigar Tree

Catalpa speciosa

and Chinese or Yellow Catalpa

Catalpa ovata

Western Catalpa is a midwestern and southern U.S. native that has spread from plantings and is hardy in Massachusetts and tolerant of periodic flooding in the floodplain forests of our major rivers. It, along with its yellow-flowered relative, the Chinese Catalpa, which also is naturalizing into western Massachusetts habitats, pose new problems for natural lands managers. Both species resprout from cut stumps.

Shrubs and Vines

Hardy Kiwi

Actinidia arguta

An Asian relative of the edible kiwi of New Zealand, it and other Asian relatives are now being sold widely in temperate North America. Advertised as having fragrant flowers, edible fruit and strong-growing vines, it can behave like Oriental Bittersweet, smothering other vegetation in forests and clearings. It can withstand temperatures down to -30°F and appears to be hardy in the Berkshires where it is a weedy invader in natural settings.

Winged Euonymus, Wahoo or Burning Bush

Euonymus alata

This shrub has been planted extensively for years because of its bright red fall foliage and fruit and corky winged branches. Now it is invading forests and pastures. Considered a frequent and abundant weed in Connecticut, where it replaces native understory shrubs, it occurs in natural habitats throughout Massachusetts. Berries are spread by birds, and there is an abundant seed source in ornamental plantings. Young plants can be hand-pulled, but with large patches, either mechanical pulling or cutting stems and applying herbicide may be more practical and effective.

Kudzu

Pueraria montana var. lobata

“The plant that ate the South” has persisted where introduced at a few places in southeastern Massachusetts. Since it dies back each winter in this climate, it may be limited by lack of hardiness. Nevertheless, given its reputation in the south, it should be watched.

Herbaceous Annuals and Perennials

Mile-A-Minute Plant

Polygonum perfoliatum

Not in the state yet, but documented a year ago just south of the border in Connecticut. Given its name, it may be here already as you read this. A prickly vine with triangular leaves, it crawls or climbs with the aid of backward bending barbs along its weak branching stems. It smothers other vegetation and its seeds are spread by birds that eat its pea-sized, iridescent blue fruits.

Japanese Stilt Grass

Microstegium vimineum

Spreading northward from the southeastern United States, this annual grass is now considered an invasive weed in Connecticut. It is very shade tolerant, growing in less than 5% light. Typically, it forms a loosely interwoven, 6-10 inch tall carpet of weak stems, spreading rapidly through river floodplains or recently disturbed areas such as logging roads. It spreads by seeds or plant fragments. A healthy plant can produce over a thousand seeds a year.

English Water Grass

Glyceria maxima

This tall, aggressive grass has the potential to be as destructive as Phragmites. At present it is limited to one wetland location in Essex County where it is excluding all other vegetation including Purple Loosestrife. Efforts to control it with cutting and herbicide treatments have yet to eradicate it at this site. There is always a danger that a few rhizomes could start a new colony, or that its seeds could land where it can get established.

Ornamental Grasses

such as Eulalia

Miscanthus sinensis

and others

Some species may pose a problem as they are being planted in ever increasing numbers without full testing for invasive qualities. Eulalia, for instance, is planted for its silvery inflorescence and variegated foliage, but has been observed spreading into native grassland habitat at a site on Cape Cod. Some bamboos are hardy and may spread aggressively through containers and walls. These may be difficult to eradicate once established.

INVASIVE PLANT SPECIES OCCURRING IN MASSACHUSETTS

The following is a list of non-native plants recorded in Massachusetts which possess strongly invasive characteristics. Those which are currently presenting the greatest threat to native plant communities are highlighted. Remember, however, that some species which are not highlighted may eventually become major problems, and that others may not become widespread problems.

COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
Amur honeysuckle	<i>Lonicera maackii</i>	Live-forever or Orpine	<i>Sedum telephium</i>
Autumn olive	<i>Elaeagnus umbellata</i>	Moneywort	<i>Lysimachia nummularia</i>
Barnyard grass	<i>Echinochloa crusgalli</i>	Morrow's honeysuckle	<i>Lonicera morrowii</i>
Black locust	<i>Robinia pseudoacacia</i>	Morrow's X Tatarian	
Black swallow-wort	<i>Cynanchum louiseae</i>	honeysuckle (hybrid)	<i>Lonicera xbella</i>
Bittersweet nightshade	<i>Solanum dulcamara</i>	Multiflora rose	<i>Rosa multiflora</i>
Bushy Rock-cress	<i>Cardamine impatiens</i>	Norway maple	<i>Acer platanoides</i>
Canada bluegrass	<i>Poa compressa</i>	Oriental bittersweet	<i>Celastrus orbiculata</i>
Chervil	<i>Anthriscus sylvestris</i>	Phragmites, Reed grass	<i>Phragmites australis</i>
Coltsfoot	<i>Tussilago farfara</i>	Porcelain berry	<i>Ampelopsis</i>
Common barberry	<i>Berberis vulgaris</i>		<i>brevipedunculata</i>
Common buckthorn	<i>Rhamnus cathartica</i>	Purple loosestrife	<i>Lythrum salicaria</i>
Common / hedge privet	<i>Ligustrum vulgare</i>	Reed canary-grass	<i>Phalaris arundinacea</i>
Common mullein	<i>Verbascum thapsus</i>	Russian olive	<i>Elaeagnus angustifolia</i>
Creeping buttercup	<i>Ranunculus repens</i>	Sea- or horned poppy	<i>Glaucium flavum</i>
Curly pondweed	<i>Potamogeton crispus</i>	Sheep fescue	<i>Festuca ovina</i>
Cypress spurge	<i>Euphorbia cyparissias</i>	Sheep-sorrel	<i>Rumex acetosella</i>
Dame's rocket	<i>Hesperis matronalis</i>	Silver lace-vine	<i>Polygonum aubertii</i>
Eurasian water-milfoil	<i>Myriophyllum spicatum</i>	Silver poplar	<i>Populus alba</i>
Fanwort	<i>Cabomba caroliniana</i>	Spotted knapweed	<i>Centaurea biebersteinii</i>
Garlic mustard	<i>Alliaria petiolata</i>	Sweet reedgrass	<i>Glyceria maxima</i>
Giant waterweed	<i>Egeria densa</i>	Sycamore maple	<i>Acer pseudoplatanus</i>
Glossy buckthorn	<i>Rhamnus frangula</i>	Tatarian honeysuckle	<i>Lonicera tatarica</i>
Goutweed or		Tree-of-heaven	<i>Ailanthus altissima</i>
Bishop's weed	<i>Aegopodium podagraria</i>	True forget-me-not	<i>Myosotis scorpioides</i>
Hair fescue	<i>Festuca filiformis</i>	Water-chestnut	<i>Trapa natans</i>
Hairy willow-herb	<i>Epilobium hirsutum</i>	Watercress	<i>Rorippa nasturtium-aquaticum</i>
Japanese barberry	<i>Berberis thunbergii</i>		
Japanese honeysuckle	<i>Lonicera japonica</i>	Western catalpa	<i>Catalpa speciosa</i>
Japanese hops	<i>Humulus japonicus</i>	White mulberry	<i>Morus alba</i>
Japanese knotweed	<i>Polygonum cuspidatum</i>	Wild thyme	<i>Thymus pulegioides</i>
Japanese privet	<i>Ligustrum obtusifolium</i>	Winged euonymus	<i>Euonymus alata</i>
Japanese rose	<i>Rosa rugosa</i>	Variable water-milfoil	<i>Myriophyllum</i>
Kiwi vine	<i>Actinidia arguta</i>		<i>heterophyllum</i>
Kudzu	<i>Pueraria montana</i>	Yellow floating heart	<i>Nymphoides peltata</i>
Lesser naiad	<i>Najas minor</i>	Yellow iris	<i>Iris pseudacorus</i>

For More Information:

Agricultural Research Service, U.S. Dept. of Agriculture. 1971. *Common Weeds of the United States*. Dover Publications, Inc. New York, NY.

