

Invasive Species Management Plan

Stow Acres

Prepared for:
Town of Stow

BSC Project No. 89615.00

Prepared by:



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Stow Acres

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Management Plan

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Stow Acres

INTRODUCTION

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1.0 INTRODUCTION

1.1. Project Need and Purpose

The Town of Stow retained BSC Group, Inc. (BSC) to conduct an invasive plant survey and prepare an adaptive invasive species management plan (ISMP) as part of the Stow Acres Master Plan. Specifically, BSC has:

- Provided detailed mapping of the invasive plant species present on the sites.
- Provided management recommendations for the treatment of invasive species, dependent upon site conditions and the need to protect sensitive resource areas and rare species habitats, while meeting management goals.
- Provided a prioritized, adaptive 5-Year Management Plan with a strategy that informs decision making for efficient and valuable expenditure of efforts and that balances the need to manage invasive species populations with the need to protect sensitive resource areas and habitats.
- Discusses future scenarios, including the need for future management beyond the initial 5-year Management Plan.

BSC has prepared this 5-year Adaptive Management Plan to help guide decisions for managing and removing invasive plant populations on the property. “Invasive plants” are defined by the Massachusetts Invasive Plant Advisory Group (MIPAG) as *“Non-native species are those that are alien to the ecosystem that they have been introduced into and whose introduction causes or is likely to cause harm to the environment or human health.”*

Invasive plants can have a variety of negative impacts on native ecosystems and species; they may out-compete native plant species for resources including water, light and nutrients (Broadbent et al., 2018; Vilà & Weiner, 2004), reducing overall biodiversity of plant communities over time; they can alter soil conditions in ways that are unfavorable for native plant species (Cipollini & Wagner, 2011; Ehrenfeld et al., 2001); they may interact with invasive animals in ways that could impact ecosystem stability (Belote & Jones, 2009); and they can negatively impact native animal species if they do not provide suitable food or habitat conditions compared to the native plants which they have displaced (Davis et al., 2015). As such, the early detection and management of invasive plants is crucial for protecting native species and ecosystems.

The attributes associated with invasive species are rapid growth, rapid reproduction, prolific dispersal ability, tolerance of or preference for disturbed conditions, and lack of predators or diseases. These attributes contribute to the displacement of native plants and animals and can lead to significant ecological disruption at various landscape scales. These are also their vulnerabilities, and this plan will describe how to leverage these attributes to best effect.

During the initial consultation and project planning phase, the target list of MIPAG invasive plant species was identified as the terrestrial plant species list. Species identified on the Site as well as the 2023 MIPAG list are found in **APPENDIX A and Appendix B**, respectively.

While it is important to manage invasive plant populations effectively, it is also important to ensure that management practices do not inadvertently cause harm to native species and habitats and the human communities in which management is conducted. In particular, invasive plant management techniques need to be compatible with maintaining native species habitat within Town of Stow. Management that prioritizes rapid or thorough treatment can be important for specific species in particular locations, but managing invasive plants effectively means understanding the context of each park and infestation, and

establishing long term strategic, achievable goals and managing for ecological function rather than setting unrealistic goals of eradication in most circumstances.

Invasive plant management can create unintended consequences by disturbing sites in ways that can introduce or bolster populations of species that are considered noxious, including native species. Noxious weeds are plants with attributes that are harmful to humans and agriculture, whether native or introduced. Invasive species management must consider the risks of benefiting noxious species.

1.2. Landscape Context

Stow Acres is the largest golf course (36 hole) in Stow, and its largest undeveloped parcel (see Figure 1). The Town is working proactively in partnership with a local land trust, housing developer, and the golf course owner to chart a future for the entire 300+ acres of the Stow Acres golf course, including support of housing diversity, trails and natural areas, and recreational uses.

Stow Acres is divided into two 18-hole courses by Randall Road, an east-west running residential street. As part of a sweeping effort negotiated with the golf course owners, the 18-holes south of Randall Road will remain an active golf course with a permanent conservation restriction (CR), and the 18-holes north of Randall Road is being divided with a proposed private housing development on the eastern (approximately) one-third of the site, and the Town has purchased approximately 150 acres with significant conservation values to support publicly accessible open space and recreation. The Town-purchased portion of the Site as well as a well-head protection area at the north end of the housing parcel forms the study area for the Master Plan.

The Site contains riparian corridors along Elizabeth Brook, a variety of wetlands both natural and man-made, scenic views from Randall Road and Gleasondale Road, and presents opportunities for large-scale wetland and upland restoration and projects that will enhance climate resiliency of the property and the Town. This Natural Resources Inventory has been conducted as a baseline assessment of natural resources within the Master Plan Study Area and as an exercise to identify opportunities for projects that will enhance the site's climate resiliency, habitat quality, and natural resources benefits to the citizens of Stow.

1.3. Special Management Planning Considerations

1.3.1. Environmental Justice

In the context of species management environmental justice includes making decisions based on the following criteria: Are members of the community being invited to participate in decision making? Do they have access to information and access to decision makers? This may not significantly affect outcomes but is important to achieving improved outcomes.

Ecological function, health, resilience, and aesthetic must be addressed. Typically, Environmental Justice (EJ) areas lack mature shade canopy. Any plan that includes removal of canopy should simultaneously replace or expand tree canopy cover. EJ areas often have limited open space, limited vegetated space, and damaged or degraded soils. Progressive soil and native species restoration should be coordinated with species management and may require successional restoration. Contextual function and risk must be weighted more heavily than objective species function often in the form of pollution containment, erosion control, water quality protection or improvement, and shade and transpirational cooling.

There will be site and population specific criteria that must also be considered on a case-by-case basis. *See also (Urban Forestry & Urban Greening Volume 77, November 2022, 127737).*

1.3.2. Rare Species

The occurrence of rare species must be accounted for in the management of invasive plants on any site. Treatment strategies may need to be modified when rare plants occur on a site or if there is potential to affect habitat of other rare species. In Massachusetts, the initial determination of whether there are rare species located on a site is made by consulting the Massachusetts Natural Heritage Atlas, a regularly updated GIS data layer created by the Massachusetts Natural Heritage & Endangered Species Program. The occurrence of “Estimated” or “Priority” habitats can result in requirements for additional permitting considerations when planning management activities. The US Fish and Wildlife Service provides a mechanism for evaluating the known occurrence of federally listed rare species, referred to as an IPaC (Information for Planning and Consultation) report.

There are no mapped Estimated or Priority Habitat on the Stow Acres site at the time that this management plan is being developed, therefore no existing records of state-listed rare organisms. This information and mapping changes on a regular basis, so any management activities conducted on the site should involve a contemporaneous evaluation of rare species with the Natural Heritage Atlas.

The US Fish and Wildlife Service has provided a report on federally listed threatened and endangered species that may occur on Stow Acres (letter dated November 13, 2023). Two (2) State and/or Federally listed species have been recorded at the Town of Stow site (see Table 1.1).

Table 1.1: Rare species and their habitat requirements within the Town of Stow Property

| Species | Status MA / Federal | Habitat |
|---|----------------------------|---|
| Monarch Butterfly <i>Danaus plexippus</i> | Candidate | Relies on open fields with large milkweed populations. |
| Northern long-eared bat <i>Myotis septentrionalis</i> (bat) | Endangered / Threatened | Forest habitats, in particular foraging over vernal pools and forest edges. Hibernates in caves or mines. |

1.4. Regulatory Compliance and Permitting Strategy

1.4.1. Permitting needs

Typical permits the town may be asked to file in association with invasive species removal may include: 401 water quality certifications, EPA Notice of intents, MA Wetland Protection Act Notice of intent, state and federal rare species filings, and local town filings. Permitting needs will require assessment on a project-by-project basis as specific projects are developed.

Additionally, all herbicide applications must be conducted by a licensed applicator in a manner consistent with state and EPA regulations.

2.0 SURVEY METHODOLOGY

BSC has prepared a comprehensive Natural Resources Inventory for the Stow Acres Master Plan Area (November 2023) and has developed an Environmental Constraints Map for the parcel and surroundings (see Figure 2). After consultation and approval of the selected survey areas defined by Stow Town Parks, and discussion and field review of data collection strategies, the defined project area was surveyed in the summer and fall of 2023. More detailed surveys were completed in areas of disturbance where invasive plant species were also more likely to be observed. These included: parking lots, day use areas, fields/meadows, forest roads, and open canopy areas shown on aerial imagery.

Invasive plant species data were collected using a tablet, an Arrow GNSS receiver, and the ARC GIS Field Collector application. Species sightings were recorded as one of three feature types: points, lines, or polygons. Quantitative information including abundance and distribution, and species location information such as habitat type (wetland, bank, field, woods, etc.) was also collected to aid in determining a recommended management strategy. Finally, a survey area polygon was drawn over areas reviewed for the presence of invasive plant species. ArcCollector field survey data, including invasive species survey points, lines and polygons, photo documentation of invasive species, and notes on the growth stage of invasive species stands (young/seedlings, mature plants, or mixed), will be made available to Town of Stow to help guide management in the field.

3.0 INVASIVE SPECIES DISTRIBUTION

BSC identified 17 MIPAG species on the Stow Acres Master Plan Area site. Invasive plants were found within the vegetated strips between fairways across the entire site. Invasive plants were found most often congregated along borders of roads/trailways and near the property lines. Species often occurred in dense stands at these locations and frequently overlapping one another (see Figure 3).

Grasses (Figure 4a)

Japanese Stiltgrass (*Microstegium vimineum*) has reportedly been detected and some treatment effort has been conducted by the Town. It was not found during the surveys conducted for this inventory, but continued vigilance is recommended, as it is present in the area and an emerging threat.

Reed Canary Grass (Ribbon Grass) (*Phalaris arundinacea*) was detected in the wetland immediately adjacent to Randall Road and the southern-most golf course pond, as well as in two small populations on the housing parcel border near the middle of the Site.

Herbs (Figure 4b)

The Bengal Dayflower (*Commelina benghalensis*), an emerging threat, Alfombrilla (*Drymaria arenarioides*), Garlic Mustard (*Alliaria petiolata*), Wetland Nightshade (*Solanum tampicense*), Swallow-wort (*Cynanchum* spp.), and Purple Loosestrife (*Lythrum salicaria*) were all found on the Site, but in small quantities and localized pockets. Loosestrife occurs at the edge of Elizabeth Brook at the north end of the Site and in a small population near the southern main golf course pathway.

Garlic Mustard occurs in a localized area at the far western extent of the adjacent town-owned parcel proximate to residential properties.

Trees (Figure 4c)

A very small amount of Black Locust (*Robinia pseudoacaria*) was detected in the north-west of the site. This is a tree that spreads both by seed and by root suckers and could be managed relatively easily to prevent spread on the site.

Shrubs (Figure 4d)

The majority of invasive plants found on the Site are shrubs. Invasive shrubs are distributed throughout the entire study area in varying densities and combinations. No invasive shrub was unexpected from the area, as all have been long-established in the SuAsCo River watershed.

4.0 PRIORITY MANAGEMENT STRATEGIES

The Town of Stow and Stow Acres are unlikely to ever be free of non-native, invasive species. However, the impacts of invasive species on natural ecosystems can be prevented and mitigated with thoughtful and adaptive strategies that are responsive to impacts on the most sensitive habitats, new infestations that can be effectively controlled or eradicated, and techniques that result in lesser impacts to natural systems.

4.1. *Protecting Sensitive Habitats*

The Natural Resources Inventory of the Stow Acres Master Plan Area conducted by BSC identified several sensitive habitats of particular interest on the Site. The Elizabeth Brook system that bounds the study area to the north, a vernal pool located at the north end of the Site, and the cedar pond and associated swamp located on the western side of the study area all were identified as unique components of the property. The Dogbone Pond, due to its natural origin and potential for restoration in its immediate surroundings is also of particular interest on the Site.

Invasive species management that is focused on these areas will be of particular interest in protecting and enhancing natural ecological conditions within these sensitive areas. Projects that focus on controlling invasive species in these locations should be among the highest priority.

4.2. *Early Detection & Rapid Response*

Invasive species are an ongoing and ever evolving threat. New species often emerge in areas even during management efforts. The best time best opportunity to prevent a new infestation or to prevent spread is by early detection and a rapid response that seeks eradication.

