

LAND MANAGEMENT AND DESIGN PLAN FOR

WRIGHT FARM

IN

LEXINGTON, MASSACHUSETTS



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Mass Audubon Ecological Extension Service
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Mass Audubon protects more than 40,000 acres of land throughout Massachusetts, saving birds and other wildlife, and making nature accessible to all. As Massachusetts' largest nature conservation nonprofit, we welcome more than a half million visitors a year to our wildlife sanctuaries and 20 nature centers. We believe in protecting our state's natural treasures for wildlife and for all people—a vision shared in 1896 by our founders, two extraordinary Boston women. Today, Mass Audubon is a nationally recognized environmental education leader, offering thousands of camp, school, and adult programs that get over 225,000 kids and adults outdoors every year. With more than 135,000 members and supporters, we advocate on Beacon Hill and beyond, and conduct conservation research to preserve the natural heritage of our beautiful state for today's and future generations.

Mass Audubon's Ecological Extension Service (EES) assists cities and towns, land trusts, state and federal agencies, and other conservation partners with natural resource inventories, habitat restoration and management planning, and conservation planning. Through EES we can share the experience we have gained in managing our own network of wildlife sanctuaries across the commonwealth.

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Introduction

The Massachusetts Audubon Ecological Extension Service prepared a draft land management and design plan for Wright Farm in 2014. As that draft was about to be completed the Town exercised its right to acquire the farmhouse and barn. At that time, it was decided to delay the completion of the management plan until the future of this acquisition of additional land was finalized and its uses determined. Since then, the farmhouse was turned over to the Lexington Housing Assistance Board (LexHAB) and is now occupied by residents. In addition, the Town contracted with the Mass Audubon Education Department to develop an educational program for the site and an architectural firm (Colin Smith Architecture) to study the feasibility and cost of renovating the barn as an environmental education center. This report will build on those completed efforts.

Land Acknowledgement

The land sustains us in many ways. A few examples of what it provides:

- The air we breathe
- The water we drink
- The food we eat
- Sequestration of carbon
- Climate moderation
- Protection from flooding
- Recreation that renews our spirits
- The lumber we use to build our shelters
- Filtration and decomposition of our wastes
- Habitats for a diversity of plants and animals

The land at Wright Farm is also part of the ancestral territory of the Massachusetts Nation of Native Americans. The land sustained them for thousands of years before its occupation by Europeans. How we care for the land will determine how well it will be able to sustain our descendants.

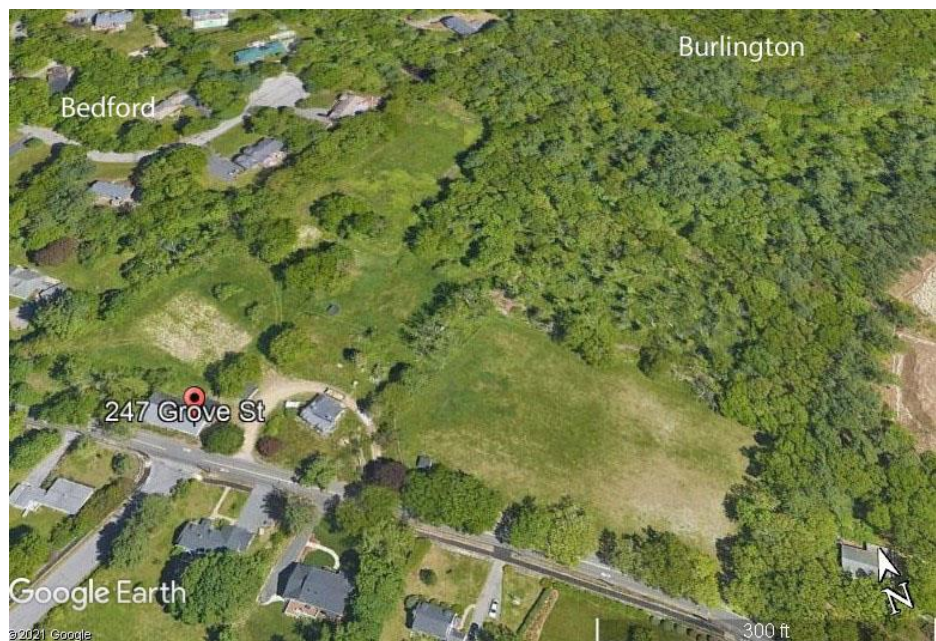


Photo 1 - Aerial view

Setting of Wright Farm Conservation Area

Wright Farm (at 247 Grove Street) is a 13-acre conservation property in the northwest corner of Lexington (bordering both Bedford and Burlington) that was initially acquired by the Conservation Commission in 2012. The lot including the house and barn was acquired in 2016 by the Town. Wright Farm includes open fields, a wet meadow, a forested wetland, and mixed forest. Although the site itself is small, it has value both as wildlife habitat and as a site for passive recreation and environmental education. It adjoins a narrow strip of wooded Lexington conservation land, which itself adjoins the Burlington Landlocked Forest, a 250-acre area of mostly forested open space in Burlington with a large trail system used extensively by mountain bikers. Together, these open spaces provide an important wildlife corridor and passive recreational area.

This master plan has been developed by Mass Audubon's Ecological Extension Service, working closely with the Lexington Conservation Commission, Conservation Office staff, and Volunteer Stewards, to identify goals for the site and specific management actions necessary to maximize the ecological, educational, and recreational potential of the property.

General Goals for the Use and Management of Lexington's Conservation Land

Given that the Conservation Commission desires to maximize public enjoyment of town conservation land through passive recreation while protecting the important natural, cultural, and historic resources of the land, the following general principles will be used to consider management of the properties.

1. Public access to town-owned conservation lands for passive recreational uses will be encouraged where it would not be detrimental to protection of the property's natural, historic, and cultural resources.
2. Approved public uses will be expressed through Conservation Commissions rules and regulations for conservation lands, property-specific regulations, use specific regulations, and on-site signage.
3. Alterations to conservation land necessary to accommodate public access, such as vegetation management, trail building, and installation of appropriately sized parking lots, bridges, and boardwalks, will be considered favorably as long as they are:
 - a) determined to be necessary to accommodate public access,
 - b) demonstrated to be the best option for achieving public access, and
 - c) demonstrated to have minimal impact on known natural, cultural, or historic resources.
4. Visitor safety will be a top priority in planning and implementing property management, public access improvement projects, and land use regulations.
5. The Commission, staff, and volunteers will strive to maximize the natural resource values of each conservation parcel. Specifically, they will manage properties to:
 - a) protect habitat for rare and sensitive species,
 - b) enhance habitat for nesting and migrating birds,

- c) protect uncommon and exemplary natural communities and maximize habitat value for dependent species,
 - d) maintain and extend wildlife corridors across conservation land,
 - e) maintain ecosystem services such as pollination, natural flood control, groundwater recharge, carbon sequestration, and food production, and
 - f) control invasive species.
6. Cultural and historic resources will be recognized, celebrated, and protected on conservation lands to the extent practicable. Specifically:
- a) all identified historic resources will be protected from disturbance,
 - b) where appropriate, conservation land will accommodate agricultural uses traditional to the site or as identified as a community need (such as community gardens), and
 - c) sites will be managed to maintain traditional landscapes and vistas, especially those that contribute to community character.