Compendium on Exotic Species. 1992. Natural Areas Association, 320 S. Third St., Rockford, IL 61104. (43 short articles about invasive plant species and their control).

McKnight, Bill N., 1993. *Biological Pollution: The control and impact of invasive species*. Indiana Academy of Science, Indianapolis.

Randall, J.M. & J. Marinelli (Eds.). 1996. *Invasive Plants: Weeds of the Global Garden*. Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, NY 11225 (Good color photos and descriptions covering invasive plants nationwide).

Weatherbee, P. B. 1994. *The most unwanted plants*. Massachusetts Wildlife. Division of Fisheries and Wildlife, Westborough MA 01581.

White, D.J., E.Haber & C.Keddy. 1993. *Invasive Plants of Natural Habitats in Canada*. Rept. prepared by Canad. Mus. of Nature for Canadian Wildlife Service, Environment Canada, Ottawa, Ontario. 121 pp.

A companion guide to this publication – *A Guide to Invasive Non-native Aquatic Plants in Massachusetts* by C. Barre Helquist – is available from the Mass. Department of Environmental Management, Lakes & Ponds Program, 100 Cambridge St., Boston, MA 02202

About the Authors:

Pamela B. Weatherbee is the author of *The Flora of Berkshire County* and a member of the Massachusetts Non-Game Advisory Committee.

Paul Somers is the State Botanist with the Massachusetts Division of Fisheries & Wildlife's Natural Heritage & Endangered Species Program.

Tim Simmons is the Restoration Ecologist with the Massachusetts Department of Fisheries, Wildlife & Environmental Law Enforcement's Biodiversity Initiative.



MassWildlife

This publication was supported by funds authorized in the 1996 Open Space Bond Bill. The Ecological Restoration Program studies natural systems and then develops and implements strategies and techniques to restore ecosystems and natural systems significant to the state's biodiversity. The Biodiversity Initiative's Ecological Restoration Program is a new program within the Massachusetts Department of Fisheries, Wildlife & Environmental Law Enforcement, and the Massachusetts Division of Fisheries & Wildlife.

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Canopy at the site is predominantly Norway Maple, an invasive species. Multiflora rose is seen in the understory



In this photo you see an example of the “Norway Maple Desert”. Norway maple canopies create densely shaded areas reducing the ability for understory growth.



Black swallow wort has aggressively been taking over the herbaceous layer on site and is recommended to be removed.



Asiatic bittersweet is seen here climbing walnut tree saplings. It is recommended that the bittersweet be removed from the site so that it does not continue to suffocate the native species on site.



This photo shows extremely large bittersweet roots that will not be able to be removed by hand. Whole plant removal techniques can be employed by a mini-excavator to assist with removals of this size.



A large stand of Japanese knotweed has occupied the riverbank that will compromise the stability of the bank if not removed.



Photo showing a debris pile that was dumped. We recommend removing the debris piles as part of this restoration plan.



We were unable to access the rear of the property due to the thick vegetation, climbing bittersweet vines, and debris piles as shown in the previous photo. It seems that the vegetation consists primarily of invasive species similar to the accessible areas.



During our site visit, a Great Blue Heron was seen. An example of one species that would benefit from the riverfront restoration plan.



Sensitive fern was seen throughout the site. This is a native species that should remain. Once invasive species are removed, this species will be able to spread and benefit from the recommended planting plan.





Abigail Manzi, BA

Environmental Scientist

Abby graduated with a bachelor's degree in Environmental Studies and Biology from Guilford College in Greensboro, North Carolina. Her studies focused on sustainable practices and ecology with courses including Sustainable Business, Animal Behavior, Rainforest Ecology and Environmental Policy.

Abby joined DeRosa Environmental Consulting in the fall of 2015. She is currently working at DeRosa Environmental as an Environmental Scientist.

While in college Abby spent a semester abroad in the rainforest in Australia studying Rainforest Ecology, Forestry Management and Socioeconomics. She also spent a month of her time there researching Lumholtz's Tree Kangaroos.

