



Town of Simsbury

933 HOPMEADOW STREET

SIMSBURY, CONNECTICUT 06070

OPEN SPACE COMMITTEE

July 5, 2023

4:30 P.M.

Zoom

REGULAR MEETING AGENDA

1. Adoption of April 5, 2023 Minutes
2. Discussion of Barndoor Hills Triangle Bird Sanctuary Proposal
3. Discussion on Need for an Invasive Plant Policy
4. Discussion on Open Space and POCD Process
5. Discussion on Open Space Budget Items for FY 25 Budget Process
6. Discussion on Adding Open Space Events on Town Calendar and Website
7. Other Business

Adjourn

Open Space Committee
Wednesday, April 5, 2023
4:30 PM- Via Zoom
REGULAR MEETING MINUTES - DRAFT

PRESENT: Margery Winters, Karyn Cordner, Helen Peterson, Erin Leavitt-Smith and Susan Masino

ALSO PRESENT: Tom Tyburski, Director of Parks and Recreation, and Tom Roy, Director of Public Works were also in attendance.

Absent: Anne Erickson, Kelly Kearney, Wendy Mackstutis

Call to Order

Ms. Winters called the meeting to order at 4:32 PM

1. Adoption of January 4, 2023 Minutes

Ms. Peterson stated item four, line 6ish she was trying to say Barn Door Hills Triangle. Ms. Winters said in section three for native plants on the second line, should read “many areas” not many things. Also, under section 6 (Dark Skies), instead of stating “sending this to Planning and Zoning”, it should read “recommendation for possible regulations”.

2. Presentation from Pollinator Pathway group on Barndoor Hills Triangle Bird Sanctuary Proposal

Ms. Grandin and Mr. Campolieta shared that Open Space has already taken a big step towards creating a Bird Sanctuary on Barndoor Hills Triangle by designating the field as grassland which would promote having grassland birds there. He stated that their proposal is to manage the field as a bird sanctuary. They have received a few grants towards that. This item will eventually come before the Board of Selectmen to have it officially sanctioned as such. Ms. Grandin stated that they did apply for a grant with Hartford Audubon which they received as seed money for this proposal. She stated they are in touch with numerous people who have extensive knowledge about what needs to happen and can advise them through the process. Two members of their Board will be designated to be the managers of the bird sanctuary.

Ms. Peterson asked if there are any invasives in the Barndoor Hills Triangle. Ms. Winters stated that there is mugwort there so it will need some handling. Mr. Campolieta stated removing invasives would be part of this project. There may be other plants in there as well, someone from DEEP will be going out there for input as well.

The Open Space Committee will send a positive referral to the Board of Selectman regarding this item.

3. Follow Up from March 27 BOS Presentation by Open Space Committee Members

Ms. Masino shared that they tried to talk about their strategic plan and specific policies. She stated that the follow-up that is going to solidify this is getting what was expressed at that meeting reflected on their website. She stated that one of the items that came up was pollinator/habitats at the community farm plots on Sand Hill Road. She stated that this could be

another level of public education they could engage in. Ms. Masino stated she gave a talk at the CT Land Conservation Conference on the weekend and she used Simsbury as an example for how they are trying to do this strategic plan. She suggested giving the Board of Selectmen a couple of resources.

Ms. Peterson shared that in prior minutes it stated that the plant policy and so forth were discussed and voted on and would be sent to the Board of Selectmen, however, that hasn't happened and she wondered if there was another process. Mr. Tyburski shared that after the Town Manager reviewed the policies she felt they were best used at the Department level rather than a Town policy. Mr. Roy commented that the thought is it becomes more of a guidance document than a policy.