BSC recommends that Stow establish an invasive species monitoring regime for Stow Acres with a particular focus on detecting new arrivals of invasive plants. This can be as intensive as annual inventory and monitoring by skilled botanists and may include contracted professional survey update efforts at regular (3 or 5 year) intervals, or as simple as regular monitoring of the Stow Acres iNaturalist page for newly observed non-native species. Other options include working directly with iNaturalist to fully utilize its features and coordinating professional or institutional monitors through local schools such as UMass Amherst.

Management strategies for newly arriving invasive plants should be aggressive and focused on eradication. Best approaches are included in this adaptive management plan, and we recommend connecting with local networks and organizations such as NAISMA, Northeast RISCC, MACC, UMass, MDAR, and SuAsCo CISMA.

4.3. Vigilance Areas

Vigilance Areas represent habitats where frequent disturbance and proximity to suburban development construction, or typical landscape maintenance pose a particular threat of new invasive species arrivals. As such, management priorities within these Vigilance Area should focus on the rapid identification and eradication of new invasive plant species and/or populations, rather than attempting to eradicate already established populations of known invasives (particularly where these have already spread across the site).

Road corridors and cart paths throughout Stow Acres should also be regularly monitored and managed for invasive plant species. Roads can provide excellent pathways for the spread of invasive species, due to the movement of wildlife, people, equipment, and sediment along the roads (which may disperse invasive plant propagules), and the open, disturbed roadside habitat, which favors the establishment of opportunistic species. As such, road margins should be regularly monitored for newly arriving invasive plants (species moving into Town of Stow property from offsite), and for established invasive populations spreading within the site. This designation reflects the potential threat that roadside populations pose to the surrounding habitat area. Given the ease of access and reduced effort required to treat roadside invasive populations, targeting these areas on a regular basis, regardless of any other associated underlying management area designations, may help to reduce spread of invasive plants from the road network into other areas.

The long-term goal for these areas is development of connections and blockades. Deliberately occupying these pathways with strong ruderal or stress tolerant native species can slow the spread of invasives reducing long term efforts related to outbreaks while providing habitat resources and canopy/ understory connections for wildlife.

4.4. Low-impact Treatment Strategies

Considerations for invasive species management at Stow Acres should focus on the reduction of potential unintended or unavoidable impacts to the natural environment. Limiting the use of herbicide to the greatest extent possible (including avoiding the use of foliar spray within 100-ft of wetlands), minimizing ground disturbance to protect micro-habitats and reduce the risk of erosion, and following time of year restrictions to avoid unintended impacts to wildlife such as amphibians and host-dependent moth species, for example, should be practiced.

The long-term goal for these areas is to establish diverse, resilient, and stable communities comprising control and stress tolerant species that can naturally resist invasive organisms by dominating available resources such as soil and light. Further these should be buffered by zones dominated by native ruderal and stress tolerant species where intervention can be performed outside of the target treatment zones.

The following represent highest priority strategies for reducing impacts from invasive species treatment regimes.

- **Education**
 - Educating visitors, land managers, and neighboring property owners about invasive species and their associated risks will increase public awareness and care to avoid their transportation.
 - Install cleaning or mitigation devices such as boot brushes or root barriers at property access points and near larger infestations.
 - Consider utilizing publicly sourced monitoring tools such as iNaturalist to both engage the community and to monitor for new arriving species.

- Provide technical assistance and matching funds for mitigation on abutting properties that threaten the success of management efforts at Stow Acres.
- **Limited use of herbicides within wetlands and their 100-ft buffer zones:**
 - Prioritize hand-pulling or cutting (where appropriate for the invasive plant species).
 - Restrict herbicide use to selective methods that use less herbicide and minimize potential effects to non-target plants and organisms, such as the cut and paint method.
 - Foliar spray within 100-ft of wetlands or vernal pools should be avoided, although a directed foliar spot spray on certain invasive species (where indicated) and/or stages of management (i.e., follow-up treatment to woody shrubs) may be considered.
 - Soap based herbicides are Non-Organic compounds and are allowed under the Stow Organic compound rules. The EPA still defines these as Herbicides, as such they are referred to thusly. Consider utilizing these rather than more hazardous chemicals.
- **Time of year restrictions**
 - No hand-pulling during Spring (*mid-February to late April*) or Summer (*early July to mid-September*) migration periods within 100 feet of vernal pools.
 - Times when species phenology allows for the most effective removal of individuals and prevents of seed spreading.
 - If vernal pools are observed to be dry at the time of treatment (more likely during the summer period), no restrictions within 100-feet on hand-pulling is necessary, although it is good practice to minimize disturbance as much as possible.
 - No herbicide application during spring amphibian breeding period (*mid-February to late April*). Where possible, avoid herbicide application during summer post-metamorphosis migration period (*early July to mid-September*) within 100-feet of breeding sites.
 - If there are no other suitable treatment windows, careful herbicide application during the summer migration period is possible, as this is less likely to cause disturbance than hand-pulling of vegetation.
 - Soap based herbicides are Non-Organic compounds and are allowed under the Stow Organic compound rules. The EPA still defines these as Herbicides, as such they are referred to thusly. Consider utilizing these rather than more hazardous chemicals.

Considerations/restrictions on invasive species management within Management Areas should include:

- **Target management** ensure only targeted species are removed/sprayed or impacted by management techniques through proper ID by treatment crews.
- **Avoid foliar spray** application in close proximity to Scrub Oak Shrublands where there is a possibility of drift impacting scrub oak trees.
- **Time of year restrictions:** Avoid all foliar spray application within scrub oak shrublands during the pine barren speranza flight period (June 15 – July 15)

5.0 5-YEAR ADAPTIVE MANAGEMENT PLAN

Managing invasive plant species requires time, energy, and resources. Many of the recommended management tactics may require years of management and monitoring to achieve a significant reduction in population presence. Some invasive plants will require management and monitoring in perpetuity, and

will likely never result in complete eradication of the population, but may provide a more balanced ecosystem that allows for a high degree of biodiversity, increased native plant abundance, species diversity, and improved habitat quality (Quirion et al., 2018). In order to achieve the best possible results, invasive species management requires defined (achievable) goals, a commitment to vigilance and action in perpetuity, and an emphasis on prevention over eradication of already established populations (MIPAG, 2005). The following sections outline the proposed goals for Town of Stow's Stow Acres, invasive plant management, recommended techniques for managing specific species to achieve these goals, and measures which will need to be put in place for continued long-term success.

To avoid wasted efforts it must be clearly understood that invasive species are not going to be eradicated and doing so is unnecessary. Invasive species can be mitigated to preserve and promote higher functioning plant communities. As land disturbance slows and Owners become more responsible for erosion, disturbance, and species management invasives will have fewer opportunities to spread as rapidly as they have over the past century. Next as host specific herbivores are selected or introduced and as native species shift to include introduced plants as food their ability to dominate and spread will decline, but this will be a slow process. Maintaining biodiversity and containing threats is the practical strategy for this larger context.

The areas with the current highest density of invasive species are the tree lines between fairways and the wetland edge at the south of the Site. When mowing ceases that line will be opened allowing the full field to go into succession with the seed bank of the invasive plants that have built up in the adjacent lawn. That succession will be led by the most aggressive species with the least constraining pressure. Without management that would be a brief vegetative growth followed by predominantly invasive woody species, we anticipate the top species would be Buckthorn, and Floribunda rose in wet areas, Autumn olive, and Bittersweet vine in dry areas, with honeysuckle, Norway maple, Burning bush, Barberry, and Knotweed in areas with some shade, or as shade develops. Areas with standing water will develop Canary grass, phragmites, and some loosestrife. Portions will also go into succession with native ruderal species like Red maple, Poplar, Birch, and Pine, but will proceed toward a blend of these with little groundcover and little native woody understory. While management may seem like a great upfront effort it will be effective attempting to restore the site after invasive domination would be too disruptive and costly to justify.

Strategy for managed succession:

- Phase 1 Containment in the south and conversion in the north 5 years
- Phase 2 Conversion in the south establishment in the north 10 years
- Phase 3 Edge management and monitoring through succession 30 years
- Phase 4 Targeted diversification, monitoring and management 50 years

The best chances for developing a functioning biodiversity alternative is containing and minimizing these species along the edge while shrinking the edge itself until there is no edge. Occupying the soil and the sunlight are the most practical long-term tactics for biodiversity. The first step is early eradication based on current species densities in the maintained tree lines in between the golf fairways a number of seasons before mowing ends. These areas tend to contain small populations of woody species which could easily be accessed from existing cart paths and are of an easily managed plant size.

We recommend beginning eradication/reforestation where invasive populations are minimal. This is to gain project momentum, build capacity, and to not leave a vulnerable landscape open behind us when we get to the bigger populations. We recommend starting with the central and northern portions of the site as these locations do not contain the high densities/ large areas of invasive species found in the southern fairways and driving range and can be naturalized first with aggressive natives to limit future invasives when we turn attention to the more heavily affected southern fairways.

While more extensive than the “easy pickings” described above, it is necessary to include an early containment of species on the edges of fairways along Randall Road and the southern half of the map. Containment will be less intensive than eradication and reforestation in the north, but will include timed cutting to reduce seed, and to weaken rootstock, many invasives become edible to browsers and insects when in tender secondary re-growth. Given that these areas are high traffic the education opportunities alone are worth considering and the methods are simple enough to be community led. Select treatments here can also reduce high-density clusters reducing the chance of spread. Additionally, species such as Reed Canary Grass (which spreads predominantly by rhizome and really requires chemical treatment) were only found in this portion of the property, treatment now could prevent spread within these areas or beyond them.

Here at Stow Acres Areas larger efforts are less due to density of species but rather to the cost/efforts to access them with management equipment. The large buckthorn populations to the west of the driving range are within a wetland complex and mixed into dense tree stands. In an effort to reduce costs it may be beneficial to target the buckthorn either during a latter railway expansion project which would establish access or slowly as surplus budget from other management efforts allows.

It will not be possible to maintain a purely un-affected site. There will be introduced, non-regional, and invasive species throughout the process and into the future. The long-term goal is a system with resilient diversity providing habitat and climate function while these species naturalize and take their place in the future landscape.

When we have moved past the establishment and conversion phases it will be necessary to manage both invasive and native successional trees and understory to prevent fire hazards, threats to diversity, and unbalanced browsing by herbivores. Anticipate the need to develop a Forest Stewardship Plan within 10 years of initial mitigation/ conversions.

5.1. Overall Management Goals for Town of Stow

- 1) Focus on reducing established species and preventing additional invasives from entering the property as the property is converted from golf courses to natural spaces.
- 2) On-going vigilance for new invasive species which could arrive at the site. The focus here should be on regular monitoring of frequently disturbed areas for new invasions and treating/controlling early.
- 3) Finally, as resources allow, invasive species management should focus on trying to control the spread from already heavily invaded areas. This should involve monitoring the extent of existing invasive stands and focusing treatment on the edges of these areas to try and prevent expansion and reduce seed, root propagule dispersal, rather than expecting to fully eradicate the existing populations.

5.2. Management Techniques and Time Frames

Invasive plant species may be controlled through manual, mechanical, chemical, and biological methods to reduce their extent, influence on habitat function, and competition with native plant species. Additional management methods include prescribed burns and the use of livestock such as goats. Management techniques recommended for Town of Stow have been chosen to protect native species and engage with the local community while meeting invasive species management goals. In particular, highly targeted techniques which minimize impacts to native species and habitats are favored, including manual hand-

pulling (for small forbs and seedling shrubs), cut-and-paint application of herbicides (for larger shrubs and small saplings), or girdling (for invasive trees). More generalized application of herbicides (foliar spray) is discouraged and should be avoided within 100-ft of wetland habitats or other exemplary community types (Oak Scrub Shrublands), where possible. Managed populations should continuously be monitored to determine success and management efficacy. Personnel and materials involved in invasive species management on the Town of Stow property will utilize existing roads, established access routes, and gulf course fairways to access treatment areas throughout the sites but no wheeled or tracked vehicles will be used off-road to conduct treatments without prior approval from the Town of Stow (within jurisdictional areas).