Prior to working at DeRosa Environmental Abby traveled to Hawaii to work on farms and learn about organic farming practices through World Wide Opportunities on Organic Farms (WWOOF).

Abby grew up with a love for the wildlife and nature taking trips every spring out to the vernal pools with her mom to check out the amphibians and camping every summer. She loves anything outdoors including hiking, diving, snowboarding and swimming. She travels as much as possible, especially to new places with animals she has never seen.

EDUCATION

BA, Biology and Environmental Studies | 2014
Guilford College, Greensboro, NC

PROFESSIONAL EXPERIENCE

Environmental Scientist | 2015 – Present
DeRosa Environmental Consulting Inc

Intern | Summer 2013
Ipswich River Watershed Association

Student Researcher | August-December 2012
Center for Rainforest Studies, Queensland, Australia

PROFESSIONAL MEMBERSHIPS/AFFILIATIONS

AMWS | Association of Massachusetts Wetland Scientists

CERTIFICATION

40 Hour Hazardous Waste Site Worker (OSHA)

PADI Open Water Diver | 2015

LICENSE

Unmanned Aircraft License | FAA | Exp. 2/28/2019

REPRESENTATIVE PROJECTS

**Private Residence | Dune Grass
Restoration**
Manchester, MA

**Commercial Property | Wetland
Restoration**
Rowley, MA

Willowdale State Forest | Culvert Repair
Ipswich, MA

Saint Joseph's School | Well Monitoring
Salem, MA

**Private Residence | Reconstruction of a
Single Family Home**
Ipswich, MA

**Ipswich River Watershed Association |
River Culvert Survey**
North Shore, MA

**Invasive Plant Management |
Restoration Project**
Ipswich, MA

Sally's Pond | Trail Restoration Grant
Ipswich, MA



REPRESENTATIVE PROJECTS

Private Residence | Restoration Project
Ipswich, MA

Keeley McCall-Tunell, BA

Environmental Specialist

Keeley is currently enrolled as a graduate student at the University of Minnesota, pursuing a master's in horticulture with a focus on ecological restoration. Her coursework focuses on plant propagation, restoration, revegetation, and sustainable horticulture and management practices.

Keeley initially joined DeRosa Environmental Consulting in 2018, working as a horticulture specialist. During this time, Keeley assisted with field projects and invasive species monitoring and management. Keeley also assisted the DeRosa team with planting and after care for plants. After a two-year departure, during which Keeley worked at The Trust for Public Land, an environmental nonprofit focused on land protection and promoting greenspace access, Keeley rejoined the DeRosa team in 2021. Her work is guided by her love for the outdoors and passion for conservation.

Keeley also has experience working with the horticulture department at the Como Park Conservatory, the largest public garden in Minnesota. At Como, Keeley worked in the green houses and the outdoor gardens. She has experience working in formal gardens, informal gardens, and water gardens.

Keeley grew up on the shores of Lake Superior, where she developed a love for the outdoors and wildlife, and above all, the water. In her hometown, Lake Superior is a central component to recreation and community life. Keeley enjoys hiking, camping, kayaking, skiing, and whenever possible, sailing.

EDUCATION

BA, Social Work | 2017

Bethel University, St. Paul, Minnesota

PROFESSIONAL EXPERIENCE

Environmental Specialist | 2021-Present
DeRosa Environmental Consulting Inc

Philanthropy Associate | 2019-2021
The Trust for Public Land

Horticultural Scientist | 2018
DeRosa Environmental Consulting Inc

Horticulture Intern | Summer 2018
Como Park Conservatory



Patrick Moran, BS

Field Support

Patrick graduated with a bachelor's degree in Geology with a concentration in Environmental Geosciences from Bridgewater State University located in Bridgewater, Massachusetts.

During his time in college, Patrick focused on the impact of hydrology in surrounding environments. He learned about contaminated water flow through an environment and the impact it has on soils and groundwater supply. He is interested in working on projects that help keep natural habitats clean and healthy as well as restoring habitats that have been negatively affected.