4. Update on FY24 Budget Open Space Items

Mr. Tyburski stated that there has been a little bit of a disconnect during the budget season. Based on the discussions with the BOS and BOF he is not sure how many of these Open Space items would have been funded this year based on the constraints that they have. They do have the CNR money project money for pollinator pathway that was funded over three years (they are only in year two). He stated there is not money set aside for interns or surveys this year. He stated they are using a lot of the ARPA money to pay for capital projects not initiatives. Mr. Roy commented that the strong desire was to have a signature project which they felt the Flower Bridge would be. Ms. Peterson commented that it would be beneficial to establish some habits and protocols where there is carryover from their meetings especially from the workgroup to the full committee meetings. Ms. Masino commented that they try to write the agenda for the next meeting at the end of their meeting. She stated that she attended last year's budget meetings about ARPA funding and she brought up ecological inventories and getting a strategic plan for invasive removal which has been on their agenda for many years and she provided verbal estimates. She feels that those items completely fell through the cracks but she assumed they were in a queue. She also stated that pursuant to Town surveys, taking care of the open space we have is important to people and that requires careful stewardship. Ms. Masino also stated that the Trap Rock Ridge Enabling Legislation was left off this agenda as well as what was presented to the Board of Selectmen so that needs to be added to the next agenda as that legislation was passed in 1998.

5. Launching Homegrown National Park co-branding opportunity

Ms. Corder stated at the BOS meeting there was some concern by the Town's attorney with regard to the Homegrown National Park co-branding, she is not sure if they have it or how to get it so they can update the webpage.

Mr. Tyburski stated he got an email today that it is on the agenda for the next Board of Selectmen meeting (April 17th). Ms. Capriola reviewed the cover memo and she put together some questions. He will forward those questions to Ms. Masino to answer.

6. Light Pollution/Dark Skies Discussion

Ms. Winters stated that she believes the Conservation Commission has forwarded the letter onto the Zoning Commission with the recommendations for possible regulations. She stated it would also be nice if they had a letter from the Open Space Committee.

Ms. Leavitt-Smith stated that whatever the committee can do to encourage Zoning because as part of the POCD they are going to be looking at it quarterly and looking at some of the regulations so they can go back to various boards and commissions and say did you do this because they want it to be a living document. Ms. Masino commented that a general letter was sent from Conservation, she thinks that if Open Space agrees they could send something general like that but she would like to engage in the same process that they did for the Natural Area Stewardship, farm policy, mowing, etc. and look at the landscape of what's out there and pick the best path and actually give Zoning specifics. Ms. Winters stated that they worked off of Newtown and Stamford's policies and regulations. Ms. Masino stated maybe she could run their proposal by Mr. Smith the International Dark Sky person. Ms. Winters suggested that they send a letter with the other Town's policies that they have along with the two additional towns.

7. Final Review of Native Plant Policy

This policy was already completed and approved.

8. Final Review of Open Space Mowing Guidelines

Ms. Winters stated that they made a change instead of mowing every two years that it be approximately every two years, however, this policy was approved as well.

9. Invasive Species Removal/Control Initiatives

Ms. Winters commented that this will require some education for Town staff and then they will need to discuss how to get it up on the website. She stated that Simsbury Land Trust has been working on something for identification process. She stated one of the easiest things to do to get people aware of their invasive plants are various applications on websites. Mr. Tyburski stated that the webpage has been updated with this information. Staff training and holding education programs on invasives/natives was discussed.

Ms. Masino shared that the Grange is starting a five-part docu-series on beaver pond wildlife, the first one will be held on Earth Day.

Ms. Leavitt-Smith stated they are hoping to have a draft of the POCD back at the end of the month. She also asked what the meeting format is going to be moving forward. The next meeting will be held in person. She also asked if the July 5th meeting would be going forward due to the holiday. The meeting calendar will be put on the agenda for the next meeting.

Mr. Tyburski shared that the Town's clean-up day will be held April 22, 2023 from 9:30-12 p.m. and you can sign up on the C.P.R. website.

ADJOURN

Ms. Peterson made a motion to adjourn the meeting, seconded by Ms. Corder. All voted in favor. Motion passed. Meeting adjourned at 5:29 pm.

Respectfully submitted,
Heather Taylor
Committee Clerk

STEEP ROCK ASSOCIATION



INVASIVE MANAGEMENT PLAN

Created February 2022



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Introduction:

Steep Rock Association (SRA) is a nationally accredited land trust whose mission is to conserve ecologically and historically significant landscapes and riparian corridors in and around Washington, CT and to enhance the community's connection to nature through outreach, education, and passive recreation.