While all locations should be considered a priority for invasive plant management over the next five years, as resources are limited, prioritization will be necessary due to limitations that include time, money, practicability, avoidance, and minimization measures, or permitting constraints within sensitive and protected resource areas. Prioritization of management should be based on the following:

- Potential source populations and a parks ability to mitigate this.
- Consulting **APPENDIX C** - Suggested year-by-year treatment schedule by species.

Detailed species-specific best management practices (**APPENDIX D**) and time of year constraints (**APPENDIX C**) should be consulted prior to starting any invasive plant treatments. The following Sections 5.2.1 – 5.2.3 should be followed in order, to help determine the most appropriate management technique for a given species. Section 5.2.1 provides recommendations for how to treat different invasive plant growth forms, including mature trees, ‘woody’ vegetation (woody shrubs, thick woody vines, and small tree saplings), vines (non-woody), grasses, and forbs. Once appropriate treatment option(s) have been determined. Section 5.2.3 details any additional site-specific restrictions on invasive plant treatments, due to rare species habitat, or presence of exemplary community types.

Stow will continually assess the invasive species management program prior to implementing these management strategies, as adaptive and flexible management is essential for ensuring that invasive species are effectively controlled and that valuable native habitats are protected. Continued monitoring is a recommendation for all invasive species management.

5.2.1. Treatment Recommendations by Growth Form

Categorizing the type/growth form of plant species can be useful in simplifying the approach to vegetation management, as categorically similar plants typically require the same variations in technique for management. For the purpose of this report and management strategies, plants are categorized into five groups: grasses, vines, forbs (non-graminoid herbaceous species), shrubs, and trees (**Figures 4a – 4d**). Note that plant maturity is a factor in determining which group/growth form some species fall into. Table 5.1 (below) summarizes the treatments recommended for different plant growth forms encountered on Town of Stow. Both shrubs and woody vines have been grouped together in Table 5.1 as they typically share the same treatment methods. To determine which of the five categories each species has been classified as, refer to **APPENDIX D, Species Specific Management Recommendations**.

For ease of treatment, tree species growing less than 4’ tall should be considered ‘shrub’ and treated following woody vegetation techniques below (select the most appropriate woody vegetation technique from fully mature, sapling, or seedling, depending on the size of the tree). Note the ‘exceptions’ column within the treatment table, which lists species where non-chemical treatments are discouraged.

Where seedlings, saplings, or grasses/forbs are removed by hand, it is important to ensure that all parts of the plant are removed (roots, rhizomes, stem, and leaves). Many species can rapidly re-sprout from

remnant roots/rhizomes left underground, or from stem fragments left on-site. In particular, bittersweet and reed canary grass are not recommended to be removed by hand for this reason. Where possible, cutting should be conducted when plants are not flowering or setting seed, reducing the risk of spreading propagules during management. If plants have seeds or berries at the time of cutting, material should be carefully bagged for disposal, either on or off site, or burned near the collection area. For species which can spread or re-sprout readily from cut stem fragments (such as common reed, reed canary grass, and seeds of garlic mustard), all material should be bagged composted or burned near the collection area to reduce the risk of spread.

With limited budget, staff and volunteer it may be valuable to prioritize which species to pursue. This section will include notes for setting these priorities.

- **Priority 1 plants** include those that are highly invasive and are not yet widespread. Plants that are highly noxious species or host to pests or diseases that threaten biodiversity, agriculture or human or animal health.
- **Priority 2 plants** are highly invasive and usually more common than Priority 1 species. Small, outlier patches may be targeted for eradication or control. Uncommon species of concern are also listed here.
- **Priority 3 plants** include all other non-native plants. These may be widespread invasives that are difficult to control at the scale of the Town, or less common species that do not cause significant ecological harm.

Table 5.1: Recommended treatment type by plant growth form.

(Note on chemicals: Other glyphosate or triclopyr-based formulations may be used if labeled for the site. For wetland use, formulations and any adjuvants must be water-safe and approved for use in or near wetlands.

*(Refer to **Figure 4** for a map of the locations of these invasive species groupings by growth form.)*

| Growth Form | Maturity Level | Non-Chemical Treatment | Secondary Herbicide Recommendations | Exceptions to Non-chemical Treatment** |
|----------------------|----------------|--|--|--|
| Shrubs / woody vines | Fully Mature | Shovels excavate (all root material) | Cut & Paint (Garlon 3A/Rodeo) | Bittersweet, Honeysuckle |
| | Sapling | Hand pull or shovel excavate (all root material) | Cut & Paint (Garlon 3A/Rodeo) | Bittersweet, Honeysuckle |
| | Seedling | Weed wrench or hand removal | Foliar* (Garlon 3A/Rodeo) | Bittersweet |
| Grass | All Stages | Hand removal/shovel excavate/mowing routinely | Foliar* (Garlon 3A/Rodeo) | Common reed, Reed canary grass |
| Forb | All Stages | Hand removal, Mowing | Foliar* (Second year Garlic Mustard [†]) (Garlon 3A/Rodeo) | |

NOTE: differences in the recommended treatment type (highlighted in green) may occur for work within exemplary communities and rare species habitat.

* Restricted use of foliar spray within 100-ft of wetlands or Scrub Oak Shrubland Habitat. Defer to secondary recommendation or non-chemical option.

- ** “Exceptions” to the recommended treatment type (highlighted in orange). These species require specific treatment measures beyond the generic treatment type. Refer to **APPENDIX D** Management Guides for specific requirements for these species.
- † Treatment is preferred when plant is in basal stage or prior to seeding for biannual species.

5.2.2. Treatment Recommendation Adjustments within Wetlands and Buffer Zones

In general, foliar application of herbicides should be avoided where possible, and **should be used only when necessary, within 100-ft of wetlands or vernal pools**. Any foliar application should be carefully targeted by adjusting nozzle size, using a low spray-pressure, and using careful application to reduce drift and overspray as much as possible. No herbicide application (foliar, cut/paint or hand wick) should be conducted when rain or fog is forecast, particularly for applications within 100-ft of wetlands. Be sure to follow the instructions on the herbicide label regarding application windows prior to, or after, any precipitation events.

5.2.3. Five Year Adaptive Management Schedule

Once an appropriate treatment type for the plant growth form and species in question has been determined (based on Table 5.1, and review of any species-specific requirements in **APPENDIX D**), treatments can begin based on the Towns available budget. This will take into consideration factors such as plant growth rate, the need for repeated treatments to contain a species and the repeated removal of new seedlings emerging from the seedbank.

Please note that monitoring and assessment after treatment will inform the need for adaptive management recommendations when applying this schedule – if new plants are identified between treatment years, or if re-growth occurs past the anticipated end date for treatment, management will need to be adjusted to meet these changes. Successful control of invasive plants is a multi-year commitment and follow-up monitoring, and management may need to be ongoing for at least 3-5 years and often longer.

6.0 FUTURE CONSIDERATIONS

Town of Stow land at Stow Acres offers several potential treatment issues which raise concerns for future management. These site-specific concerns are unique to the site and should be noted and monitored with any adaptive strategy. Species specific considerations are outlined in **APPENDIX D**, generalized aspects are outlined here.

Naturally occurring wetlands and vernal pools are located throughout the site, supporting multiple species, while also providing important ecosystem services such as groundwater recharge, protection of the public and private water supply and prevention of pollution. As such, use of herbicide or other heavy impact techniques in these sensitive areas should be limited, and incorporate selective methods and application techniques, as well as the protective measures outlined in this plan. Continued monitoring of the health and vigor of native plant populations, invasive plant presence, and protection from other disturbances and impacts, should be ongoing. Invasive plant management techniques may need to be adapted to achieve the greatest reduction in invasive plant presence, while avoiding impacts to native communities.

Several factors contribute to the current invasive plant problems, and increase the risk of future invasions:

- Sites located within suburban areas experience an elevated risk of invasive species establishment from neighboring gardens (particularly from ornamental species popular with homeowners and gardeners).
- The utility ROWs and roadways which bisect the Town of Stow provide a potential pathway for both the spread of already established species (e.g., common reed), and the introduction of new species through seed or viable plant material via machinery and equipment being brought onto the site.
- Use of the property by people and pets (and associated vehicle use), which can also contribute to the spread of invasive plants within the site.
- Ubiquitous threats. The majority of significant invasive plant species have been present in New England for decades. They are widespread and well established. Many are wind borne or carried by birds and herbivores. They will take time and intervention to naturalize and will remain a permanent feature of the landscape regardless of management methods.

To best mitigate for these issues, awareness, coordination, and cooperation between all groups who access the Town of Stow Site will be necessary. While the nature of the site means that disturbance cannot be avoided, risks can be mitigated through careful cleaning of machinery, boots, and other vectors both before entering and prior to leaving the site, and through rigorous education of the public. Coordination between Town of Stow and neighboring property owners will be important to increase awareness of the risks posed by invasive species, and to promote understanding of the pathways by which they are spread (movement of soil, vegetation fragments, dumping of cut material from other areas, accidental garden escapes of ornamental species etc.).

Monitoring and containing invasive species within areas of heavy use and impact will be important. While complete eradication of well-established populations is less likely to be successful, efforts should be made to contain their spread, in particular preventing establishment within exemplary community types and rare species habitats. Continued maintenance of any areas treated will be needed to address inevitable re-growth, and to ensure re-invasion does not occur. For the management plan to be effective, repeated treatments and varied control methods will be needed.

6.1. Future Pathways of Invasion

Seed bank: The local seed bank poses a threat for management of invasive species by providing a pathway for re-establishment. Mature populations of invasive plant species at Town of Stow are contributing to the local seed bank. Invasive plant seeds can remain viable in the ground for 8+ years, germinating when conditions are favorable. This is often exacerbated by the removal of invasive plants, particularly dense invasions, and mature trees, which open up canopy gaps for seedlings to become established. To best mitigate the seed bank effect, ongoing monitoring, and repeated treatment of impacted areas, over the course of several years, is recommended. It should be noted that many native species also have an established and long-lasting seedbank, which can help in the restoration of native vegetation once invasive plants are on a trajectory to being removed. Repeated and carefully targeted treatment of invasive plants (so that they do not reach maturity and set seed), will gradually flip the invasive: native seedbank ratio, promoting the re-establishment of desirable native species over the more competitive invasive species. Once native vegetation becomes established, it will be better able to compete with invasive plants for resources such as available water, sunlight, nutrients, and growing space, reducing the ability for invasive seeds to germinate successfully if they are maintained and not deliberately damaged in development and maintenance.

Neighboring properties: Town of Stow land is bordered by a variety of used areas including, Municipal areas, residential property, roadways, and other land uses. All pose as potential sources for invasive plant

species spread onto Stow Acres. As the Town does not have the rights to all of these properties, direct control of any invasive presence associated is not feasible. A containment approach regarding this is potentially the only solution. This will require annual monitoring of growth or bordering populations and treatment, should they encroach onto Town of Stow land. Additionally, root barriers could be installed along large bordering populations of rhizomatic-spread species. Unfortunately, species whose seeds can be dispersed via wind or fauna will require larger areas of monitoring, as the spread will not be contained to immediate border area. Creating a dialogue with neighboring properties, in particular the rivers, may allow for addressing these source populations. Neighboring property owners may be keen to collaborate on preventing the spread of invasive species into their property, and they may already have some invasive plant management initiatives (including volunteer groups for hand pulling of some species).

Wildlife: Wildlife can spread invasive plant material (particularly seeds), via fecal transport. The wildlife impact comes from seed-eating birds, which consume invasive seeds and release them throughout the site. Squirrels and other rodents can likewise spread invasive plant material. Impacts from the spread of invasive plant material via wildlife are likely to be far lower than those associated with the movement of machinery/equipment/people, however, they may affect a wider and less accessible area. Although there is no feasible way to address the spread of invasive plants via fauna, an awareness of this pathway and appreciation that continued monitoring may be required (even in inaccessible habitats), is valuable.