Site Goals and Challenges

Goals for the management of Wright Farm include:

- Improved public access including parking and trail system
- Exemplary stewardship of the site’s natural and cultural values
- Use for environmental education (schools, adults, special events, etc.)
- Wright Farm can also be an important new entry point to the large area of open space – the Burlington Landlocked Forest
- Easy connections can be made to the 69-acre Old Reservoir conservation land in Bedford, as well. This geographic serendipity opens possibilities for regional trail connections

Challenges include:

- Ongoing discussion of the appropriate uses for the site, especially given its relatively small size
- The peripheral location of the site – away from the center of town
- The expense involved in making the site more accessible and developing the facilities for making the site more suitable for environmental education

Property Description

Physical Features

Wright Farm is a 13.2-acre property at the very northern tip of Lexington, located on the east side of Grove Street on the Bedford and the Burlington town lines (Figure 1). The structures on the property are a large barn dating to the 1840s (with alterations in the 1900s), a garage, and two 3-sided sheds,



Photo 2 - Sign along Grove Street



Figure I. Wright Farm Locus Map



formerly used to shelter horses, and roughly 1,000 feet of fencing. There is a wooden sign at the southern end of the property, along Grove Street, identifying the parcel as a Lexington conservation area.

The southwest side of the property abuts Grove Street. Land to the southeast includes a small house lot directly on Grove Street and a new residential development that has a trail system that connects to Wright Farm. To the northeast lies the Burlington town line and Burlington's Landlocked Forest, a 250-acre parcel which, while not formally protected, offers a buffer to and recreational connection from Wright Farm. The northwest boundary runs along back yards of houses on Avon Road in Bedford. The Lexington Greenways Corridor Committee has proposed a trail linking Wright Farm to Burlington's Landlocked Forest/Paint Mine and Simonds Brook. The trail would cross Grove Street and connect to Bedford's Old Reservoir conservation land.

Wright Farm features gently rolling topography with an overall slope to the east and ranging in height from 275 feet above mean sea level at the very southern point to 216 feet at the very eastern corner.

Water drains to the east over most of the property except for the very western corner which drains towards Grove Street. The property is underlain by ~425-million-year-old Quincy Granite bedrock of the Milford-Dedham Zone. While bedrock appears to have little direct influence on the vegetation and land use of the property, it does influence the topography of the site. There are no streams or permanent standing water bodies on the property, but runoff and groundwater do migrate to the lower ground in the eastern corner of the property.

Surficial geology, unlike the bedrock, plays an important role in site conditions. The dominant surficial material is glacial till, a mix of clay, silt, sand, cobbles, and stones deposited by the melting glacier roughly 15,000 years ago. Till is generally well-drained and tends to weather to an acidic soil in eastern Massachusetts. Wright Farm soils are uniformly fine sandy loams, including Scituate, Canton, Montauk, and Whitman fine sandy loams. These standard types, which are named and described by the Natural Resource Conservation Service, vary only modestly in depth, chemical makeup, and color. Whitman soils are found in low-lying areas that tend to collect water and so are relatively poorly drained. Except for the extent of stones, the Scituate, Canton, and Montauk soils are suitable for crop production.

Ecological Features

The property is nearly evenly split between fields and woodland. The fields are dominated by grasses with typical hayfield herbaceous species including Queen Anne's lace and asters. In 2014, the field north and east of the house lot was thoroughly infested with Japanese stiltgrass, an aggressive invasive species that is relatively new to Massachusetts, but a concerted effort by the Conservation Commission and volunteers has largely eradicated it. The wooded stands include a White Pine-Mixed Oak forest along the eastern boundary and continuing into Burlington's Landlocked Forest, and a section of white ashes in the southeast quadrant of the property. The ashes are generally in decline even though they are not particularly old. Many white ashes in our area are in a similar condition due to a disease generically called Ash Dieback.

The mammalian wildlife of Wright Farm will include suburban generalists such as white-tailed deer, coyote, red fox, gray fox, raccoon, striped skunk, opossum, eastern cottontail, eastern chipmunk, and

gray squirrel. Red squirrel can be found in the forested areas; and meadow vole, short-tailed shrew, star-nosed mole, white-footed mouse, and groundhog are probable in the fields. Fisher likely visit the property and mink may occasionally explore wetlands that link through Landlocked Forest. While still uncommon in eastern Massachusetts, a spring dispersing black bear could find its way to the property. Bats likely roost in the barn and hunt over the meadows.

The variety of habitat at Wright Farm likely attracts a diverse group of birds throughout the year. Scrubby field edges are ideal for sparrows through the fall, the forested area likely hosts owls in the winter, and the treetops and meadow edges will attract migratory warblers and other species in the Spring and Fall. The site is a bit more limited in terms of breeding habitat in that it does not have one large area of any habitat type. The fields are not big enough to attract grassland specialists, nor does the small wetland area have the structure or size to attract wetland breeders. But several species are drawn to the edges found on Wright Farm including indigo bunting, eastern phoebe, eastern bluebird, and Baltimore oriole. The forested area, while small on the farm parcel, does buffer and connect with more forest on the adjacent parcel and likely hosts forest breeders such as wood thrush, hermit thrush, and scarlet tanager. The barn and sheds may also provide nesting habitat for barn swallows. A visitor has reported seeing a bald eagle on at least one occasion. Other raptors are likely to hunt the fields from time to time.

As mentioned above, vernal pool species that breed in nearby pools may venture into the forested sections of Wright Farm during the non-breeding period. American toads may use smaller pools within the wet section of the property for breeding. Spring peepers and gray tree frogs are likely in the shrubby habitat east of the meadows. A wide variety of invertebrates, including butterflies and dragonflies make use of the meadows throughout the growing season.

There is no evidence of rare or unusual species or natural communities on the property. The site is not identified by Massachusetts Natural Heritage Program as either Priority Habitat for Rare Species or Estimate Habitat for Rare Wildlife. Neither is the site identified as BioMap2 Core Habitat or Critical Natural Landscape. There are three Certified Vernal Pools located at least 800 feet to the east of the parcel, on the Landlocked Forest, and a fourth Certified Vernal Pool roughly 800 feet to the south on a privately owned parcel. The forested sections of Wright Farm may serve as non-breeding habitat for salamander and frog species reliant on these vernal pools.

Most of the property has a typical load of invasive species for fields and forest in a suburban setting. The field edges include multiflora rose, oriental bittersweet, and glossy buckthorn with some common buckthorn and Japanese barberry. A potentially invasive vine has also been noted – Fortune’s spindle (*Euonymus fortune*) – growing up a tree in the field to the north of the barn.

Cultural Features

The property has been a farm for nearly two centuries, leading to a significant portion of the land being open fields. The conservation area includes a large barn, originally built in the 1840s for livestock that was converted for use for poultry in 1936. It consists of three interconnected structures and is listed in the Massachusetts Cultural Resource Information System (MACRIS – LEX 749). Also included on the site

is a two-car garage – now being used for a program space with interpretive information about the site’s natural and cultural history – and two 3-sided sheds that were built to shelter horses. At an informal hearing with the Lexington Historical Commission (HC) on March 21, 2018 there was a consensus that the barn be preserved to the fullest extent possible.