As of 2022, SRA owns 2,828 acres across 27 nature preserves. For each preserve, SRA creates and maintains a comprehensive management plan that focuses on inventorying recreational opportunities and conserving natural resources. Management units within the preserves identify habitat types, species of conservation concern, threats to natural communities, and conservation actions necessary to monitor and manage the properties.

Across our preserves, invasive plant and animal species are considered one of the most significant threats to each property's respective conservation value. Numerous ecological surveys conducted throughout the preserves support this determination and the need for active management. In 2014, consulting botanist William Moorhead conducted an inventory of critical habitats within the preserves, updating this inventory in 2016 with a survey of rare and uncommon plants. In both reports, Moorhead listed invasive plants as one of the most significant threats to the conservation of inventoried plant species and habitat types. Other biological studies commissioned by SRA, including inventories of reptiles and amphibians, recognize invasive plants as a primary ecological concern for sensitive habitat types and their associated species.¹

SRA's Invasive Species Management Plan (Plan) is an effort to synthesize the various studies and recommendations by SRA consultants, staff, and citizen scientists into a comprehensive framework for effectively monitoring and managing invasive threats, with an overarching goal of increasing biodiversity, protecting vulnerable habitats, and ensuring safe recreational experiences for preserve users. In pursuit of this goal, the Plan identifies and elaborates upon the following objectives:

- 1) Survey and map existing invasive plant stands within all preserves and develop a ranking system to prioritize management
- 2) Catalog invasive management efforts from 2012 to the present
- 3) Determine best management practices for control of individual invasive plant species known to be pervasive within the preserves
- 4) Identify a management objective for each priority invasive plant stand, establish a five-year schedule for management actions, and identify resources required to implement said schedule
- 5) Develop and implement a monitoring regime to document invasive plant stand condition, assess effectiveness of management efforts, and detect early colonization of new species
- 6) Catalog internal policies and initiatives that prevent the spread of invasive species, increase public awareness, promote collaborative management efforts, and identify recommendations for improvement.

Note that while this Plan is primarily geared towards the establishment of a management framework for invasive *plant* species, other invasive pests and diseases are explicitly discussed in Objectives Two, Five and Six. All information provided herein reflects best management practices based on the scientific

¹ For a complete catalog of biodiversity reports and studies conducted within the preserves, see the respective Land Management Plans, available on file at the SRA Office.

literature. As new invasive threats emerge and research on invasive management develops, pertinent information will be incorporated into this document.

Objective One:

Survey and map existing invasive plant stands within the preserves and develop a ranking system to prioritize management.

Beginning in 2019, SRA launched a program to inventory readily observable invasive plant stands within our preserves. As part of this survey, stands of invasive plants were mapped using GIS software; the relative density of the stand, predominant species, and nearby geographical features were also recorded. This initial survey does not constitute a definitive inventory of every invasive stand in the preserves. Further monitoring efforts are required and discussed at length in Objective Five.

Within the mapped stands, SRA created a management prioritization ranking system based on six categories: 1) Invasiveness Potential; 2) Extent and Scope of Stand; 3) Environmental and Natural Resource Considerations; 4) Public and Human Health Considerations; 5) Control and Restoration Feasibility; and 6) Management Investment. For each category, SRA developed a numeric ranking system, assigning a value of one to four for each stand using the scoring rubrics listed below. A score of zero indicates that the criterion is not applicable to a particular stand. These values were then incorporated into a formula, which was used to assign an Invasive Stand Prioritization Score (ISPS) to each mapped invasive stand.²

To determine a stand's ISPS, SRA staff cross referenced existing stand survey data with other ecological and recreational GIS data. Such data included: critical habitats and significant natural communities; occurrence of species listed as "Endangered", "Threatened", or "Special Concern" in Connecticut³; wetlands soils and waterbodies; and high use areas, trails, and other recreational amenities. This spatial data, combined with staff knowledge of the preserves, served as the basis for determining each stand's categorical score, and therefore the overarching ISPS score.