Machinery/human transport through land use: As described previously, several of the site uses at Town of Stow mean that the widescale movement of machinery and equipment, both within the site and from outside the site, provides a major pathway for invasive species dispersal. This is reflected in the high association between invasive plant locations and access routes/roadways. Thoroughly cleaning all machinery and outerwear can help prevent the spread of invasive plants. Be sure to clean all machinery and clothing used in known invasive areas, both prior to and when leaving the Town of Stow management area. Seed brushes for boots, and Velcro and sticky tape for removing seeds from clothing, can help reduce the spread of invasive plant material by people. Equipment should be pressure washed away from sensitive resource areas, paying particular attention to wheels/tracks, where soil and plant fragments tend to collect.

6.2. Monitoring for New Invasive Species Populations

In addition to monitoring and control of documented and established invasive species within Town of Stow, there is need for continued vigilance for newly arriving invasive species or species not included on the MIPAG official list that are known invasives elsewhere in the region. These may include plants (for example Kudzu, an invasive vine found elsewhere in Connecticut, but not yet reported in Stow), animals, fungi, or pathogens (bacteria and viruses). Species to be particularly vigilant for include:

Plants: Comprehensive lists of invasive plant species to watch out for in Massachusetts can be found on the MA.gov website, and from MIPAG (<https://www.massnrc.org/mipag/>)

- Kudzu – Kudzu is an invasive vine found across CT. It can grow nearly a foot per day, and its tuberous rootstocks enable it to accumulate carbon and conserve water (Mass Audubon, n.d.).
- Dames Rocket- An invasive flower that has been spotted near Stow. The species poses a distinct threat to the forest edge habitat where it could thrive and establish dominance.
Identification can be found here:
<https://dnr.wisconsin.gov/topic/Invasives/fact/DamesRocket.html>

Invertebrates:

- Asian Longhorn Beetle (ALB)- ALB is a beetle originally from Asia that attacks and kills host tree species. An adult beetle can fly up to one mile to establish itself on a new host plant where it will burrow and lay eggs. The larva will then destroy the host. ALB should be monitored for, with infected trees being removed prior to larval flight. Any sightings of ALB should be reported to MA DEP and the USDA. At the Town of Stow, all maple, tree of heaven, and elm trees provide potential hosts. Identification can be found here: <https://www.dec.ny.gov/animals/7255.html>
- Emerald Ash Borer - A small, invasive beetle that is devastating to all ash tree species in MA. It is currently present in eleven MA counties and continues to spread. The Ash Borer can affect any species of ash. It is recommended that Town arborists and parks staff be sure to monitor trees for any signs of infestation. If identified, report it to MA DEP: <https://www.mass.gov/guides/emerald-ash-borer-in-Connecticut/#slowing-the-spread>
- Woolly hemlock adelgid- An adelgid that attacks hemlock trees. The adelgid has been found in Connecticut and should be monitored for in large stands at Town of Stow. The adelgid can affect hemlock trees. It is recommended that Town arborists and parks staff be sure to monitor trees for any signs of infestation. Identification can be found here:
https://www.canr.msu.edu/resources/how_to_treat_hemlock_trees_for_hemlock_woolly_adelgid
- Spotted Lantern Fly- An insect that attacks and destroys trees in the region. This species has been found in Stow and is a concern to any fruit trees on site. Management of faunal species will require techniques not included in this guide. Consult with MA DEP and the USDA for guidance on managing this pest. The lantern fly can affect any many species of plants including grape, hop, apple, stone fruit, maple, poplar, walnut, and willow. It is recommended that Town arborists and parks staff be sure to monitor trees for any signs of infestation. Identification can be found here:
<https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/spotted-lanternfly/spotted-lanternfly>
- Spongy Moth (Gypsy Moth)- An insect which defoliate tree cover when eggs hatch and the young begin to eat. The species affects hundreds of local plants and egg masses persist overwinter. Management of faunal species will require techniques not included in this guide. Consult with MA DEP and the USDA for guidance on managing this pest. Monitoring for egg masses and impact locations will be key to preventing the spread of this species. Identification can be found here: <https://www.aphis.usda.gov/aphis/resources/pests-diseases/hungry-pests/the-threat/spongy-moth/hp-spongy-moth>
- Winter Moth- An insect which impact many deciduous plants particularly Oak, Apple, maple, and blueberry. Management of faunal species will require techniques not included in this guide. Consult with MA DEP and the USDA for guidance on managing this pest. Monitoring for egg masses and impact locations will be key to preventing the spread of this species. Identification can be found here: <https://ag.umass.edu/landscape/fact-sheets/winter-moth-identification-management>

- Varroa mites- These mites inflict physical injury on both native bees and honeybee hosts and serve as the vector for deadly viruses, including Deformed wing virus (DWV) and the related Varroa destructor virus-1 (VDV-1) (i. e., DWV-like viruses). Identification can be found here: <https://beelab.umn.edu/varroa-mites>

Pathogens:

- Chronic Wasting- A prion infection affecting ungulates. In the case of Town of Stow, White tailed deer are at risk. The best prevention is monitoring for the disease and removing any diseased animals. DES should be notified of any potential Chronic Wasting cases. Within Stow, this disease has the potential to heavily impact white tailed deer. Identification can be found here: <https://www.cdc.gov/prions/cwd/index.html>
- White nose syndrome- A fungal disease impacting bats. The disease has been noted to be moving north. Monitoring of Stow's bat population will be key. Any potential cases should be reported to CT DES and the USDA. Identification can be found here: <https://www.nps.gov/articles/what-is-white-nose-syndrome.htm>
- Rana virus: This is a viral infection that affects amphibians and reptiles. The disease causes 90 – 100% mortality among larval amphibians, causing hemorrhaging and edema of the legs and body. Although the disease appears to be widespread across the US, cases are poorly documented. Biosecurity is paramount for protecting amphibian and reptile populations, and all boots/equipment should be thorough cleaned and dried when moving between wetland sites. Identification information is available from: <https://www.extension.purdue.edu/extmedia/FNR/FNR-485-W.pdf>. Any potential cases should be reported to CT DES.

While this list highlights several species of high concern, it by no means encompasses all potential species. To get a better understanding of new species to watch for, it is best to consult with MA DEP. Additionally, consulting with other states (NY, VT, NH, ME, VI, CO, TX, CA to name a few), in which your personnel/ general public may visit or associate with could better prepare Stow for new threats.

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Appendix A

Invasive Species Management Plan
Stow Acres

DETAILED FIELD SURVEY RESULT TABLES

2023 Survey Species List- Stow Acres

| Species | | Category |
|---------------------------------------|-------------------------------|-----------------|
| <i>Sandwort Drymary (Alfombrilla)</i> | <i>Drymaria arenarioides</i> | <i>herb</i> |
| Asiatic Bittersweet | Celastrus orbiculatus | Shrub |
| Autumn Olive | Elaeagnus umbellata | Shrub |
| <i>Benghal Dayflower</i> | <i>Commelina benghalensis</i> | <i>herb</i> |
| Black Locust | Robinia psuedocacia | Tree |
| Burning Bush; Winged Euonymus | Euonymus alatus | Shrub |
| <i>Common Barberry</i> | <i>Berberis vulgaris</i> | |
| <i>European Barberry</i> | | <i>Shrub</i> |
| Common Buckthorn | Rhamnus cathartica | Shrub |
| European Buckthorn | Frangulus alnus | |
| Glossy Buckthorn | | Shrub |
| Garlic Mustard | Alliaria petiolata | Herb |
| Japanese Barberry | Berberis thunbergii | Shrub |
| Morrow's Honeysuckle | Lonicera morrowii | Shrub |
| Multiflora Rose | Rosa multiflora | Vine |
| <i>Pale Swallow-wort</i> | <i>Vincetoxicum rossicum</i> | |
| Black Swallow-wort | V. louiseae | Vine |
| Purple Loosestrife | Lythrum salicaria | herb |
| Reed Canary-grass, Ribbon Grass | Phalaris arundinacea | grass |
| <i>Wetland Nightshade</i> | <i>Solanum tampicense</i> | <i>Shrub</i> |

Appendix B

Invasive Species Management Plan
Stow Acres

MIPAG INVASIVE SPECIES LIST

Massachusetts Invasive Plant Advisory Group (MIPAG) List

| Species | Common name | Category |
|---|---|----------|
| <i>Acer platanoides</i> | Norway maple | Invasive |
| <i>Acer pseudoplatanus</i> | Sycamore maple | Invasive |
| <i>Aegopodium podagraria</i> | Bishop's goutweed, bishop's weed; goutweed | Invasive |
| <i>Ailanthus altissima</i> | Tree of heaven | Invasive |
| <i>Alliaria petiolata</i> | Garlic mustard | Invasive |
| <i>Berberis thunbergii</i> | Japanese barberry | Invasive |
| <i>Cabomba caroliniana</i> | Carolina fanwort; fanwort | Invasive |
| <i>Celastrus orbiculatus</i> | Oriental, Asian or Asiatic bittersweet | Invasive |
| <i>Cynanchum louiseae</i> | Black swallow-wort; Louise's swallow-wort | Invasive |
| <i>Elaeagnus umbellata</i> | Autumn olive | Invasive |
| <i>Eragrostis curvula</i> | Weeping lovegrass | Invasive |
| <i>Euonymus alatus</i> | Winged euonymus, burning bush | Invasive |
| <i>Euphorbia esula</i> | Leafy spurge; wolf's milk | Invasive |
| <i>Frangula alnus/Rhamnus frangula</i> | European buckthorn, glossy buckthorn | Invasive |
| <i>Glaucium flavum</i> | Sea or horned poppy, yellow hornpoppy | Invasive |
| <i>Hesperis matronalis</i> | Dame's rocket | Invasive |
| <i>Iris pseudacorus</i> | Yellow iris | Invasive |
| <i>Lepidium latifolium</i> | Broad-leaved pepperweed, tall pepperweed | Invasive |
| <i>Lonicera japonica</i> | Japanese honeysuckle | Invasive |
| <i>Lonicera morrowii</i> | Morrow's honeysuckle | Invasive |
| <i>Lonicera x bella [morrowii x tatarica]</i> | Bell's honeysuckle | Invasive |
| <i>Lysimachia nummularia</i> | Creeping jenny, moneywort | Invasive |
| <i>Lythrum salicaria</i> | Purple loosestrife | Invasive |
| <i>Myriophyllum heterophyllum</i> | Variable water-milfoil; two-leaved water-milfoil | Invasive |
| <i>Myriophyllum spicatum</i> | Eurasian or European water-milfoil; spike water-milfoil | Invasive |
| <i>Phalaris arundinacea</i> | Reed canary-grass | Invasive |
| <i>Phragmites australis</i> | Common reed | Invasive |
| <i>Polygonum cuspidatum / Fallopia japonica</i> | Japanese knotweed; Japanese or Mexican bamboo | Invasive |
| <i>Polygonum perfoliatum</i> | Mile-a-minute vine; Asiatic tearthumb | Invasive |
| <i>Potamogeton crispus</i> | Crisped pondweed, curly pondweed | Invasive |
| <i>Ranunculus ficaria/Ficaria verna</i> | Lesser celandine; fig buttercup | Invasive |
| <i>Rhamnus cathartica</i> | Common buckthorn | Invasive |
| <i>Robinia pseudoacacia</i> | Black locust | Invasive |
| <i>Rosa multiflora</i> | Multiflora rose | Invasive |
| <i>Salix atrocinerea/Salix cinerea</i> | Rusty Willow/Large Gray Willow complex | Invasive |
| <i>Trapa natans</i> | Water-chestnut | Invasive |
| ----- | ----- | ----- |