Patrick spent a semester working with professors on a research project to determine the impact that oceanic crust has on fluids exiting from underwater hot springs at a mid-ocean spreading center in the Gulf of Mexico. He conducted research and sample testing at the Woods Hole Oceanographic Institute.

Patrick began working with DeRosa Environmental Consulting in the summer of 2018 as an intern. He is currently working at DeRosa Environmental as field support. Patrick has worked alongside DeRosa Environmental employees on a variety of projects including wetland delineations and wetland restoration. Patrick's work is driven by his interest in the natural resources that the north shore has to offer and his desire to sustain and protect the habitats they provide.

Patrick has had a strong passion for the outdoors since he was young. He has grown up enjoying many outdoor hobbies including hunting, fishing, camping, hiking, kayaking, and surfing.

EDUCATION

BS, Geology - concentration in environmental geosciences | 2018

Bridgewater State University, Bridgewater, MA

PROFESSIONAL EXPERIENCE

Field Support at DeRosa Environmental Consulting Inc |
Summer 2018-present

REPRESENTATIVE PROJECTS

Invasive Plant Management | Restoration Project
Ipswich, MA

Commercial Property | Wetland Restoration
Rowley, MA

Sally's Meadow | Butterfly Meadow Restoration
Ipswich, MA

Private Residence | Dune Grass Restoration
Ipswich, MA

Invasive Plant Management | Restoration Project
Gloucester, MA

Invasive Plant Management | Restoration Project
Manchester, MA



Evin Guvendiren, BS

Natural Resource Economist

Evin graduated from the University of Massachusetts Amherst with a Bachelor of Science in Natural Resource Economics and minors in Environmental Science, Economics, and Natural Resource Conservation. Her studies focused on sustainability, econometrics, land conservation, environmental policy and natural resource management.

Evin joined DeRosa Environmental Consulting in the Summer of 2017 and is currently holding the position as Environmental Scientist.

During her bachelor's studies, Evin spent a semester abroad with the School for Field Studies in Costa Rica. There, she lived on a sustainable farm and implemented an integrated pest management system. Her classes consisted of field experience and course work on sustainable development, tropical ecology, and resource management in a developing country. She also participated in environmental stewardship and spent one month conducting a Socio-economic directed research project with a national park.

Evin also spent a semester researching the Colony Collapse Disorder as an independent study. She helped a professor with a grant from the USDA to determine consumers' willingness to pay for native bee pollination on cranberries. This research was funded to help find an alternative to commercial honeybee pollination to support the agriculture industry and economy.

Having grown up near beaches and ocean, marshes, rivers, vernal pools, and national parks, Evin has a strong love and passion for the environment. She spends most of her time outdoors and camps, hikes and kayaks whenever she can.

REPRESENTATIVE PROJECTS

Private Residence | Dune Grass Restoration
Manchester, MA

Private Residence | Dune Grass Restoration
Ipswich, MA

Commercial Property | Wetland Restoration
Rowley, MA

Private Residence | Reconstruction of a Single Family Home
Ipswich, MA

Invasive Plant Management | Restoration Project
Ipswich, MA

Sally's Meadow | Butterfly Meadow Restoration
Ipswich, MA

Town Wide Beach and Road Management Plans
Manchester, MA

Wetland Restoration | MassDEP ACOP
Rockport, MA

Wetland Restoration | MassDEP ACOP
Essex, MA

CERTIFICATION

40 Hour Hazardous Waste Site Worker (OSHA)

Adult and Pediatric First Aid/CPR/AED

EDUCATION

BS, Natural Resource Economics | 2014
University of Massachusetts, Amherst, MA

PROFESSIONAL EXPERIENCE

Environmental Scientist | 2017 – Present

DeRosa Environmental Consulting Inc

Student Researcher | January – May 2014

University of Massachusetts Amherst-Resource Economics department

Student Researcher | January – May 2013

The SFS Center for Sustainable Development Studies, Atenas, Costa Rica



Michael J. DeRosa

Principal, LSP, LEED AP BC&D

Michael J. DeRosa, Principal and project manager specializing in habitat restoration and wetland restoration projects. He has more than 24 years experience working with ecological systems focused on restoration and rehabilitation of damaged landscapes. Ecological principles inform his design and restoration practices.