Below is a brief overview of each rating category, the scoring rubric used to define each stand's individual category scores, and the formula used to integrate these scores. The cumulative and individual scores for each surveyed stand are stored in the attribute table of the "Surveyed Invasive Plant Stands" layer within the [SRA Interactive Invasive Species Map](#). In this ranking system, a higher score denotes higher prioritization, with a 4.00 the highest possible score.

Category 1: Invasiveness Potential (20% of ISPS)

This category measures the potential for spread based on characteristics of the predominant plant species within each stand. SRA's scoring of this category relies heavily on scientific data compiled by the Connecticut Invasive Plant Working Group (CIPWG) and the New York Invasive Species Information Clearinghouse (NYIS.INFO). In collaboration with Cornell University, NYIS.INFO has created a convenient ranking system for individual invasive plants, scoring each plant based on ecological impact, biological characteristics and dispersal ability, ecological amplitude and distribution, and difficulty of

² The ISPS framework is derived, in part, from a similar technique employed by the Nature Conservancy. The criteria and scoring have been substantially modified to better represent SRA's needs. (The Nature Conservancy, 2001)

³ See *Connecticut's Endangered, Threatened, and Special Concern Species* for additional information on listed species in Connecticut. State of Connecticut Department of Energy and Environmental Protection Bureau of Natural Resources (2015).

control. Based on these four factors, NYIS.INFO assigned an overall invasiveness score for plant species, and then, based on these scores, divided the plants into a five-tiered ranking system. In this system, “very high” indicates a relative invasiveness score of 80 and above; “high” is 70 to 79.99; “medium” is 60 to 69.99; “low” is 50 to 59.99; and “insignificant” is less than 49.99.⁴ Using this data, SRA created its own ranking system, using the criteria below. This category accounts for 20 percent of a stand’s ISPS.

Scoring:

- 4) Those plants listed by CIPWG on the “Invasive and Potentially Invasive Plant Early Detection List”⁵ and/or given an invasiveness rank of “high” or “very high” by NYIS.INFO’s Non-Native Plant Assessments that have been detected but are not yet pervasive within the preserves.
- 3-0) Those plants given an invasive rank by NYIS.INFO’s Non-Native Plant Assessment that are known to occur or have been recently detected within the preserves, but do not meet the above criteria. The numerical ranking for these plants is calculated by multiplying the plant’s respective NYIS.INFO score by 0.03, converting the score to a 0-3 scoring value.

Category 2: Extent and Scope of Stand (20% of ISPS)

This category assesses the relative density and size of each stand, giving prioritization to individual plants of new colonizer species and, to a lesser degree, “satellite” populations of invasive stands with species already present in the preserves. This strategy of prioritizing emerging threats and smaller populations of existing threats is in keeping with current best management practices.⁶ This category accounts for 20 percent of a stand’s ISPS.

Scoring:

- 4) Individual plants or small stands of invasive species that have not yet spread in the preserves but are known to be problematic regionally and/or are listed on the CIPWIG “Invasive and Potentially Invasive Plant Early Detection List”.
- 3) Those stands that are new populations or outliers of larger infestations in the preserves that have the potential to expand rapidly.
- 2) Large infestations of species pervasive in the preserves that continue to expand.
- 1) Large infestations of species pervasive in the preserves that are not expanding.

Category 3: Environmental and Natural Resources Considerations (30% of ISPS)

This category assesses the invasive stand’s potential for impairing biodiversity and natural resources, both at landscape and species level scales. In keeping with SRA’s overarching stewardship philosophy, priority is given to those stands that pose an inordinate threat to rare habitat types and greatest conservation need (GCN) species. This category accounts for 30 percent of a stand’s ISPS.

Scoring:

- 4) Infestations that occur in and threaten to fundamentally impair critical and significant habitat types and/or where a listed species is known to exist.

⁴ For additional information on the NYIS ranking system and for a breakdown of each species’ scores, see *Invasiveness Assessment Scores and Ranks...* (New York Invasive Species Information Clearinghouse, 2013).

⁵ See *Invasive and Potentially Invasive Plant Early Detection List* (Connecticut Invasive Plant Working Group, 2016).

⁶ See pages 125-128 of the Natural Land Trust’s *Lands for Life* publication (Harper, D.B., 2014).