| | | |
|------------------------------------|--|-----------------------|
| <i>Actinidia arguta</i> | Hardy kiwi; tara vine | Likely Invasive |
| <i>Ampelopsis brevipedunculata</i> | Porcelain-berry; Amur peppervine | Likely invasive |
| <i>Anthriscus sylvestris</i> | Wild chervil | Likely invasive |
| <i>Berberis vulgaris</i> | Common barberry; European barberry | Likely Invasive |
| <i>Butomus umbellatus</i> | Flowering rush | Likely Invasive |
| <i>Cardamine impatiens</i> | Bushy rock-cress; narrowleaf bittercress | Likely Invasive |
| <i>Centaurea stoebe</i> | Spotted knapweed | Likely Invasive |
| <i>Cynanchum rossicum</i> | European swallow-wort, pale swallow-wort | Likely Invasive |
| <i>Cytisus scoparius</i> | Scotch broom; English broom | Likely Invasive |
| <i>Egeria densa</i> | Brazilian water weed; Brazilian elodea | Likely Invasive |
| <i>Epilobium hirsutum</i> | Hairy willow herb; Codlins and cream | Likely Invasive |
| <i>Euphorbia cyparissias</i> | Cypress spurge | Likely Invasive |
| <i>Festuca filiformis</i> | Hair fescue; fineleaf sheep fescue | Likely Invasive |
| <i>Glyceria maxima</i> | Tall mannagrass; reed mannagrass | Likely Invasive |
| <i>Heracleum mantegazzianum</i> | Giant hogweed | Likely Invasive |
| <i>Humulus japonicus</i> | Japanese hops | Likely Invasive |
| <i>Hydrilla verticillata</i> | Hydrilla; water-thyme; Florida elodea | Likely Invasive |
| <i>Ligustrum obtusifolium</i> | Border privet | Likely Invasive |
| <i>Lonicera tatarica</i> | Tatarian honeysuckle | Likely invasive |
| <i>Microstegium vimineum</i> | Japanese stilt grass, Nepalese browntop | Likely Invasive |
| <i>Miscanthus sacchariflorus</i> | Plume grass; Amur silvergrass | Likely Invasive |
| <i>Mycelis muralis</i> | Wall Lettuce | Likely Invasive |
| <i>Myosotis scorpioides</i> | Forget-me-not | Likely Invasive |
| <i>Myriophyllum aquaticum</i> | Parrot-feather; water-feather; Brazilian water-milfoil | Likely Invasive |
| <i>Najas minor</i> | Brittle water-nymph, lesser naiad | Likely Invasive |
| <i>Nymphoides peltata</i> | Yellow floating heart | Likely Invasive |
| <i>Phellodendron amurense</i> | Amur cork-tree | Likely Invasive |
| <i>Pinus thunbergii</i> | Japanese black pine | Likely Invasive |
| <i>Pueraria montana</i> | Kudzu; Japanese arrowroot | Likely Invasive |
| <i>Pyrus calleryana</i> | Callery Pear; Bradford Pear | Likely Invasive |
| <i>Ranunculus repens</i> | Creeping buttercup | Likely Invasive |
| <i>Rorippa amphibia</i> | Water yellowcress; great yellowcress | Likely Invasive |
| <i>Rubus phoenicolasius</i> | Wineberry; Japanese wineberry; wine raspberry | Likely Invasive |
| <i>Senecio jacobaea</i> | Tansy ragwort; stinking Willie | Likely Invasive |
| <i>Tussilago farfara</i> | Coltsfoot | Likely Invasive |
| ----- | ----- | ----- |
| <i>Arthraxon hispidus</i> | Hairy joint grass; jointhead; small carpetgrass | Potentially Invasive |
| <i>Carex kobomugi</i> | Japanese sedge, Asiatic sand sedge | Potentially Invasive |
| <i>Lonicera maackii</i> | Amur honeysuckle | Potentially Invasive. |
| ----- | ----- | ----- |

| | | |
|---|---|--------------------------|
| <i>Akebia quinata</i> | Five-leaved Akebia; chocolate vine | Do not list at this time |
| <i>Amorpha fruticosa</i> | False indigo-bush | Do not list at this time |
| <i>Catalpa speciosa</i> | Northern catalpa | Do not list at this time |
| <i>Elaeagnus angustifolia</i> | Russian olive | Do not list at this time |
| <i>Euonymus europaeus</i> | European spindle-tree | Do not list at this time |
| <i>Euonymus fortunei</i> | Wintercreeper; Climbing spindle-tree | Do not list at this time |
| <i>Festuca ovina</i> | Sheep fescue | Do not list at this time |
| <i>Ligustrum ovalifolium</i> | California privet | Do not list at this time |
| <i>Ligustrum sinense</i> | Chinese privet | Do not list at this time |
| <i>Ligustrum vulgare</i> L. | European privet | Do not list at this time |
| <i>Lonicera xylosteum</i> | Dwarf honeysuckle | Do not list at this time |
| <i>Miscanthus sinensis</i> | Eulalia; Chinese silvergrass | Do not list at this time |
| <i>Morus alba</i> | White mulberry | Do not list at this time |
| <i>Polygonum sachalinense</i> / <i>Fallopia sachalinensis</i> | Giant knotweed | Do not list at this time |
| <i>Populus alba</i> | White poplar | Do not list at this time |
| <i>Rorippa microphylla</i> | Watercress; onerow yellowcress | Do not list at this time |
| <i>Rorippa nasturtium-aquaticum</i> | Watercress | Do not list at this time |
| <i>Rosa rugosa</i> | Japanese rose; rugosa rose | Do not list at this time |
| <i>Sedum telephium</i> ssp. <i>telephium</i> | Live-forever; orpine; witch's moneybags | Do not list at this time |
| <i>Verbascum thapsus</i> | Common mullein; flannel mullein; velvet plant | Do not list at this time |

Appendix C

Invasive Species Management Plan
Stow Acres

TIME OF YEAR RESTRICTIONS AND MONTHLY SCHEDULE TABLES

Table B-3: Time of Year Treatment for Secondary Management Areas

| Species | Growth Form | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|------------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asiatic bittersweet | Woody | | | | | | | | | | | | |
| Autumn olive | Woody | | | | | | | | | | | | |
| Barberry spp. | Woody | | | | | | | | | | | | |
| Bush honeysuckle spp. | Woody | | | | | | | | | | | | |
| Garlic mustard | Herb | | | | | | | | | | | | |
| Mugwort | Herb | | | | | | | | | | | | |
| Purple loosestrife | Herb | | | | | | | | | | | | |
| Reed Canary Grass | Grass | | | | | | | | | | | | |
| Rosa multiflora | woody | | | | | | | | | | | | |
| Swallow-wort | Herb | | | | | | | | | | | | |
| Bittersweet nightshade | Vine | | | | | | | | | | | | |
| Buckthorn spp. | Woody | | | | | | | | | | | | |
| Benghal dayflower | Herb | | | | | | | | | | | | |
| alfombrilla | Herb | | | | | | | | | | | | |
| Locust spp. | Tree | | | | | | | | | | | | |
| Burning bush | Woody | | | | | | | | | | | | |

Legend:



Treatment window

Best time for treatment

Basal growth treatment only as rest has seeded (Biannual species)

"Until FF" - Until First Frost

Appendix D

Invasive Species Management Plan
Stow Acres

**BEST MANAGEMENT PRACTICES &
TREATMENT GUIDES**

Invasive Plant Management Methods and Guidance

Prevention

Early Detection and Rapid Response: preventing the species from arriving into an area and/or preventing the plant from flowering or going to seed is essential. An early detection and rapid response plan is critical in preventing the arrival and spread of invasive species, particularly those on the Stowe Acres Parks invasive plant species list. Once present, an integrated pest management plan (IPM) is critical in ensuring proper management of invasive plants. IPM incorporates a combination of all best management tools provided herein.

Integrated Pest Management (IPM)

Manual Management:

- **Hand pulling:** Pulling up individual plant stems is an effective control method for many vines, grasses, forbs, and seedling trees and shrubs (please note the exceptions listed below). Careful pulling is also required for certain annual and biennial species, as well as other woody species with resilient root systems, as they may re-sprout from root portions left in the ground. Moist soil can help to loosen roots for more effective pulling and reduces soil and seed bank disturbance.

Mechanical Management:

- **Cutting:** Individual invasive plants should be cut at ground level using a chainsaw, hand saw, loppers, pruners, shears, or other suitable implement. The cut material should be left elevated off the ground, or removed from site, to avoid re-establishing. Repeated cutting can be an effective means of managing small populations of woody invasive vines and some forbs, but this technique is less effective at removing invasive plant populations entirely. Many of the species found on the Stowe Acres Parks property will re-sprout vigorously from cut stems. Thus, cutting should occur on a repeated basis and/or combined with chemical management (see the next section).
- **Mowing:** Mowing is appropriate for small infestations of invasive plants, or environmentally sensitive areas where herbicides are not preferred and is generally used as a control method rather than an eradication method. Mowing is not generally recommended for plants that re-sprout heavily, unless it can be repeated often, and the area monitored until the targeted species has been exhausted and eliminated. Stems should be cut at least once for control, and preferably multiple times per growing season, and as close to ground level as possible. It often takes multiple years of mechanical management to eradicate an invasive plant population. Mowing and cutting should consider the plants phenology including time of seeding and can be used to reduce seed bank contributions.
- **Girdling:** Girdling (with no addition of chemical) of canopy and sub-canopy trees and some shrubs is an effective management technique for certain species. Girdling not only results in the eventual death of the invasive tree being girdled, but also appears to reduce seedling production while girdling is being conducted, due to the deteriorating health of the individual. Additionally, girdling will usually kill an individual tree over the course of 1-3 years, allowing for understory vegetation to adjust to the changing light conditions. It also produces snag trees that are valuable nesting habitat often eliminated by maintenance practices in urban areas.

Invasive Plant Management Methods and Guidance

To properly girdle a tree, use a chainsaw, axe, or girdling tool, and cut 2 shallow rings through the cambium of the tree. The rings should completely wrap the tree, and be within 2-6 inches of each other, below the lowest branches. Trees with a Diameter at Breast height (DBH) of 4+ inches can be effectively girdled. Girdling is most effective in the spring and can be combined with chemical treatment to further increase effectiveness.

Chemical Management: Professional herbicide applicators need to be appropriately licensed by the State of Connecticut or Department of Defense to apply herbicides or solutions intended to be used as herbicide. Pesticide applicators should read the entire pesticide label carefully, follow all mixing and application instructions and wear all recommended personal protective gear and clothing. The Stowe Acres has a ban on Organic based compounds being used as herbicides, a waiver would be required should City parks opt for this approach. Conversely, non-organic (Soap based) herbicides exist and are recommended for application via the same means outlined as traditional herbicides whilst remaining compliant. Contact the Connecticut Department of Energy & Environmental Protection for any additional pesticide use requirements, restrictions, or recommendations. State pesticide regulations are located at <https://portal.ct.gov/DEEP/Pesticides/Pesticide-Certification-General/Pesticide-CertificationLicensing>

- **Foliar:** Foliar herbicide application involves applying a herbicide mix to the leaves of the plant. This method should be considered for large or dense infestations, where the risk to sensitive areas and native plant species is minimal. Foliar spot spray application is a method that directs the application to a small distinct target by using low-pressure application equipment (backpack and hand-pump sprayers), anti-drift adjuvants, and even spray shields, to avoid drift. This method can be carried out with minimal risk of drift, and is generally effective for herbaceous plants and woody shrubs less than six feet tall. The best time to treat is during the growing season and/or during the late fall, when the targeted plant is preparing to overwinter (sending its resources to its root system). For proper foliar methodology consult the pesticide label. Foliar spray should be avoided within 100-ft of wetlands and vernal pools, where possible, otherwise applications must be targeted foliar spot treatments using aquatic safe herbicides and surfactants.
 - **Plants generally unsuitable for foliar herbicide application:** *Plants which are intermixed with native, non-target species (likely to result in accidental die-off of non-target species) and plants which are growing in a wetland or within 100-ft of wetlands or vernal pools (although carefully targeted foliar application of aquatic safe herbicides may be used, if necessary).*
- **Cut Stem / Cut and Paint:** This method involves the application of herbicide directly on the cut end of a plant stem. Although time consuming, this selective method requires a small amount of herbicide and has the potential to greatly reduce effects on non-target species and the environment. Cut stem is recommended for woody plants that tend to re-sprout after cutting, and for use in sensitive areas to minimize risk of contact with non-target plant species. Stems are typically cut near the ground. A good practice is to leave enough above ground stem to perform a follow-up cut and treatment if necessary. Herbicide must be applied immediately after cutting the stem (within minutes) to be effective. Cut stem application can be completed at any time except during the spring when the movement of sap flow is up. Herbicide can be applied to the cut stem using various methods including hand-held spray or squirt bottles and well as paint (or foam) brushes. The active ingredient Glyphosate or Triclopyr is commonly used for this treatment

Invasive Plant Management Methods and Guidance

method and is effective for many species, however, the applicator should always check the herbicide label. Applying a dye to the herbicide mix is helpful in keeping track of treated plants.