Photo 3 - Barn

Future Uses

Considerable effort has gone into defining the potential future uses of the site. In 2017, the Town engaged Massachusetts Audubon’s Education Department “to design opportunities for Lexington residents to connect with the natural and cultural resources at Wright Farm and adjacent landscapes”. Working with stakeholders and representatives of the community that effort included:

- Development of an education plan for Wright Farm – with potential programs, audiences, and coordination
- Exploration of different program coordination and delivery models, including fee-based programming
- Recommendations for a phased progression for developing educational resources and designing and delivering educational programming

Summary of Mass Audubon Education Department Report

The report was submitted in 2019. Major recommendations included (See full report for more detail):

- Phased Approach for Educational Program
 - Phase 1 A – Early Programs and Initial Site Improvements (2017 to 2020)
 - minimal facilities (signage, trails, some picnic tables, and a tent)
 - rented port-a-potty for part of year
 - scheduled programs and events (bird walks, nature walks, Spring Celebrations)
 - community gardens
 - site improvements done by volunteers
 - parking (DPW)
 - estimated costs, \$50,000 - parking
 - Phase 1 B – Additional Programs and Events, Initial Private Function Rentals (2020 - 2025)

- the expanded parking area, picnic tables, signage, and seasonal port-a-potty and tent, public programs and community events can continue to expand including school programs, high school community service projects, etc.
- additional community events (with live music, and food trucks)
- initial private functions for a fee
- possible construction of a “pavilion” (\$125,000)
- barn stabilization (see cost estimate below - \$122,250)
- Phase 2 – Expanded Programs and Events, Expanded Private Function Rentals
 - in addition to the programs developed in phase 1, accommodate an expanded level of private function rentals with the use of the tent and pavilion
 - a paid part-time employee to coordinate the function rentals
 - begin fundraising to convert barn into a community conservation center (estimated cost \$4,275,000 in 2019 dollars)
- Phase 3 – A New Community Conservation Center – Educational programs, office space for the town’s Conservation Department, a gathering-meeting place for local conservation leaders and volunteers, a scenic and historic setting to rent for private functions, and a place for Lexington residents to come learn, connect, and spend time in nature while also learning how to protect the environment.

Summary of Wright Farm Barn Needs and Feasibility Study

At the same time the firm of Colin Smith Architecture was engaged to evaluate the barn and develop a plan for its conversion into an environment education center. The effort included three major aspects: Structural Stability Analysis, Educational Needs Assessment, and Architectural Design Concept Plans. Their report was submitted in April of 2018. Major findings were (See the full report for details):



Figure 2 - Site Plan

- Structural Stability Analysis
 - the existing structure is not adequate or safe for use as it exists, nearly all framing members will require reinforcing, including floors, roof, and walls.
 - extensive replacement, reinforcing would be required for re-use
 - the structure is not properly braced laterally for wind and seismic loads, additional interior shear walls would be required
 - it would cost at least \$122,250 to stabilize and “mothball” the structure
- Educational Needs Assessment (defers to the Mass Audubon Education Department effort)
- Architectural Design Concept Plans
 - report describes a detailed reuse plan for the barn and a site plan
 - it would cost at least \$4,275,000 to implement the concept plan



Figure 3 - Bird's eye view of Community Conservation Center

Current Uses

Permitted uses should include all forms of passive recreation consistent with the future uses as envisioned. The site has potential as a trailhead for reaching Burlington’s Landlocked Forest. There is a potential that the site will become popular with mountain bikers. Some mountain bikers are currently using the site to access the trails in the Landlocked Forest. This could interfere with the educational and program uses for Wright Farm. Guiding bikers to a more appropriate access is recommended.

The Mass Audubon Education Department Education Plan outlines a phased approach to future uses of the site. Current uses are consistent with Phase 1 A of the Education Plan. The Wright Farm Barn Needs and Feasibility Study shows how the area around the barn and entrance will be used if/when Phase 3 is implemented (See Figure 3).

Conservation Commission Use Regulations

The Conservation Commission regulations include the following:

Without permission of the Conservation Commission, it is forbidden to:

- Be in or on conservation land between the hours of 1/2 hour after sunset and 1/2 hour before sunrise.
- Commit any disorderly action, or disturb the peace, or conduct oneself in such manner as to interfere with the rightful enjoyment of the public upon these grounds.
- Hunt, trap or shoot
- Remove, cut, or damage any flowers, plants, shrubs, trees or rocks.
- Operate a motor vehicle (the term "motor vehicle" includes, without limiting the generality of the same, any car, truck, bus, motorcycle, motorbike, or snowmobile) on conservation lands.
- Make a fire except in designated fireplaces with permission of the Fire Department.
- Discard litter except in designated receptacles or post, paint, affix or display any sign, notice, placard, or advertising device.
- Dump materials of any kind.
- Build any structures.
- Dam any stream.
- Park a motor vehicle except in designated parking areas.
- Possess, be in control of, or be responsible for more than 2 dogs per person.
- Possess, be in control of, or be responsible for any dog or dogs unless carrying a waste bag for each dog and properly disposing of each dog's waste. Waste may be disposed of by placing the bagged waste in a designated trash or waste receptacle in the conservation land or by removing the waste from the conservation land for disposal.
- Possess, be in control of, or be responsible for any dog or dogs unless carrying a leash for each dog.
- Possess, be in control of, or be responsible for any dog or dogs unless such dog(s) are under immediate restraint and control of a responsible person (hereafter "the guardian"), either by leash, or by sight and voice command. Sight and voice command means that dog(s):
 - are always within the guardian's sight
 - come to the guardian immediately when called
 - stay at the guardian's command
 - do not charge or chase any person, dog, or wildlife, nor engage in any aggressive behavior
 - do not cause damage to any conservation land, or any land used to gain access to conservation land.

Safety

There are no pressing safety concerns at the site. Several large white ash trees on the north side of the barn are in decline and may present the hazard of falling limbs in the future. Large trees along the

proposed trail route should be assessed by an arborist and large dead limbs pruned. There can be emergency vehicle access to the site by the drive next to the garage.

Threats and Opportunities

Invasive species of exotic plants are the most obvious threat. A concerted effort to remove Japanese stiltgrass appears to have been successful but continuing to monitor for its reappearance is warranted. Appendix A includes information on controlling this species should it recur. Other invasive species include oriental bittersweet and multiflora rose as well as some others included in the Appendix. Fortune's spindle (*Euonymus fortunei*) a potentially invasive evergreen vine has also been found climbing trees along the trail near the middle of the field.

The greatest opportunities lie in the potential to create the program uses envisioned in the education plan. This will entail improving the parking area, developing trails connecting to the extensive trail network on Burlington's Landlocked Forest and conservation land in Bedford, and developing community gardens (if that use continues to be desired), and ultimately renovating the barn as a community conservation center. Immediate improvement to access and parking and improved connections to adjacent conservation land would contribute to greatly increasing public use and enjoyment of this property.

Public Access

There is currently parking for about six cars near the garage. The existing trail system includes a trail along the north western boundary that crosses a wet meadow. Public access improvements should focus on establishing an entrance and parking area and developing trail connections with adjacent conservation areas and trail networks. Trail planning guidelines will be discussed below.

- Parking – The area around the barn and directly adjacent to Grove Street has been identified as a public entrance and parking lot (See Figure 3). The site plan indicates the area can hold 19 cars. Program use in combination with the community garden may represent more demand than there is capacity on this small site, especially if event rentals are part of the future. The DPW is working to evaluate sight lines for pulling out into traffic. Several (3-6) medium-sized white ash trees would need to be removed to maximize parking. These trees appear to be dead, dying, or in decline, as are many white ashes in eastern Massachusetts.
- Trails – A short-term solution for creating trails has been implemented by volunteers. A few

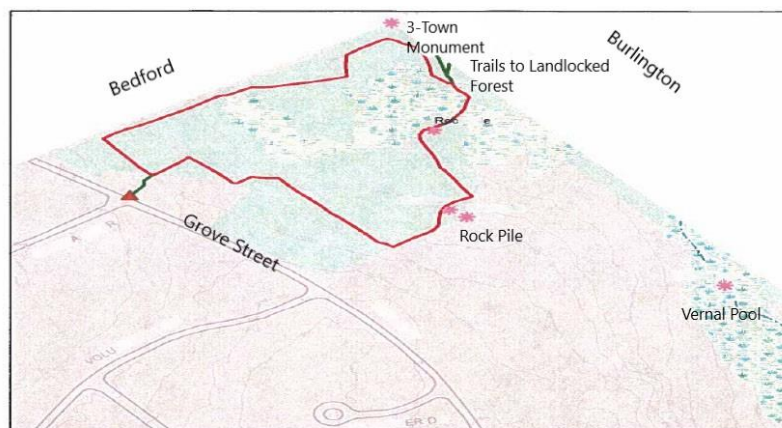


Figure 4 - Existing Trails

trails have been added since this drawing was prepared.