- 3) Infestations that occur near critical and significant habitat types and that are *likely* to expand into and/or fundamentally impair said habitats.
- 2) Infestations that occur in or near critical and significant habitat types but that are *unlikely* to expand and/or significantly impair said habitats.
- 1) Infestations that occur in areas of lesser ecological importance and are unlikely to spread or impact more valued habitats and resources.

Category 4: Public and Human Health Considerations (5% of ISPS)

This category assesses the invasive stand's potential impact to human health. In assessing this category, staff only considered significant health implications, including: the stand or plant species is likely to cause extreme allergic reactions (i.e. giant hogweed); and the presence of the stand and its associated plant species positively correlates with the prevalence of insect-borne diseases (i.e. Japanese barberry, multi-flora rose).⁷ Priority is given to those projects that pose the greatest risk to human health and are the most public facing. This category accounts for 5 percent of a stand's ISPS.

Scoring:

- 4) Infestations that occur in or near high priority trails and/or high-use recreational areas and are likely to pose a significant risk to human health.
- 3) Infestations that occur in or near medium or low priority trails and are likely to pose a significant risk to human health.
- 2) Infestations that occur in or near high priority trails and/or high-use recreational areas but are unlikely to pose a significant risk to human health.
- 1) Infestations that occur in or near medium or low priority trails and are unlikely to pose a significant risk to human health.

Category 5: Control and Restoration Feasibility (20% of ISPS)

This category assesses the feasibility of successfully completing management objectives to control an invasive plant stand and the relative ease by which native plant species can be reestablished in the area. Priority is given to those stands that can be initially controlled effectively and efficiently and require minimal follow-up effort to ensure a successful re-establishment of native dominance. This category accounts for 20 percent of a stand's ISPS.

Scoring:

- 4) Stands likely to be eradicated with available technology and resources and which desirable native species will replace with little further input.
- 3) Stands likely to be controlled but will not be replaced by desirable natives without an active restoration program requiring substantial resources.
- 2) Stands that are difficult to control with available technology and resources and/or whose control will likely result in substantial damage to other, desirable species.
- 1) Species and/or stands unlikely to be controlled with available technology and resources.

⁷ See *The Barberry-Lyme Disease Connection* for additional information on the connection between barberry and human health (Pettinelli, D.).

Category 6: Management Investment (5% of ISPS)

Scoring:

This category assesses resources already invested and planning implemented for management of invasive plant stands. Priority is given to stands that have been actively managed and require continued stewardship for long-term strategy success. This category accounts for 5 percent of a stand's ISPS.

- 4) Stands that are presently receiving targeted management, require follow up treatments, and are subject to open permits.
- 3) Stands that are presently receiving targeted management, require follow up treatments, and are not subject to external oversight.
- 2) Stands that have been prioritized by conservation professionals and planning is underway for targeted management.
- 1) Stands that have been managed in the past and may require follow up treatments.

Invasive Stand Priority Score (ISPS) Formula

Below is the formula used to determine the Invasive Stand Priority Score (ISPS) for each mapped stand. For reference, the Python 3 script for ArcGIS Pro Field Calculator is also provided.

Invasive Stand Priority Score =

$$\begin{aligned}
 &0.20 \text{ (Category 1: Invasiveness Potential)} \\
 &+ 0.20 \text{ (Category 2: Extent and Scope of Stand)} \\
 &+ 0.30 \text{ (Category 3: Environmental and Natural Resource Considerations)} \\
 &+ 0.05 \text{ (Category 4: Public and Human Health Considerations)} \\
 &+ 0.20 \text{ (Category 5: Control and Restoration Feasibility)} \\
 &+ 0.05 \text{ (Category 6: Management Investment)}
 \end{aligned}$$

ArcGIS Field Calculator Python 3 Script:

$$ISPS = (!Cat_1! * .2) + (!Cat_2! * .2) + (!Cat_3! * .3) + (!Cat_4! * .05) + (!Cat_5! * .2) + (!Cat_6! * .05)$$

Objective Two:

Catalog invasive management efforts from 2012 to the present.