- **Bundle Cut and Wipe:** This technique is similar to the cut and wipe method described above, except that multiple stems are bundled together and treated simultaneously. Stems should be bundled with twine at approximately waist height, cut in their bundles, and drip or wiped with herbicide using a hand-held squirt bottle, wick applicator, or injection gun. Mowing in the spring or previous season prior to treatment can help to remove old canes and make application more efficient.
 - **Plants generally suitable for bundle cut and wipe application:** *Common reed, reed canary grass.*
 - **Plants generally unsuitable for bundle cut and wipe application:** *Species and populations of species which do not grow in dense stands. Also, woody plant species.*
- **Basal Bark:** The basal bark technique consists of applying herbicide directly to the bark at the base of the plant. Although time consuming, this method is recommended for large infestations in sensitive areas where the risk of contact with non-targeted species is high. This method is effective throughout the year, provided that the base of the plant is exposed (remove snow, puddling water, dried leaves, etc.). Applying a dye to the herbicide mix is helpful in keeping track of treated plants.
 - **Plants generally suitable for basal bark application:** *Tree of heaven, Norway maple, black and honey locust, large grey willow, common and glossy buckthorn, autumn olive, burning bush.*
 - **Plants generally unsuitable for basal bark application:** *Non-woody and herbaceous species, any individual under 4 inches DBH.*
- **Injection (Herbaceous):** The injection technique is another targeted treatment approach, which involves injection of the herbicide into the hollow portion of certain plant stems, using an injection device. This method is particularly effective for the management of Japanese knotweed and common reed. and although time consuming, could be appropriate for small patches and stray individuals.
 - **Plants generally suitable for injection:** *Japanese knotweed, Common reed, other species with hollow stems.*
 - **Plants generally unsuitable for injection:** *Species that do not have hollow stem cavities.*
- **Injection (Shrub/Tree):** This technique is similar to that described above, except that the injection involves the application of herbicide directly into the cambium of woody/tree plants. Using a tree injector, a series of small, non-overlapping injections is made at the base of the trunk, below all branches. Herbicide is applied to each opening.
 - **Plants generally suitable for injection:** *large gray willow, Norway maple, common and glossy buckthorn, tree of heaven, black and honey locust.*
 - **Plants generally unsuitable for injection:** *Herbaceous plants and individuals smaller than 4 inches DBH.*
- **Bloody Glove/Paint:** The bloody glove / paint method involves the manual application of a herbicide formula directly on the plant's stems and leaves, using an herbicide saturated cotton glove over chemical resistant gloves. The bloody glove/paint method is recommended for use in

Invasive Plant Management Methods and Guidance

sensitive areas such as riparian and wetland systems. Direct manual application of the herbicide formula reduces the risk of damaging non-target plant species and helps to protect water quality and wetland habitats, as it eliminates the element of drift involved in foliar application.

- **Plants generally suitable for bloody glove:** *Common reed, reed canary grass, Asiatic bittersweet, pale and black swallow wort.*
- **Plants generally unsuitable for bloody glove:** *Any plants with thorns, or plants that have not leafed out.*
- **Girdle and Squirt / Hack and Squirt:** This is a combined girdle and chemical treatment approach. Following the guidelines for girdling (described above), immediately apply herbicide to the cut rings using a targeted spray bottle. Alternatively, for the “Hack and Squirt” technique, cut into the cambium around the base of the individual tree, and apply herbicide inside the cuts. Use the label recommended percentages for the species/chemical of choice.
 - **Plants generally suitable for Hack and Squirt:** *Tree of heaven, Norway maple, black and honey locust, large grey willow, common and glossy buckthorn, autumn olive, burning bush.*
 - **Plants generally unsuitable for Hack and Squirt:** *Non-woody and herbaceous species, and any individual less than 4 inches DBH.*

Biological Pest Control/ Biocontrol: several biocontrol agents have been approved by the USDA for the management of invasive species. See specific invasive species information below to determine whether a biocontrol is available for management purposes. Please note that biocontrol agents do not eradicate invasive species populations, however, by suppressing the growth and/or spread of the invasive plant, the biocontrol provides opportunities for reduced competition and diverse plant communities.

Other types of Management

- **Prescribed Burns:** Prescribed burns are not currently recommended as a management tool for Stowe Acres Parks, although they may be considered in the future. The Fire Effects Information System (<https://www.feis-crs.org/feis/>) maintained by the US Forest Service provides synthesized information about various fire regimes and effects on specific plant species to help determine the benefits and effectiveness of fire on specific plant species. Some invasive plant species can be managed with controlled burns, typically in combination with one of more of the other management techniques described above. Prescribed fire during the dormant season is generally ineffective for controlling invasive vines, grasses, and forbs.
- **Intensive Grazing:** Grazing is not currently recommended as a management tool for Stowe Acres Parks, although this technique may be considered in the future. Timing of grazing is important (targeting plants before they set seed), but can be difficult to manage, due to the non-selective nature of this technique. In addition, grazing animals will consume both invasive and native plants. In an effort to protect native plants, it is recommended that grazing occur early in the season, prior to the flowering of many native plants. Proper management and handling of the herd is also important to prevent overgrazing of native grasses and forbs, which would lead to soil erosion and reduced diversity.

Invasive Plant Management Methods and Guidance

Managing invasive plant material

Disposal: Viable plant propagules, such as roots, rhizomes, and seed heads, should be placed in sturdy plastic bags and disposed of with trash or designated compost disposal sites, or taken to a sanitary landfill for disposal. Do not compost or put in yard waste. Cut stems of woody plants can often be left on site where they were cut or can be composted or burned. Consider adding bio-char production to municipal compost facilities.

Equipment Management: Clean equipment of all plant pieces before moving the equipment to a new management site. Work boots should also be checked for any potential seed hitchhikers.

Managing invasive plants in wetlands and within 100-ft of Wetlands and Vernal Pools

Wetland resource areas within Stowe Acres Parks primarily consist of wetlands and vernal pools. Not only are these habitats jurisdictions under the WPA and local wetlands bylaws, but many of them also support listed rare species. The following invasive plant management precautions should be taken when working within 100-ft of wetlands or vernal pools:

- **Limited use of herbicides within all wetlands and their 100-ft buffer zones:**
 - Prioritize hand-pulling or cutting (where appropriate for the invasive plant species).
 - If herbicide use is necessary (mature woody shrubs/vines), restrict to selective methods that use less herbicide and minimize potential effects to non-target plants, such as cut and paint. Foliar spray within 100-ft of wetlands or vernal pools should be avoided, although minimal use of foliar spot spray on certain invasive species (such as low growing herbaceous plants and follow-up treatment to re-sprouting woody plants), may be appropriate.
 - Targeted foliar spot treatments using low-volume application equipment (backpack hand-pump sprayers), can be carried out effectively with minimal risk of drift to nontarget organisms, in areas where invasive plants are not interspersed with non-target plant species. Herbicide and any adjuvants need to be water-safe and approved for use in wetland habitat areas and wetland buffer zones.

Monitoring

Monitoring of treatment areas is essential for successful invasive species management. Treated areas should be monitored for:

- **Success in treating the invasive plants** – is the population declining in area, density, or extent? Do treatments need to be continued or adjusted to further reduce invasive plant populations based on the response to the previous treatments?
- **Failure in treating the invasive plants** – is the invasive population unimpaired by treatment, or even expanding / growing more rigorously? Have cut stumps produced multiple new shoots? Should the current management approach be continued, or should a new approach be implemented?

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- **Damage to non-target species** – are native, non-target plants in the vicinity of the treatment area showing signs of stress, or are they responding positively to reduced invasive plant pressure? Has the treatment area become overly exposed / free from all vegetation? If non-target communities are being negatively impacted, cease the current treatment method and review suitable alternatives.

At the end of each growing season, the success of invasive plant management actions should be evaluated and used to inform the subsequent years management plan. Managing invasive plant species requires time, energy, and resources. Many of the recommended management strategies may require years of management and monitoring to achieve a significant reduction in population presence. Some invasive plants will require management and monitoring in perpetuity, and will likely never result in complete eradication of the population, but may provide a more balanced ecosystem that allows for a high degree of biodiversity, increased native plant abundance, species diversity, and improved habitat quality.

Asiatic Bittersweet^{1,2,3}

Woody/Semi Woody and Herbaceous Perennial Vines

Best Management Technique:

- Cut/paint with herbicide. Applying a dye to the herbicide mix is helpful in keeping track of treated plants.
- Glyphosate and/or Triclopyr-based herbicide formulations. If using in wetland sites, use formulations approved for wetland sites such as Rodeo and Garlon 3A respectively.

Best Non-Chemical Technique:

- Repeated cutting of the vines to limit the spread of the species is recommended. Note: this approach is more likely to contain the spread rather than eliminate the population.
- Soap based foliar products such as AXXE may be effective for reducing population sizes.

Reed Canary Grass^{4,5}

Grass

Common Reed and Reed Canary Grass are commonly found in riparian habitats, wetlands, and their buffers. Therefore, management of these species will likely require coordination with the appropriate Conservation office in order to comply with provisions of the WPA.

Best Management Techniques:

- Mowing, followed by chemical treatment (bundle cut and wipe or bloody glove preferred, to reduce risk of drift). If mowing is conducted prior to treatment, ensure all equipment is free of grass fragments - including rhizomes - since these can help the grasses spread.
- Glyphosate-based herbicides are effective for established populations of reed canary grass. If treatment is within 100 feet of a wetland, use a formulation labeled for wetland use (such as Rodeo, and a wetland safe surfactant such as Cide-Kick), and limit herbicide application to selective methods.
- NOTE: Herbicide application should be limited to direct application (e.g., hand wick), in a wetland or within 100-ft of wetlands.

Best Non-chemical Technique:

- Repeated mowing can prevent the spread of these species, without chemical use containment is the best goal currently. For additional containment the installation of root barriers can help with containment mowing.

¹ Mervosh, T.L and Gumbart, D (2015) “Cutting and Herbicide Treatments for Control of Oriental Bittersweet, Pale Swallow-Wort and Morrow’s Honeysuckle,” *Natural Areas Journal* 35, no. 2: 256–65.
<https://doi.org/10.3375/043.035.0206>.

² NRCS (n/d) “Brush Management - Invasive Plant Control - Oriental Bittersweet - *Celastrus Orbiculatus*”
Conservation Practice Job Sheet NH-314, accessed October 4, 2023,
<https://bugwoodcloud.org/mura/mipn/assets/File/Educational%20Resources/Oriental%20Bittersweet%20Mgmt.pdf>.

³ Plant Conservation Alliance Alien Plant Working Group (2006), “Oriental Bittersweet *Celastrus Orbiculatus*”,
accessed October 4, 2023, <https://www.invasive.org/weeded/pdfs/wgw/orientalbittersweet.pdf>.

⁴ Wisconsin Reed Canary Grass Management Working Group (2009), “Reed Canary Grass (*Phalaris Arundinacea*) Management Guide: Recommendations for Landowners and Restoration Professionals”, accessed October 4, 2023,
https://www.nrcs.usda.gov/sites/default/files/2022-09/Reed%20Canary%20Grass%20Management%20Guide_0.pdf.

⁵ Adams, C.R and Galatowitsch, S.M (2006) “Increasing the Effectiveness of Reed Canary Grass (*Phalaris Arundinacea* L.) Control in Wet Meadow Restorations,” *Restoration Ecology* **14**, no. 3: 441–51.

*Benghal Dayflower*⁶

Forb

Best Management Techniques:

- Glyphosate can control very small seedlings but has not been shown to be very effective on mature plants.

Best Non-Chemical Technique:

- Manual removal by hand pulling or digging of the early stages of these species is recommended for small manageable populations.
- New plants can sprout from broken stems, so extra care should be taken to clean up after hand removal, and mowing is not advised.