General Management Recommendations

Recent past management of the Wright Farm conservation area appears to have been limited to grazing or mowing the meadows to keep them in an open condition. An area north of the barn has been used, at least recently, as a garden plot. The stand of white ashes was formerly maintained as an orchard. Historic aerial photos show it growing in by the late 1960s and that most of the old apple trees were removed by the 1990s.

The property is generally in good condition given its former use. The top priorities for remediation, maintenance, and improvement projects focus on, improving public access, maintaining the open fields, wildlife habitat enhancement, and invasives management. Other management issues like community gardens, stone walls and fences, and potential reuse of the horse sheds are also included.

Management of Natural Areas in a Time of Changing Climate

The management of natural resources has largely assumed a stable climatic background. Now there is widespread agreement among scientists that the climate is changing because of human activities – largely attributed to the burning of fossil fuels resulting in the production of carbon dioxide. Massachusetts is already experiencing the effects of climate change, from hotter Summers, warmer Winters with less snow cover, rising sea levels, more frequent severe weather events, and inland flooding.

Climate impacts that may affect open spaces are predicted to:

- increase the number of extremely hot days and degrade air quality
- compromise infrastructure like trails (e.g., more erosion, blowdowns, and flooding)
- increase the risks from extreme storm events
- increase non-native plants and pests
- increase vector-borne illnesses (like West Nile and Lyme disease).

Some of these impacts are likely to affect the future management of conservation lands in complex ways. Manomet Center for Conservation Science and the Massachusetts Division of Fisheries and Wildlife have published a study¹ promoting two primary objectives for the management of sites and habitats – managing resilience and managing change. The report does not address the management of grasslands and shrublands. Still, the concepts of resilience and managing change may be useful to keep in mind.

¹ Manomet Center for Conservation Sciences & Massachusetts Division of Fisheries and Wildlife, Habitat Management, April 2010 (<https://www.manomet.org/wp-content/uploads/old-files/Climate%20Change%20and%20Massachusetts%20Fisheries%20and%20Wildlife%20Reports,%20Vol.%203%20April%202010.pdf>)

Management for Resilience and Managing Change

Bob Wilber, Mass Audubon's Director of Land Protection, recently articulated four principles for increasing the resilience of conservation land².

1. **Reduce Non-climate Stressors** – for example, controlling invasive plants and pests.
2. **Restore Form and Function** – for example, removing a dam to promote spawning of anadromous fishes.
3. **Increase Complexity** – for example, increasing diversity and microclimates.
4. **Create Linkages** – for example connecting to adjacent land and creating corridors.

The previously mentioned Manomet report does make recommendations for forests and freshwater wetlands that are relevant for the Wright Farm Conservation Area.

Forested Habitats

- Diversify the age structure and species composition of the forested landscape in advance of climate change could increase resilience of forested ecosystems and overall resistance to the impacts of a changing climate.
- Control of white-tailed deer densities. High levels of browsing by white-tailed deer have adversely affected the structure, composition, and functioning of Massachusetts forested ecosystems, particularly through the elimination of preferred food species such as Red Oak, and thereby reduced their diversity and resilience. Also, overgrazing by deer has opened the way for increased rates of infestation by non-native plants.
- Control invasive species and pests. Damage caused by non-native plants and insect pests will become more serious under climate change. Forest managers will need to:
 - detect and track infestations and outbreaks in their early stages, and
 - take aggressive actions to eliminate these problems before they escape control.
- Manage change. Past management has been primarily guided by the concept of preserving natural habitats and associated species. Adaptive management is recognizing that preserving the status quo may not always be possible. When preservation of a habitat or species is no longer feasible, how do we adapt management practices to guide change? One answer may be to think about planting more southern species that will help maintain diversity or other ecological values. The science of adaptive change is underway, with the beginning of many studies, still much needs to be done.

Freshwater Wetlands

The main threats to freshwater wetlands in Massachusetts are likely to be impaired hydrology and habitat loss, and ecological injuries caused by non-native pest species, the same threats that currently affect wetland quality and function. The regulations that currently protect wetlands have been extraordinarily successful. However, climate change may require us to rethink how these regulations are applied. Active management of wetlands may be an important tool under climate change. For example, it may become beneficial to alter wetland hydrology, or expand their boundaries. If such management is

² Massachusetts Land Conference, Resilient Lands Webinar, May 5, 2020.

impeded by the way some regulations are currently applied, they may have to be modified to reflect changing circumstances.

Control of Invasives. It is likely that the problems that are currently posed by invasive plant species to wetlands will be exacerbated by the higher levels of environmental stress introduced by climate change (droughts, extreme events, etc.). To continue to protect valued wetlands will require three things:

- More active monitoring. It will be essential to detect pest outbreaks in their earlier stages, rather than later when they have secured a foothold. This can only be accomplished if active detection and monitoring schemes are implemented.
- Aggressive control activities. More resources will be needed to eliminate or control outbreaks of pests in their early stages.
- Education on and enforcement of best management practices. Many pests are transported from site to site by humans. To reduce this hazard, it will be necessary to educate users of wetland resources (e.g., anglers, hunters, nature viewers) about the dangers posed and to provide them with guidance and facilities to reduce off-site transport.

Watershed Protection. Wetlands are impacted by what happens within the entire watershed. The nexus of expanding human populations, land-use change, and climate change requires that we adopt a watershed focus when considering how to protect wetlands. Land protection within the watershed is also watershed protection.

Wright Farm Management Recommendations

The following sections are specific management recommendations for the future stewardship of Wright Farm. These recommendations are based on the educational program plan and the Wright Farm barn feasibility plan (see the summaries of those plans on pages 7 and 8).

Improve Access

Improving access can be an incremental process, but each step should contribute to the eventual implementation of the plan.

Parking. The Colin Smith feasibility study identified an area for parking 19 cars. An incremental step would be to develop an entrance drive and a smaller number of parking spaces in the same general location. The Lexington DPW has been asked to evaluate the parking situation and make a recommendation.

Trails. It is beyond the scope of this management plan to develop a specific trail plan. Some general trail layout recommendations include:

- Climate change is having an impact on trails causing more erosion, more wet areas, and more fallen trees and branches
- Sustainable trails will
 - Withstand the impacts of normal use
 - Cause negligible soil loss

- Encourage users to stay on trails
- Not adversely affect area's natural or cultural resources
- Require minimal maintenance
- To protect habitat trails should
 - Preserve large areas of habitat
 - Avoid habitat fragmentation
 - Protect wetlands and sensitive areas
 - Reduce or eliminate trails especially in sensitive areas
- Design trails to match the users' capabilities and needs
- Trails should connect people to nature in ways that maintain the natural resources
- A trail system for a site should include
 - A starting point with a map for orientation
 - Loops
 - Destinations (like interesting natural features/views), activity areas (like a place to gather a group), quiet/contemplative areas
 - Avoid adjacent development
- The trail's average grade should be maintained at 10% or less (short areas can exceed 10%)

There are several interesting features that a well-designed trail system could include.

There are some impressive stone piles and an intermittent brook that winds through the forest that could add interest to the trail layout.

Much of the existing "preliminary" trail system is located along the developed perimeter of the site. This generally does not work well for either the site's visitors or the neighbors, who would probably rather not have visitors



Photo 5 - Rock Pile

walking along their backyard. The field just behind the barn has such a boundary trail that is nicely screened from the neighbors by hemlocks that are badly infested with woolly adelgid and likely to die. We recommend avoiding boundary trails in most cases.