To accurately determine future ISPS values, invasive plant management initiatives from 2012 to the present have been catalogued within Appendix A: Invasive Stand Management Cards. Only efforts in the last ten years were cataloged since these initiatives have the greatest impact on current management practices and protocols. This catalog will be updated annually, incorporating pertinent management efforts from the previous year's efforts.

Significantly, SRA has conducted landscape-level initiatives to control invasive pests, particularly hemlock woolly adelgid, throughout the preserves. These efforts are documented in the relevant nature preserve's management plan.

Objective Three:

Determine best management practices for control of individual invasive species known to be pervasive within the preserves.

SRA has conducted a comprehensive review of current invasive plant publications from various state and federal agencies and non-profit organizations. The results of this review are available in Appendix B: Review of Best Management Practices, which includes links to select publications, outlines control measures, and provides a calendar for management of invasive plant species known to be pervasive within the preserves. As new research becomes available and new species detected, this table will be promptly updated with supplemental information.

Objective Four:

Identify a management objective for each priority invasive plant stand, establish a five-year schedule for management actions, and identify resources required to implement said schedule.

Each invasive stand with an ISPS over 2.80 has been designated as a priority plant stand and incorporated within a comprehensive five-year management schedule. For each stand meeting this criterion, a management objective has been defined. The purpose of these objectives is to clearly define the intended outcome for each invasive stand, setting goals that are specific, measurable, achievable, results-oriented, and time-bound (i.e. S.M.A.R.T). In total, SRA considers four potential management objectives for each detected invasive stand, as defined below.⁸

Eradication: Eradication entails the complete removal of a given species from a target area. In general, eradication is most practical and desirable when a stand is small, more resources are available for control, and/or the target species is newly introduced and not yet endemic in the surrounding landscape. Although initially labor and resource intensive, eradication minimizes ongoing inputs, and so may be more cost-effective for long-term management.

Containment: Containment is any action to control a plant species or prevent its establishment within a pre-defined zone of exclusion. Containment is most practical when there are definable boundaries for exclusion, when a species is endemic across a large tract of land and thus difficult to eradicate, and where limited resources are in place for immediate eradication efforts. A containment zone should always be clearly defined when containment is listed as an objective. The containment zone should take into consideration the range of seed dispersal for the particular invasive species within the target area, as well as other considerations, including nearby habitat types, recreational uses, and property boundaries. While initially less labor and resource intensive than eradication, containment in and of itself requires perpetual management and monitoring of a stand, greatly increasing long-term resource investment. Containment can also be used as a temporary management technique, arresting the expansion of an invasive stand until resources become available for eradication.

Suppression: Suppression is any activity to reduce the abundance or reproductive potential of a stand outside of a pre-defined containment zone. Typically, suppression is listed as an objective alongside containment, as suppressing the uncontained invasive plant population minimizes seed production and so limits the ability of the stand to continue spreading within the containment zone.

⁸ SRA's management objectives and goals are derived from the *Land Manager's Guide to Developing an Invasive Plant Management Plan* (U.S. Fish and Wildlife Service, 2018).

Asset-Based Protection: Asset-based protection is a more limited practice, specifically focused on controlling invasive plant infestations that threaten high-value assets, such as rare habitat types, endangered species, and cultural or recreational resources. Asset-based protection is commonly utilized when an invasive stand is widespread with limited practicality of eradication and when there is a nearby resource worthy of conservation. Like containment, asset-based protection requires continual upkeep and labor/cost inputs.

Identified management objectives for each invasive stand with an ISPS over 2.80, as well as the associated strategies, estimated capital expenditures and labor hours required to attain them, are listed in Appendix A: Invasive Stand Management Cards, alongside relevant maps to provide reference for the objectives and clearly define the target areas. Appendix C: Compiled Tables of Estimated Costs and Labor Hours details the totality of expected resources required over the five-year period to meet these management objectives. On an annual basis, staff will assess total actual resources (capital expenditures and staff hours) against the expected resource allocation provided in the table. Strategies, timelines, and objectives for each stand may be adjusted if actual resource needs greatly exceed or fall short of the expected total. Additionally, adjustments may also be made as new stands are detected and incorporated within this Plan. Inventorying annual resource expenditure as well as protocols for documenting and developing management objectives for newly detected stands are further described in Objective Five.