Mike was the principal wetland permitting leader for the Turner Hill Resort Center in Ipswich Massachusetts. He has consulted with the Archdiocese of Boston since 1989 in all environmental areas. His firm is known for their expertise in wetland and wildlife habitat restoration and rehabilitation and invasive species control and management.

Mike incorporated DeRosa Environmental Consulting, Inc., in May 1994 after spending 8 years working in the environmental consulting industry as technical director and project manager. Prior to his consulting career he was a researcher at the Harvard School of Tropical Public Health working with infectious diseases and tick transmitted Lyme disease, in particular.

Mike has been involved with many projects associated with MGL Ch. 21e and Massachusetts Contingency Plan (MCP) projects. He received his Licensed Site Professional (LSP Lic. 3452) registration in 1993. Mike is uniquely credentialed in hazardous waste site assessment and remediation and has over 24 years experience in wetland permitting, habitat restoration and mitigation. Mike has permitted projects with all federal, state and local environmental agencies. Mike is on the Practice Faculty at The Boston Architectural College. His new passion is the incorporation of urban agriculture and food justice initiatives in mixed use community based projects.

EDUCATION

MA, Boston University, 1993

North Carolina State University, 1986

Harvard University, 1985

BA, University of Denver, 1982

REPRESENTATIVE PROJECTS

Ipswich River Watershed Association
Ipswich MA

**Miles River Task Force |
Watershed Restoration**
Beverly Wenham Hamilton Ipswich MA

**Paumier Residence |
Dune Restoration**
Manchester MA

**Matignon High School Athletic Fields |
Landfill Cap Remediation**
Cambridge/Somerville MA

**Turner Hill Golf Course |
Wetland Mitigation & Pond Design**
Ipswich MA

**Saint Aidan's Church |
UST Remediation**
Brookline MA

**Saint Kevin's School |
AST Remediation**
Dorchester MA

**Saint Joseph's School |
UST Remediation**
Salem MA

**Ipswich Country Club |
Wetland Restoration**
Ipswich MA

**Ould Newbury Golf Club |
LID Runoff Design**
Newbury MA

**Ferncroft Country Club |
Pond Restoration**
Topsfield/Middleton MA

PROFESSIONAL EXPERIENCES

Principal, LSP, LEED AP BC&D

DeRosa Environmental Consulting, Inc. | 1994-Present

Technical director, Environmental Engineering Division

Web Engineering Associates, Inc. | 1990-1994

Project manager/Environmental Scientist,

Dennison Environmental, Inc. | 1988-1989

Population Ecologist & Wetlands Specialist,

Lelito Environmental Consultants, LLC | 1987-1988

Research Assistant,

North Carolina State University | 1985-1987

Air Pollution Analyst

Entropy Environmentalists, Inc. | 1985-1987

Senior Research Assistant

Harvard University | 1983-1985

Naturalist

The Trustees of Reservations | 1983-1985

PROFESSIONAL MEMBERSHIPS/AFFILIATIONS

New England Wildflower Society

USGBC | United States Green Building Council

NGWA | National Ground Water Association

AMWS | Association of Massachusetts Wetland Scientists

LSPA | Licensed Site Professional Association

SWS | Society of Wetland Scientists

MACC | Massachusetts Association of Conversation Commissioners

CERTIFICATIONS AND SPECIAL TRAINING

Licensed Site Professional (LSP), Lic. No. 3452

Professional Wetland Scientist (PWS)

LEED Accredited Professional | 10342989

Certified Ecologist, The Ecological Society of America |

June 2002 – May 2007

CERCLA 40 Hour Hazardous Materials Safety Training |

OSHA 29 CFR 1910.120

Confined Space Entry Training | OSHA 29 CFR 1910.146

Management Training Workshop | Dun and Bradstreet

Hazardous Materials Chemistry Seminar | University of Toledo

Unmanned Aircraft License | FAA | Exp. 2/28/2019