Field Management

The currently open fields and prior pasture areas should be mown at least once annually to maintain grassland habitat and the pastoral character of the property. The one exception is the low wet area of the field at the northwest corner of the site. The effects of climate change are likely to cause this area to be wetter and stay wet longer. It may be interesting to let this area go without mowing for a couple of years and let it go through a process of succession. Likely it will begin to brush in with red maple, alder, and other wetland species. It would also need to be monitored for invasive species.

The fields at Wright Farm are not large enough to function as grassland bird breeding habitat rather, they can be managed as hayfields if any local farmer were interested. Such management would likely involve mowing in late June. If no farmer is interested in haying the site, the fields should be mown annually in late summer or early fall to maintain an attractive mix of grasses and flowering herbaceous species that will benefit pollinators. Brush should be cleared from the stone walls alongside the fields to prevent encroachment and for aesthetics. Particular attention should be paid to the stone wall along Grove Street and efforts continued to remove glossy buckthorn there and to maintain the attractive view from the road.



Photo 6 - Wet Area

Forest Management

The site includes seven acres of forest that is connected to the 250-acre Burlington Land-locked Forest. The 7 acres includes considerable variety, the University of Massachusetts Department of Natural Resources Conservation has classified forest stands in terms of their productivity and Wright Farm includes small areas of Prime 1, 2, and 3; and Statewide and Local importance; and small areas of wet forest of Statewide and Local importance as shown in Figure 5. This is not to imply that the forest should be managed for timber, but to indicate the ecological richness of these forest stands and their capability to sequester carbon and help reduce the effects of climate change.

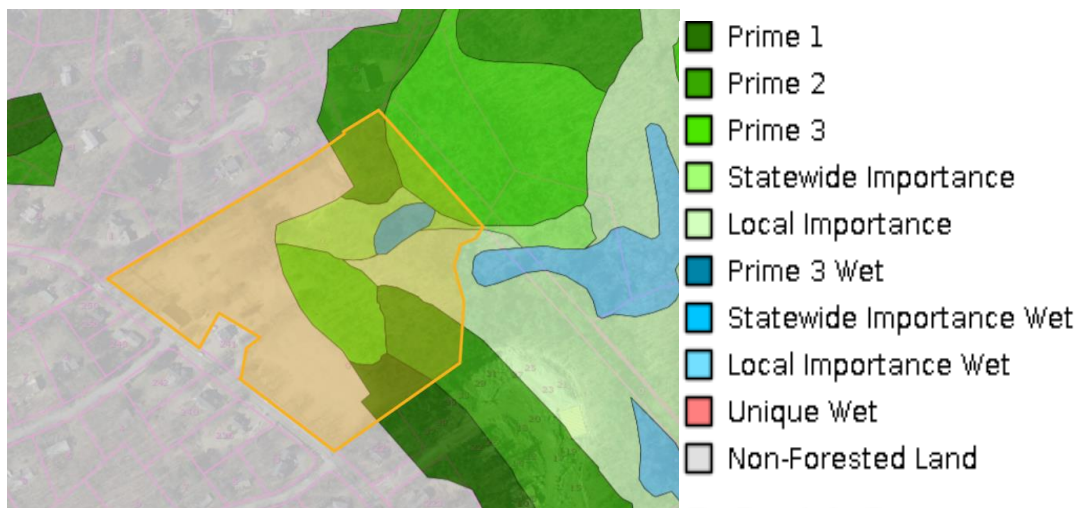


Figure 5 - Prime Forest Land

Red oaks, a few white oaks, and white pines predominate, with a few scattered beeches, red maples, and other species. Several of the older trees in these stands are nearing their senescence and will likely

die. Such old or dead trees are wonderful for wildlife but may also be hazards if they fall onto trails. Monitoring and periodic clean-up are recommended.

As noted in the section on Forested Habitats on page 13, browse by white tailed deer has adversely affected the structure, composition, and functioning of Massachusetts forested ecosystems. Deer prefer eating red oak saplings, so efforts to control deer populations will benefit the forest of Wright Farm.

Community Gardens

The area designated for a community garden is to the north of the barn and measures approximately 6,500 square feet and could be expanded to more than 20,000 square feet (See Figure 2, #7,9). The Idylwilde community garden is approximately 34,000 square feet. There are 110 plots. Garden plots are 20' by 20' with some half plots (10' by 20'). The smaller community garden area at Wright Farm would accommodate 15 such plots and the expanded area could accommodate another 40 plots. Water would need to be piped from the road. Parking for gardeners may compete with the limited number of spaces for program participants, trail users, and events. Gardeners bring 50-pound bags of compost and trays of seedlings in the Spring and would want to park as close to their plot as possible. It has been suggested that they have an unloading area near the garden plots and then park on the adjacent neighborhood streets if no spaces are available in the on-site parking area. Two questions arise with this plan, has anyone cleared this idea with the residents living on those streets, and who will enforce moving the vehicles from the unloading zone?

Fencing Stonewalls and Boundary

Existing 3-rail fencing should remain in place alongside Oak Street to maintain the historic character of this stretch. New 3-rail fencing has been placed around the residence. Most of the other fencing can be removed as it serves no purpose. Some of it could be reused to replace rails and posts along Oak Street or to incorporate into the site plan. For example, to delimit the parking area.

The stonewalls are an attractive feature of the site. Several of them are overgrown with bittersweet and other invasives and should be kept cleared.

Horse Sheds

The existing horse sheds could be removed or could be repurposed for use on the site. One shed could be used as part of a community garden, for tool storage or other needs. The sheds could remain as potential nesting habitat for barn swallows and could even be enhanced to welcome barn swallows and possibly cliff swallows. Barn



Photo 7 - Stonewall

swallows nest from late April till August³. If deemed to be unnecessary for planned use of the conservation land and determined not to host breeding swallows, the sheds should be removed.

Ash Trees

The ash trees on the site are in decline. Some are already a potential hazard and should be taken down. As trees are removed there may be opportunities to replace some with trees that will be adaptable to climate change. It is probably wise to not plant a single species as replacements. Some species that are being considered as “climate smart” are red maple, white oak, American hornbeam, Serviceberry, and tulip tree.

Wildlife Enhancement Management Recommendations

There are several actions that can enhance wildlife habitat quality and make the Wright Farm conservation area a more interesting destination.

Brush piles

Strategically placed piles of brush in the forested areas or at the edges of the fields can be assembled to provide resting/escape cover and den sites for wildlife. Brush piles are used for cover by eastern cottontails and other small mammals. Songbirds may use brush piles for perch sites, especially if the piles are located near feeding or nest sites. Also, if brush piles are adjacent to a water source, amphibians and reptiles may use them for breeding, feeding, or resting. See <https://extension.psu.edu/management-practices-for-enhancing-wildlife-habitat> for more information on steps for enhancing wildlife habitat.

Snags

Leaving dead or partially dead standing trees provide several important benefits to a variety of wildlife. Snags provide cavities for nesting and resting, perches for hunting and displaying, and an abundant supply of food for insect eaters. There are numerous species of birds and mammals that use snags at some point in their life cycles. The best method to provide snags for wildlife is to retain existing snags in places where they will not create a dangerous situation for people using the nearby area for outdoor activities.

Nest boxes

Nest boxes, platforms, and other types of nesting structures provide nest sites for wildlife in areas where natural nest sites (particularly cavities) are absent or available only in low numbers. They are also used to attract wildlife to specific areas even when nest sites are not limited. Nest boxes can be used to provide nest sites for birds such as Eastern bluebirds, tree swallows, and



Figure 8 - Nest box suitable for tree swallows or bluebirds

³ For more information on barn swallow conservation see <https://www.massaudubon.org/our-conservation-work/wildlife-research-conservation/bird-conservation-monitoring/grassland-birds/barn-swallows>

Carolina wrens. Nest boxes also provide nest sites for mammals like squirrels and bats. Platforms and other structures are used to provide nest sites for species like Eastern Phoebe and Barn Swallows. Bat boxes can also be erected along the field edges. See Mass Audubon's website at <https://www.massaudubon.org/learn/nature-wildlife/birds/birdhouses> for instructions for building and placing nest boxes. Volunteers can maintain and monitor nest boxes and enter data on the Cornell web site.