It is important to note that in determining management objectives and timelines, both for existing invasive stands and future ones, ISPS values should be used as instructive guides rather than definitive ranks. ISPS values enable staff to quickly determine and highlight priority areas, but they may not capture all the nuances of a particular situation and should not be the sole basis for determining management timelines nor objectives. Staff and volunteer knowledge of a particular stand should always supplement the ISPS when defining these variables. Additionally, unintended negative impacts to rare and threatened native flora and fauna because of invasive control efforts should be thoroughly considered before defining a management objective for a stand.⁹

Objective Five:

Develop and implement a monitoring regime to document invasive plant stand condition, assess effectiveness of management efforts, and detect early colonization of new species.

Consistent, replicable monitoring is a critical component of any successful invasive management initiative, allowing not only for analysis of ongoing management efforts but also detection of potential new threats in the landscape, including stand expansions, new establishments, and/or new species. Efforts to prevent establishment or minimize dissemination are typically the most cost-effective method of controlling invasive spread. Accordingly, SRA will invest tremendous volunteer and staff resources in establishing and maintaining a monitoring regime, as described in detail below.

To establish an effective monitoring program across SRA's 2,800 acres of owned lands, community participation is vital. Community-based monitoring immensely expands capability, exponentially increasing the number of eyes and ears throughout the preserves and so increasing the likelihood that new or emerging threats will be promptly detected. Of course, by incorporating and educating the community

⁹ For a more thorough discussion on the complex interactions between invasive plant species and native fauna, see the article "Towards Consensus-Based Actions that Balance Invasive Plant Management and At-Risk Fauna" (Litvaitis et al., 2013).

in this effort, SRA also hopes that invasive control initiatives will expand beyond the boundaries of our preserves and into adjoining properties, both publicly and privately owned.

To this end, SRA plans to incorporate more detailed trainings on invasive species within existing volunteer networks and programs. Volunteer Trail Managers will be trained in the use of EDDMapS, a geo-based mobile application that crowdsources data on invasive plants, insects, plant diseases, and wildlife.¹⁰ An overview of this application and its features is provided in Appendix D: How to Use EDDMapS Smartphone App. Volunteer Nature Preserve Monitors will likewise be encouraged to use this application when monitoring SRA's nature preserves. Together, these two programs account for over 50 volunteers, who will serve as the primary means of detecting new stands and species within the preserves. When a new invasive plant stand is discovered, SRA staff will promptly assess the stand against its priority criteria, as defined in Objective One. For any stand with an ISPS higher than 2.80, a management objective and associated strategies and costs will be defined. If a new species is detected that is known to be invasive and not yet present within the preserves, SRA will undertake an immediate effort to control and/or further assess the situation.

A separate group of volunteers will be recruited to revisit existing invasive plant stands on a regular basis, recording changes in density, distribution, and other relevant information. This volunteer Invasive Task Force will be trained in EDDMapS Pro, a derivative of the previously explained mobile application designed for professional use. Within EDDMapS Pro, photo projects will be set up for each invasive plant stand under an active management regime; volunteers will be asked to record photos at designated stations monthly to document effectiveness of management efforts over time. This volunteer group will also be trained in non-herbicidal management strategies and asked to remove small invasive plant satellite populations in non-regulated areas when possible.

Finally, SRA staff and volunteers will document all management activities using Survey 123, a mobile application powered by ESRI GIS software. Within the application, individuals will record control measures initiated within the stand, date of treatment, treated acreage, labor hours, as well as pertinent information for herbicide application, including application rates, herbicide type, and delivery method. A preview of this survey is available at [Invasive Plant Management Record Survey](#). This information, combined with other relevant data, will inform future management efforts, and enable staff to better understand resource inputs required for long-term success.

Objective Six:

Catalog internal policies and initiatives that prevent the spread of invasive species, increase public awareness, promote collaborative management efforts, and define recommendations for improvement.