*Purple Loosestrife*⁷

Forb

Due to the location of these species growing in or along wetlands and wet depressions, management of these species will likely require coordination with the appropriate Conservation office in order to comply with provisions of the WPA.

Best Management Techniques:

- The biological control agent (the beetle *Galerucella* spp.), has been released in Massachusetts and is now found in the wild controlling some populations. If the beetle is not successful in this area, targeted application of herbicide (preferably hand wicking), may be an option. Foliar herbicide application should be avoided in wetlands, which is where purple loosestrife is most commonly found.
- Rodeo or other Glyphosate-based herbicide approved for use in wetlands with an appropriate wetland safe surfactant (check the label for specifications).

Best Non-Chemical Technique:

- Manual removal by hand pulling or digging of the early stages of these species is recommended for small manageable populations.
- Frequent short mowing may control and slow down the spread of these species along roadsides and other areas, however, this approach is not effective at eradication.

⁶ Khamare, Yuvraj, et al. "Biology and Management of Benghal Dayflower (*Commelina Benghalensis*) in Ornamental Crop Production", IFAS Extension, University of Florida, accessed 5 July 2021, edis.ifas.ufl.edu/publication/EP350.

⁷ Department of Natural Resources MN, "What You Can Do to Control Purple Loosestrife," Minnesota Department of Natural Resources, accessed December 11, 2020, <https://www.dnr.state.mn.us/invasives/aquaticplants/purpleloosestrife/control.html>.

Garlic Mustard^{8,9,10}

Forb

Best Management Techniques:

- Garlic Mustard: Manual removal of small infestations. Systemic herbicide applications in the late Spring should be considered for large infestations.
- Spotted Knapweed: Small populations can be hand pulled or mowed. Systemic herbicide applications in the late Spring should be considered for large infestations. Biocontrol releases are also an option for large and scattered populations.
- Glyphosate or Triclopyr should be used for targeted chemical treatments. Triclopyr is selective on broad-leaved plants and can be used for situations in which the target plants are growing intermixed with native grasses. If treatment is within 100 feet of a wetland, use a formulation labeled for wetland use, such as Rodeo and a wetland safe surfactant such as Cide-Kick, and limit herbicide application to selective methods.

Best Non-chemical Technique:

- Garlic Mustard: Manual removal of small infestations.
- Spotted Knapweed: Small populations can be hand pulled or mowed.
- Foliar application of a soap based herbicide.

Non-Native Shrub Honeysuckles^{11, 12}

Shrub

Best Management Technique:

- New population composed of small seedlings: Mechanical removal through consistent mowing, or other forms of cutting.
- Established population: A combination of mechanical and chemical control via cut/paint or foliar application will likely result in the most successful management. This type of control diminishes soil disturbance and non-targeted species exposure.
- **NOTE: Herbicide application should be limited to direct application (cut/paint, foliar), within 100-ft of wetlands.**

Best Non-Chemical Technique:

- Mowing of seedlings on a consistent and regular basis will deplete the root system. However, this will take multiple years.
- Cut established shrubs and treat the cuts with soap based herbicides

⁸ UMass Amherst, *Pesticide Safety Education - Core Manual 3rd Edition* (Amherst: UMass, n.d.).

⁹ Penn State University, "Garlic Mustard," Penn State Extension, accessed December 11, 2020, <https://extension.psu.edu/garlic-mustard>.

¹⁰ Adriane M. Carlson and David L. Gorchov, "Effects of Herbicide on the Invasive Biennial *Alliaria Petiolata* (Garlic Mustard) and Initial Responses of Native Plants in a Southwestern Ohio Forest," *Restoration Ecology* 12, no. 4 (December 2004): 559–67, <https://doi.org/10.1111/j.1061-2971.2004.00373.x>.

¹¹ NRCS, "Pest Management - Invasive Plant Control - Shrub Honeysuckles - *Lonicera* Sp." (Conservation Practice Job Sheet NH-595), accessed December 11, 2020, https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081648.pdf.

¹² "Shrub Honeysuckles," Penn State Extension, accessed December 11, 2020, <https://extension.psu.edu/shrub-honeysuckles>.

Common and Glossy Buckthorns^{13,14,15}, *Autumn Olive*¹⁶, *Burning Bush*^{17,18,19},
Japanese and European Barberry^{20,21} *Multiflora Rose*^{22,23}
Shrubs

Best Management Technique:

- Small seedlings: Mechanical removal through consistent mowing, or other forms of cutting. Targeted foliar application is also an option but should be avoided/minimized within 100-ft of wetlands.
- Established population: A combination of mechanical and chemical control via cut/paint or basal bark application will likely result in the most successful management. This type of control diminishes soils disturbance and non-targeted species exposure.
- Triclopyr should be used for Basal bark application or cut/paint application methods. Glyphosate is the recommended herbicide for all other chemical treatment methods. All pesticide should be used in accordance with the label, and local regulations. If treatment is within 100 feet of a wetland, use a formulation labeled for wetland use (such as Rodeo, and a wetland safe surfactant such as Cide-Kick), and limit herbicide application to selective methods.
- NOTE: Herbicide application should be limited to direct application (cut/paint, basal bark) within wetlands and 100-ft of wetlands.

Best Non-Chemical Technique:

- Repeated mowing for multiple years
- Soap Based herbicides may be effective at reducing species presence.

¹³ Department of Natural Resources MN, “Buckthorn Management,” Minnesota Department of Natural Resources, accessed December 11, 2020, <https://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/control.html>.

¹⁴ L. M. Nagel, R. G. Corace, and A. J. Storer, “An Experimental Approach to Testing the Efficacy of Management Treatments for Glossy Buckthorn at Seney National Wildlife Refuge, Upper Michigan,” *Ecological Restoration* 26, no. 2 (June 1, 2008): 136–42, <https://doi.org/10.3368/er.26.2.136>.

¹⁵ Michigan DNR, “Common Buckthorn *Rhamnus Cathartica*” (Invasive Species - Best Control Practices), accessed December 11, 2020, <https://mnfi.anr.msu.edu/invasive-species/CommonBuckthornBCP.pdf>.

¹⁶ Penn State University, “Autumn Olive,” Penn State Extension, 2020, <https://extension.psu.edu/autumn-olive>.

¹⁷ Penn State University, “Burning Bush,” Penn State Extension, accessed December 11, 2020, <https://extension.psu.edu/burning-bush>.

¹⁸ Douglas Cygan, “Integrated Pest Management for Woody Invasive Plants” (New Hampshire Department of Agriculture, Markets & Food, n/d).

¹⁹ NRCS, “Pest Management - Invasive Plant Control - Burning Bush - *Euonymus Alatus*” (Conservation Practice Job Sheet NH-595), accessed December 11, 2020, https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1081645.pdf.

²⁰ Michigan DNR, “Japanese Barberry *Berberis Thunbergii*” (Invasive Species - Best Control Practices, 2012).

²¹ NRCS, “Brush Management – Invasive Plant Control Barberies – *Berbis Sp.*” (Conservation Practice Job Sheet NH-314, 2011).

²² Jon Johnson, Art Gover, and Jim Sellmer, “Managing Multiflora Rose” (Penn State University, 2007), https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_018028.pdf.

²³ NRCS, “Brush Management – Invasive Plant Control Multiflora Rose – *Rosa Multiflora*” (Conservation Practice Job Sheet NH-314, 2011).

Black Locust^{24,25}

Trees

Best Management Technique:

- New population composed of small seedlings: Mechanical removal through consistent mowing or chemical foliar treatment.
- Established population: A combination of mechanical and chemical control via cut/paint or basal bark application will likely result in the most successful management. This type of control diminishes soils disturbance and non-targeted species exposure to chemicals or other damage.
- If treatment is within 100 feet of a wetland, use a formulation labeled for wetland use (such as Rodeo, and a wetland safe surfactant such as Cide-Kick), and limit herbicide application to selective methods.

Best Non-Chemical Technique:

- New population composed of small seedlings: Mechanical removal through consistent mowing
- Removal of established trees should be coupled with mowing of any resprouts.

²⁴ J.M DiTomaso and J.B Kyser, “Robinia Pseudoacacia Black Locust,” in *Weed Control in Natural Areas in the Western United States* (University of California: Weed Research and Information Center, 2013), 544, https://wric.ucdavis.edu/information/natural%20areas/wr_R/Robinia.pdf.

²⁵ NRCS, “Brush Management - Invasive Plant Control - Black Locust - Robinia Pseudoacacia” (Job Sheet - Brush Management 314), accessed December 11, 2020, https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_015112.pdf.

Figures

Invasive Species Management Plan
Stow Acres

USGS TOPOGRAPHIC MAP
STOW ACRES ENVIRONMENTAL CONSTRAINTS MAP
STOW ACRES INVASIVE SPECIES DISTRIBUTION MAP
INVASIVE SPECIES BY GROWTH FORM