Each box should be mounted on a pole between 4 and 5 feet off the ground. The boxes should be placed in pairs at least 10 feet apart so that any tree swallows that take up residence will chase other tree swallows from the nearby nest, leaving it available for eastern bluebirds. No more than two nest boxes should be installed per acre, and they should be located far away from the barn to discourage use by English house sparrows.

The best time to put up a new birdhouse is in the fall or winter so that birds will have plenty of time to locate them before the breeding season. Always mount the house with the entrance hole facing slightly downward to keep wind and rain from entering. And make sure it is secured so that it does not swing or move. Once breeding season is over, usually by mid-August, it is a good idea to clean out the birdhouse. Remove old nesting material and scrub the house with a solution of one part bleach to nine parts water. Rinse well and leave it open to dry completely.

Pollinator plantings

Pollinator-friendly plantings support numerous kinds of native bees, as well as honeybees, butterflies, hummingbirds, and other pollinators. Planting a diverse mix of flowering plants that provides a sequence of blooms from early spring to late fall will have the most impact. Even a small patch of the right flowers can help, as it adds to the larger landscape mosaic in which the pollinators live and search for food. For a list of plants and guidelines for planting see https://extension.unh.edu/resources/files/Resource005973_Rep8387.pdf. Also, see the plant list for native declining pollinators from the MCA Native Pollinator Task Force, <https://www.svtweb.org/mca-native-pollinator-task-force>.

Invasives Management

Continue to monitor for resprouting of the Japanese stiltgrass and monitor the Fortune's spindle to keep it from spreading.

Additional invasive control efforts should be focused on thickets of oriental bittersweet and multiflora rose found along the edges of meadows. Oriental bittersweet can be cut near the ground with loppers and resprouts pulled annually. Japanese barberry grows along the intermittent stream running through the forest. It too can be cut at the ground with loppers and/or pulled. Larger shrubs of multiflora rose, and other species can be cut back, and the smaller ones pulled from the ground. Ideally, the larger plants should be pulled up with a root wrench or tractor to get most of the roots. Glossy buckthorn is another invasive species that occurs along the stonewall on Grove Street and elsewhere. Small plants can be pulled. Roots are prone to resprout if cut.

See Appendix A for additional information on invasives management.

While not considered an exotic invasive, poison ivy needs to be controlled, especially in areas that are likely to be used for educational programs.

Schedule of Maintenance Activity

Yearly Ongoing Activities

	Winter	Spring	Summer	Fall
	Dec-Feb	Mar-May	Jun-Aug	Sep-Nov
Monthly Property Visits	x	x	x	x
Annual Work Plan with Staff and Stewards		x		x
Safety Meeting with Staff, Stewards, Police and Fire Dept.		x		
Trail Walk/Clean Up (downed limbs, drainage issues, signage)		x		
Building Projects (kiosks, signposts, etc.)		x		x
Invasive Plant Management			x	x
Mow Fields				x
Clean out nest boxes				x
Boundary Walk (monitoring for encroachments, signage, etc)				x

Short Term Projects

1. Develop a trail plan, including a trail from parking area to the north meadow and on to the boundary with Burlington's Landlocked Forest. Negotiate trail connection with managers of adjacent trail systems, as necessary. Maintain connections to the Liberty Ridge (Jefferson Drive) trail system and the proposed ACROSS Lexington trail system⁴. Trail to the north meadow may require a short bridge or boardwalk to cross the seasonally wet area. Include interesting features and potential activity areas.
2. Remove fence sections as necessary, and remove invasives from stonewalls, establish regular mowing program to maintain trail through meadows.
3. Monitor Japanese stiltgrass control project
4. Monitor Fortune's spindle
5. Mowing of fields
6. Experiment with not mowing the wet area of field in the northeast corner of the site
7. Install nest boxes.
8. Complete feasibility study for community garden.
9. Finalize desired number of parking spaces based on future use of the site. Work with engineering department to study feasibility of curb cut and potential storm water drainage issues. Initiate design and permitting for parking lot. Manage ash trees (i.e., remove dead and dying trees if they are a hazard). Note that parking can be implemented on an incremental or two phased approach with part of the parking area installed early and additional spaces added in a second phase.
10. Stabilize barn

⁴ <https://www.lexingtonma.gov/across-lexington>

Long Term Projects

1. Monitor and continue to control Japanese stiltgrass and Fortune's spindle
2. Install phase one parking area north of barn. Include signage listing acceptable uses and illustrating trails.
3. Create community garden.
4. Remove unnecessary fencing and realign some sections to better demarcate parking area.
5. Renovate barn for program use

Priorities and Cost Estimates for Recommended Projects

Recommendation	Priority Level	Cost Estimate	Variables
Manage invasive species	High	\$1,000 annually	Control through mowing, manual pulling, or herbicides
Stabilize barn	High	\$125,000	Cost based on stabilization proposal by Colin Smith Architects
Develop and implement trail plan	High	\$0-\$500 annually	Volunteer, contractor, or staff
Establish parking lot	High	\$10-\$30k	size of lot, need for gravel, permitting, tree removal, size and design of signage
Install bird boxes	Medium	< \$500	Boy Scout or volunteer project
Community garden feasibility study	Medium	\$0	Town staff and volunteers
Create community garden	Medium	\$10-20k	Type of fencing, town water, necessary site prep
Remove some existing fencing	Low	\$0	Volunteer effort
Relocate some fencing to demarcate parking area	Low	\$0-\$5k	volunteer or contractor labor
Finalize plan to renovate barn and implement	Medium	Up to \$4,300,000	Cost based on total renovation proposal by Colin Smith Architects

Appendix A – Invasive Species Management

Several species of invasive plants are currently found within the Wright Farm Conservation Area and we have described their management as it pertains to specific goals and objectives outlined in this plan. In general, we recommend that the stewards assess threats from invasive species during annual monitoring and implement treatment according to specifications outlined by the town.

If herbicide is used, the exact concentration, chemical, and type of application should be decided by the licensed applicator and approved by the town. The applicator should develop an Invasive Plant Management plan for the area and make recommendations to the town that are best suited for the site.

Glossy and Common Buckthorn

Manual, mechanical, and chemical means are effective in controlling glossy buckthorn and is most effectively controlled by recognizing its appearance early and removing isolated plants before they begin to produce seed. With large infestations, remove the largest seed-producing plants first. Currently no means of biological control is available for controlling buckthorn. Hand pulling is effective in small infestations. Remove the entire root section or re-sprouting will occur. Weed wrenches can be very effective in uprooting buckthorn.

Chemical treatment is also an option. The type of herbicide determines the best time of year to apply based on how the chemicals disrupt the biological process of the plant. Triclopyr herbicides are much more effective early in the growing season. Glossy buckthorn retains its leaves late into the Fall, so you can apply herbicide fairly late in the season. However, the application should not be too late, or the leaves will no longer be photosynthetically active (or minimally so) and will easily fall from the twigs without affecting the roots. During the growing season, cut the stems near ground level and apply a 20%-25% herbicide mixture to the stumps. Re-sprouts should be cut and treated again or sprayed with a hand sprayer of 1.5%. Foliar applications over non-water sites can also be used. Foliar application of herbicides using a backpack sprayer is effective, but less selective.

For more information on buckthorn see:

https://files.dnr.state.mn.us/natural_resources/invasives/terrestrialplants/woodyplants/buckthorn_wh_at_you_should_know.pdf

Multiflora Rose

Mechanical and chemical methods are effective methods for managing multiflora rose but may need to be combined with chemical treatment in large or persistent infestations. The most important steps to controlling multiflora rose are to destroy existing plants and begin a yearly program to control seedlings as they appear. Biological control is not yet available for management of multiflora rose. However, researchers are investigating several options, including a native viral pathogen (rose-rosette disease), which is spread by a tiny native mite, and a seed-infesting wasp, the European rose chalcid.

Manual and mechanical control consisting of frequent, repeated cutting or mowing three to six times per growing season for two to four years is effective in achieving high mortality of multiflora rose. In high quality natural communities, cut the individual plants to minimize habitat disturbance. Herbicides are successful in controlling multiflora rose, but follow-up treatments are required because of the long-lived stores of seed in the soil. Apply systemic herbicides (such as glyphosate) late in the growing season to freshly cut stumps or to regrowth. In wetlands, where multiflora rose may occur, make sure to use a wetland-formulated concentrate. Use an active ingredient concentration of 25-35% when you apply herbicide to the cut stem. Plant growth regulators control the spread of multiflora rose by preventing fruit set.

Oriental Bittersweet

A combination of cutting followed by application of concentrated systemic herbicide to rooted, living cut surfaces is an effective approach for removing Oriental bittersweet. For large infestations spanning extensive areas of ground, a foliar herbicide is recommended over manual or mechanical methods, which would create soil disturbance to minimize soil disturbance. Manual, mechanical, and chemical control methods are effective in removing and killing Oriental bittersweet. A combination of methods often yields the best results and may reduce potential impacts to native plants, animals, and people. The method selected depends on the extent and type of infestation, the amount of native vegetation on the site, and the time, labor, and available resources. No biological controls are currently available for this plant.

Manual control of small infestations can be achieved by hand-pulling, but the entire plant should be removed including all the root portions. If fruits are present, collect, bag, and dispose of them in heavy garbage bags. Always wear gloves and long sleeves to protect your skin from poison ivy and barbed or spiny plants. Plants can also be controlled by cutting climbing vines near the ground at a comfortable height to kill upper portions and to relieve the tree canopy. Vines can be cut using pruning snips or a pruning saw for smaller stems, or a hand axe or chain saw for larger vines. Minimize the damage to the bark of the host tree. Rooted portions will remain alive and should be repeatedly cut to the ground or treated with herbicide. Cutting without herbicide treatment requires vigilance and repeated cutting because plants will re-sprout from the base. Begin treatment early in the growing season and repeat the treatment every two weeks until autumn.

Systemic herbicides are absorbed into plant tissues and carried to the roots, killing the entire plant within about a week. This method is most effective if the stems are first cut and herbicide is applied immediately to the cut stem tissue.

Fall and Winter applications will avoid or minimize impacts to native plants and animals. Repeated treatments will be required. Any herbicide applications should be carefully targeted to avoid damage to native, non-target species. If native grasses are intermingled with the bittersweet, triclopyr is better to use than glyphosate because it is selective for broad-leaved plants and will not harm grasses. Follow-up monitoring is required to ensure effective control.

Japanese Barberry

Japanese barberry (*Berberis thunbergii*) is an invasive, non-native woody plant that can grow 3 to 6 feet tall with a similar width. It was introduced in the United States as an ornamental plant. However, like many invasive species, it escaped from managed care and is now naturalized. This plant can dominate deep in the woods and along woodland edges. This crowds out native plants and disrupts these ecosystems. Research has shown that the presence of the black-legged tick, which transmits Lyme disease, increases in areas with dense barberry.

Japanese barberry has small, oval, alternate leaves. Foliage is green to a dark reddish purple. The stems have single spines along their length. Barberry is a very dense plant due to the multitude of small twigs and branches. Small, yellow flowers are produced during the spring, but are not particularly noticeable since they are under the foliage. Red fruit develops and can persist into winter. Birds and other animals feed on the fruit and then deposit seeds as they move.

Young plants can be removed by hand, but this option is not going to work on well-established plants. Gloves are necessary due to the presence of spines on the twigs. Mowing is an option for barberry but requires professional power equipment. Established plants, even small ones, are not going to be cut using a lawnmower. Plants need to be mowed multiple times each year (3-6 times) to deplete energy reserves and kill the plant.

Barberry can also be pulled out (a weed wrench is a great tool) or dug out but follow up treatments may be necessary if runners start new plants. Dicamba, 2,4-D, or triclopyr can be applied as foliar herbicides early in the growing season. In late August or early September, glyphosate or triclopyr can be applied as cut stump/branch treatments, or basal bark. Glyphosate can also be applied as a foliar treatment in late summer. Remember to always read the label for specific application sites, precautions, and mix rates.



Weed wrench

Garlic Mustard

Garlic mustard (*Alliaria petiolata*) is an invasive biennial weed. It is an herbaceous member of the mustard family (*Brassicaceae*) brought over by early European colonizers. First documented in New York in 1868, it was used as a source of food and medicine. This plant's biennial life cycle consists of a ground-level, or "basal," year and a reproductive, or "bolt," year. Garlic mustard's vigorous reproduction has enabled it to spread from coast to coast, where it blankets habitats with moist, rich soils. A prolific seeder, it forms dense monocultures, leaving little room for native plants.



Suited to a wide range of habitat types, garlic mustard thrives especially well in areas with a disturbed overstory and basic soil pH. They are shade tolerant and will often spread from forest edges and openings to mature forest understories.

Garlic mustard has a taproot, and unlike some invasive herbaceous perennials, it does not regenerate from root fragments. Therefore, this is one of the few invasive plant species that can be controlled manually by pulling. Manual operations that completely remove shoot tissue will prevent regrowth. Plants should be pulled before the seed shatter stage. Individuals hold their flowers for several weeks, giving the population staggered blooming periods. For this reason, it is a "best" practice to bag and remove pulled plants from the site, as even early pulling treatments probably include some plants that have viable seed.

Fortune's Spindle

Fortune's spindle or Winter creeper (*Euonymus fortunei*) is an evergreen vine. It is a native of China that was introduced to the US in 1907 as an ornamental ground cover. It is known to spread rapidly and replace spring ephemerals. Available information indicate that winter creeper is persistent, competitive, and difficult to control. It is not currently listed as a prohibited plant species in Massachusetts nor is it listed as invasive by the Mass. Invasive Plant Advisory Group.

Still, its potential to spread aggressively and impact on native species warrants control. The traits that make it a desirable ornamental plant, such as rapid growth, evergreen nature, and tolerance of variable

site conditions, also make it a threat to natural areas. Probably the most effective way to control winter creeper is to prevent its establishment by minimizing its use as a landscape plant and preventing further seed dispersal. Once established, control of winter creeper requires complete removal of plants and roots, because it can spread vegetatively. The most effective management of winter creeper is to totally eradicate it from natural areas and the surrounding vicinity by pulling and removing individuals as soon as possible after recognition.

Physical or mechanical control: Hand-pulling or grubbing using a pulaski or similar digging tool may control small populations of winter creeper. To be effective, the entire plant, including the roots, stem fragments, and fruits, must be bagged and removed from the site to prevent reestablishment. Any portion of the remaining root system may sprout. Cutting is not recommended as a control method except to prevent fruiting, or in combination with herbicide application.

Biological control: No effective biological controls are currently known for winter creeper. However, winter creeper is one of the top 10 invasive plants of Asian origin in the United States that is being studied for future biological control opportunities, and scientists are looking for host-specific natural enemies in China.