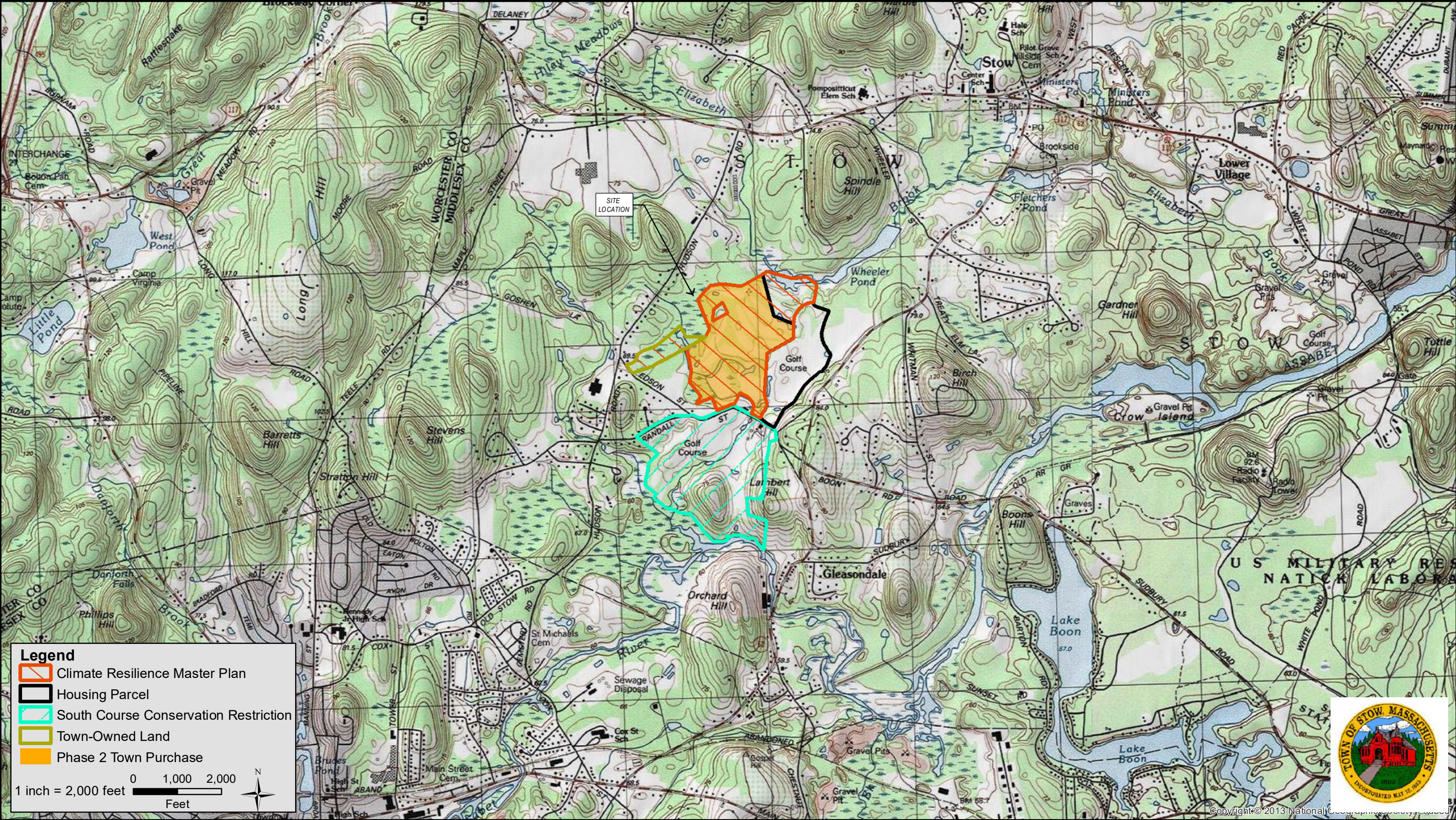
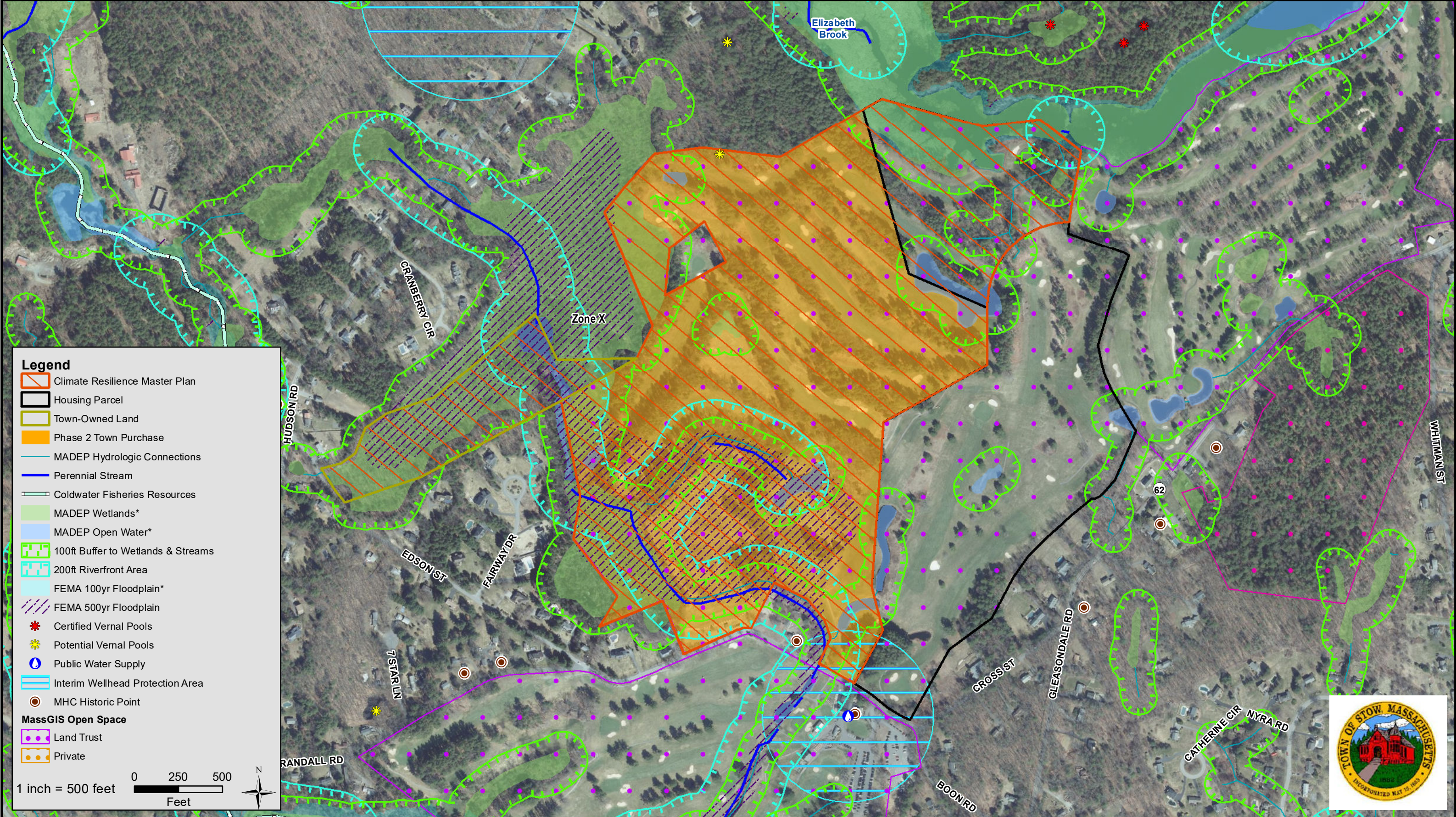


Figure 1

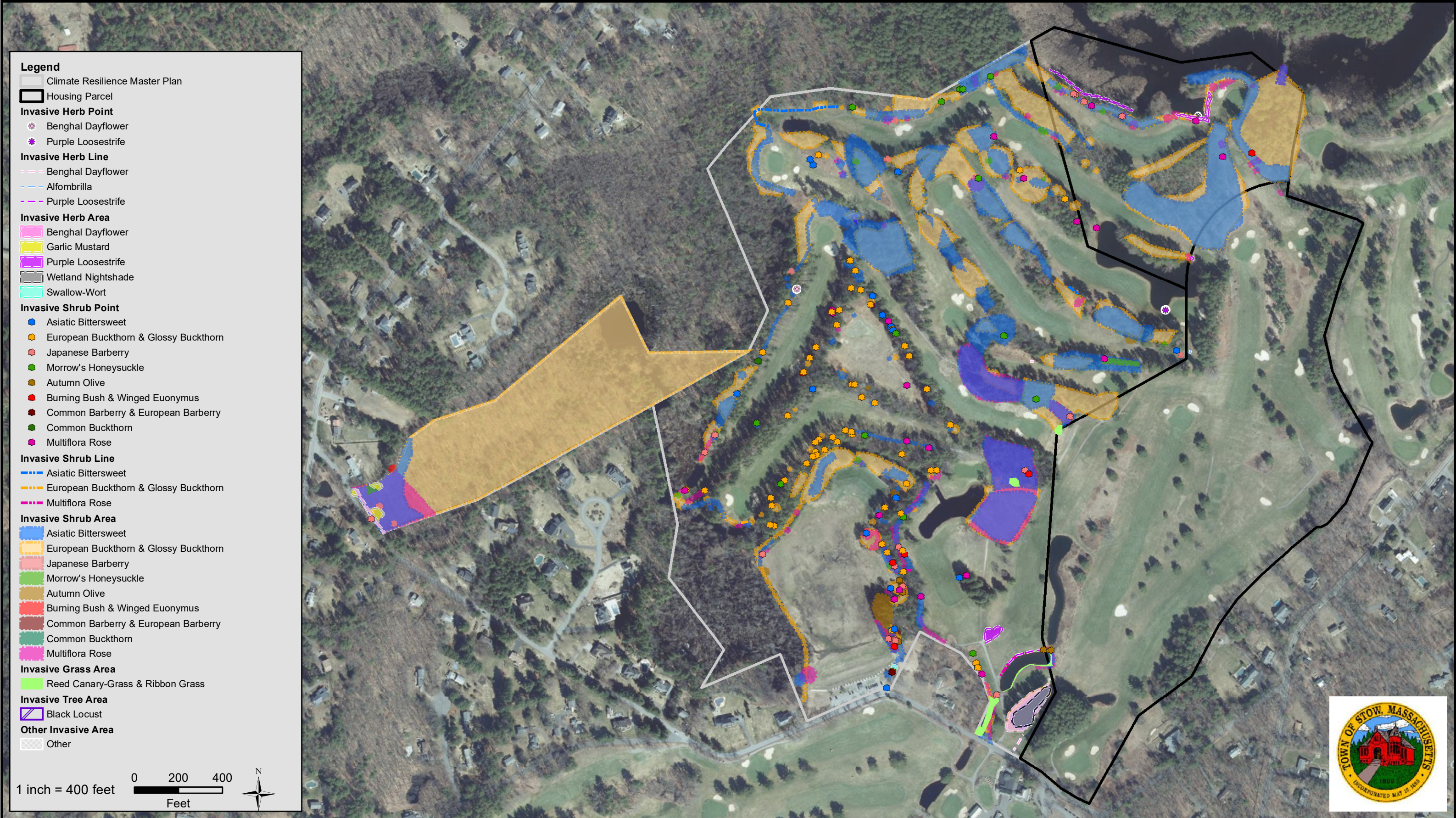


STOW ACRES MASTER PLAN



Figure 2

Sources: MassGIS, Town of Stow



STOW ACRES MASTER PLAN



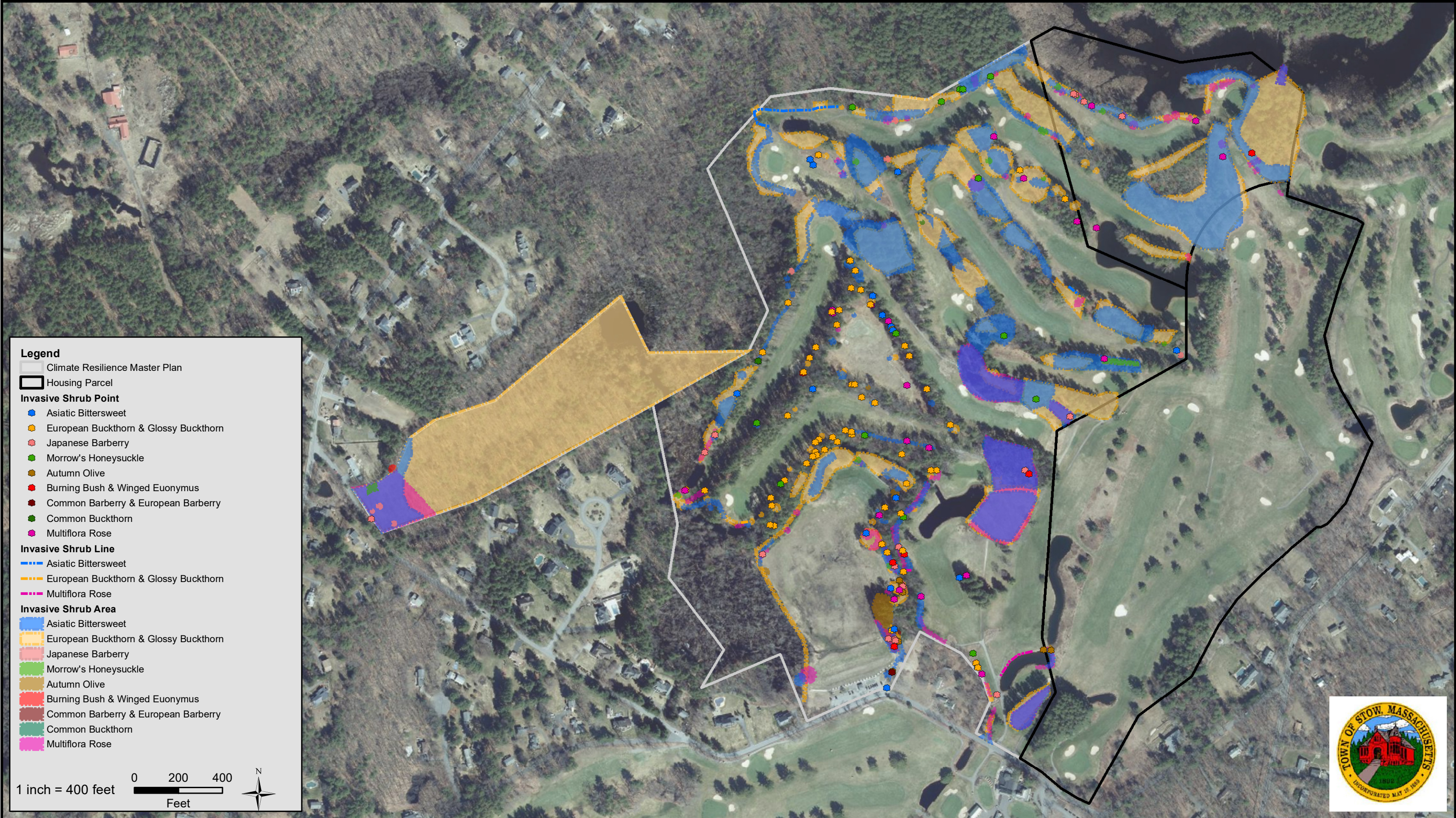
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