Chemical control: On winter creeper populations that are too large to control by hand-pulling or digging, foliar or cut-stem applications of herbicides may be effective. Cut stem application of herbicides is effective in areas where lianas are well established on or around nontarget plants or where they have grown into tree canopies or other vertical surfaces.

For more information see <https://www.fs.fed.us/database/feis/plants/vine/euofor/all.html> .



Japanese Stiltgrass

Microstegium vimineum (Trin.) Camus
Grass family (Poaceae)

Jil M. Swearingen, National Park Service, Center for Urban Ecology, Washington, DC
Shehrezade Adams, University of Maryland, Frostburg, MD

Adapted from <http://www.nps.gov/plants/ALIEN/fact/mivi1.htm>



NATIVE RANGE

Japan, Korea, China, Malaysia and India

DESCRIPTION

Japanese stiltgrass, or Nepalese browntop, is an annual grass with a sprawling habit. It germinates in spring and grows slowly through the summer months, ultimately reaching heights of 2 to 3½ ft. The leaves are pale green, lance-shaped, asymmetrical, 1 to 3 in. long, and have a distinctive shiny midrib. Slender stalks of tiny flowers are produced in late summer (August through September-early October) and dry fruits called achenes are produced soon afterwards.

ECOLOGICAL THREAT

Japanese stiltgrass is especially well adapted to low light conditions. It threatens native plants and natural habitats in open to shady, and moist to dry locations. Stiltgrass spreads to form extensive patches, displacing native species that are not able to compete with it. Where white-tail deer are over-abundant, they may facilitate its invasion by feeding on native plant species and

avoiding stiltgrass. Japanese stiltgrass may impact other plants by changing soil chemistry and shading other plants.

DISTRIBUTION IN THE UNITED STATES

According to the WeedUS Database, Japanese stiltgrass has been reported to be invasive in natural areas in 15 eastern states including Connecticut, Delaware, Georgia, Indiana, Kentucky, Maryland, Massachusetts, New Jersey, New York, North Carolina, Pennsylvania, Tennessee, Virginia, West Virginia, and Washington, DC.

HABITAT IN THE UNITED STATES

Stiltgrass occurs in a wide variety of habitats including moist ground of open woods, floodplain forests, wetlands, uplands, fields, thickets, paths, clearings, roadsides, ditches, utility corridors,

and gardens. It readily invades areas subject to regular mowing, tilling, foot traffic, and other soil disturbing activities as well as natural disturbances such as the scouring associated with flooding. Stiltgrass appears to prefer moist, acidic to neutral soils that are high in nitrogen.

BACKGROUND

First documented in Tennessee around 1919, stiltgrass may have accidentally escaped as a result of its use as a packing material for porcelain.

BIOLOGY & SPREAD

Japanese stiltgrass is an annual grass, with all plants dying each fall. It is a colonial species that spreads during the summer and fall by rooting at stem nodes that touch the ground. Individual plants may produce 100 to 1,000 seeds that fall close to the parent plant from both self-fertilizing and cross-fertilizing flowers. Seed may be carried further by water currents during heavy rains or moved in contaminated hay, soil, or potted plants, and on footwear and vehicles. Stiltgrass seed remains viable in the soil for five or more years and germinates readily. Deer and other grazers reportedly do not browse it, though they have been found to spread the seeds. Stiltgrass leaves a thick layer of thatch after dieback each year in heavily invaded areas, and while leaves decompose quickly, stems do not. Like other invasive species, stiltgrass is physiologically adaptive. For example, it is able to withstand low light levels where nutrient levels are sufficient, and able to withstand low nutrient levels where light levels are sufficient. While stiltgrass can photosynthesize in low light conditions and respond quickly to the changing light conditions typically found on the forest floor, the very low light conditions found beneath a multilayered forest canopy will limit its growth.

MANAGEMENT OPTIONS

A variety of control methods are available for stiltgrass, depending on the extent of the infestation, the type of habitat, and the availability of labor and other resources. Preventing the introduction of stiltgrass from infested to non-infested areas should be a priority. Early control of new infestations will also reduce the likelihood of establishment and expansion. Manual removal of plants results in unavoidable disturbance to the soil which can result in additional germination of stiltgrass seed. Using an herbicide leaves the plants and soil in place, thus minimizing that likelihood.

Chemical

For extensive stiltgrass infestations, use of a systemic herbicide such as glyphosate (e.g., Roundup Pro®) is a practical and effective method if used with some caution. Glyphosate is a non-specific herbicide that will kill or damage almost any herbaceous plant and possibly some woody plants it contacts. Roundup Pro® is surfactant-loaded (no additional surfactant needed) and the surfactant is not lethal to amphibians and aquatic invertebrates like the polyoxyethyleneamine surfactant in Roundup Classic® is. Roundup Pro® carries the 'Caution' signal word while Roundup Classic® carries 'Warning'. When treating stiltgrass in wetland sites, use Rodeo® or other formulation labeled for wetlands. Apply a 2% solution of Roundup® or Rodeo® mixed with water (8 oz. per 3 gals. mix) and a surfactant in late summer. Be careful to avoid application to non-target plants.

Some researchers have also found success using the pre-emergent herbicide imazapic which is the active ingredient found in Plateau® (for government use only), and Journey® (for all other applicators). Imazapic is most effective against stiltgrass when applied in March in the Mid-Atlantic states. The best rate for maximum selectivity is 4 oz. per acre, applied as a broadcast application with backpack sprayers. Sprayers should be fitted with an 8003E flat fan nozzle and calibrated at 15 to 20 gpa. Plateau® and Journey® can be applied continually through germination of the stiltgrass and throughout the summer during its peak growth. No surfactant is necessary for pre-emergent applications. As germination nears, begin to add 1/4% non-ionic surfactant to the mixture.

Another option that may be appropriate for certain situations is to apply a pre-emergent (only) treatment with Pendulum® Aquacap™ (active ingredient is pendimethalin) at 2.4 qts. to 4.8 qts. per acre (15 to 20 gpa). The higher rates have provided season long control.

Note: Calibration of spray equipment will ensure that the correct rate of herbicide mix is actually applied to the plants. Actual rate of application can vary widely based on different skills and techniques of applicators. These differences can lead to under-application or over-application of herbicide mix which can affect the efficacy of the treatment. For this reason, it is important to calibrate spray equipment before conducting herbicide applications.

Manual

Stiltgrass is a shallow-rooted annual that can be pulled by hand throughout the growing season, especially when the soil is moist and entire plants with roots can be removed. Pulling is easier and probably more effective in mid-to-late summer when the plants are much taller and more branched. At this stage, entire plants can be easily removed by grabbing the basal portion of a plant and pulling firmly. In a short time, a fair amount of stiltgrass can be pulled and piled up to dehydrate on site. If plants are already in the fruiting stage, they should be bagged and disposed of offsite to prevent dispersal of seed. Also, try to avoid pulling native grasses like Virginia cutgrass (*Leersia virginia*) that often grow intermingled with stiltgrass and may be difficult to distinguish from it. Because hand pulling plants disturbs the soil and may expose stiltgrass seed from previous seasons, late season pulling will avoid the likelihood of seed germination. Hand pulling of plants will need to be repeated and continued for many seasons until the seed bank is exhausted.

Mechanical

Stiltgrass can be mowed in late summer (i.e., August through September) when the plants are flowering but preferably before seed is produced. This can be done using a lawn mower or "Weed Whacker" type machine or a scythe. Because stiltgrass is primarily an annual plant, cutting late in the season before the plants would die back naturally avoids the possibility of regrowth. Recent information suggests that stiltgrass plants that are cut early in the summer respond by regrowing and flowering soon after cutting, much earlier than they would normally flower. This is another reason to consider cutting in late summer to fall rather than during the early summer months.

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