To this point, the Plan has primarily focused on *reactive* measures to invasive threats; of equal importance, however, are *proactive* strategies to minimize the risk of introduction and colonization of new species. SRA groups these proactive, preventative strategies into three categories: Internal Policy Initiatives; Educational Outreach; and Collaborative Efforts. Existing preventative strategies are categorized below, listed along with recommendations for improvement.

¹⁰ Appendix D: How to Use EDDMapS Smartphone App is freely available on the EDDMapS website. EDDMapS also provides additional training materials, maps, and other resources (University of Georgia, 2022).

Spread Prevention

Existing

Prohibition on Imported Firewood: To limit the introduction of materials hosting non-native pests, SRA maintains a prohibition on imported firewood within the Preserves. SRA provides firewood for campers, and staff source that firewood from within the Town of Washington.

Clean Equipment: All equipment contaminated or potentially contaminated with invasive material is thoroughly cleaned prior to use outside of the contaminated work zone. All contractors are informed of this policy and requested to sanitize their equipment of contaminated materials prior to staging within the preserves.

Landscaping: No invasive or potentially invasive plant species is intentionally planted within the preserves and associated conservation gardens.

Visitor Rules: To limit invasive seed spread and minimize disturbance of native plant communities, all visitors are required to stay on-trail, leash their pets, and refrain from removing any debris or materials from the preserves.

Potential for Improvement

Visitor Rules: Fishing, boating, and hiking rules should include cleaning of equipment and apparel prior to arrival. Additionally, limiting the use of bait for fishing may be examined.

Educational Outreach

Existing

Invasive Plant Community Events: SRA has hosted numerous community events to educate the public on the identification, management, and environmental implications of invasive plant species. Typically, these events are held annually.

Communication of Invasive Management: SRA makes an active effort to share invasive management efforts with the public through social media posts, annual reports, electronic newsletters, website postings, and informal conversations. By disseminating information on our efforts, SRA garners increased support, shares the value of these programs, and encourages increased participation in management outside the physical boundaries of the preserves.

Potential for Improvement

Outreach to New Groups: SRA may hold invasive management discussions with other organizations, including the Town of Washington, the Garden Club, school groups, and other interested parties.

Management Case Studies: Completed projects serve as an engaging topic for outdoor programming, educating community members on management options and SRA's ongoing efforts.

Invasive Spotlight Videos: To reach a broader audience, SRA staff will create short, educational videos highlighting invasive plant species and distributing those videos through social media and our website.

Improved Communication: SRA will continue its effort to share updates on its invasive management

efforts with visitors and supporters through social media posts, electronic newsletters, and annual reports. New delivery methods, such as Story Maps, wayside exhibits, and videos, should be explored for future content distribution.

Collaborative Efforts

Existing

Town of Washington: SRA staff have developed ongoing relationships with Town of Washington staff, as well as with members of the Planning Commission, Sustainability Commission, Zoning Commission, and Conservation Commission. SRA will continue to share its efforts with Town officials and support a collaborative effort to manage invasives throughout the Town.

Washington Rod and Gun Club: SRA works with members of the Washington Rod and Gun Club to suppress stands of Japanese Knotweed along the Shepaug River.

Nature Preserve Neighbors: SRA works with adjoining property owners of our nature preserves to manage stands that exceed the boundaries of our preserves.

Eversource: SRA has developed an ongoing relationship with Eversource staff to ensure that the powerline corridor vegetation management and structure replacement activities minimize the risk of invasive establishment and spread.

Potential for Improvement

Regional Conservation Partners: SRA can have a broad regional impact by disseminating this Plan widely and collaborating with conservation organizations in neighboring towns, aligning management objectives and sharing resources where feasible.

CIPWG: SRA will develop a closer working relationship with members of the Connecticut Invasive Plant Working Group (CIPWG), North American Invasive Species Management Association (NAISMA), and New York Invasive Species Information Clearinghouse (NYIS.Info), ensuring that SRA staff stay apprised of the most up-to-date scientific information and potential grant funding opportunities.

New Species Monitoring: SRA will identify regional monitoring initiatives and contribute to the extent possible through research and sampling efforts in the preserves.

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Invasive Plant Stand #46

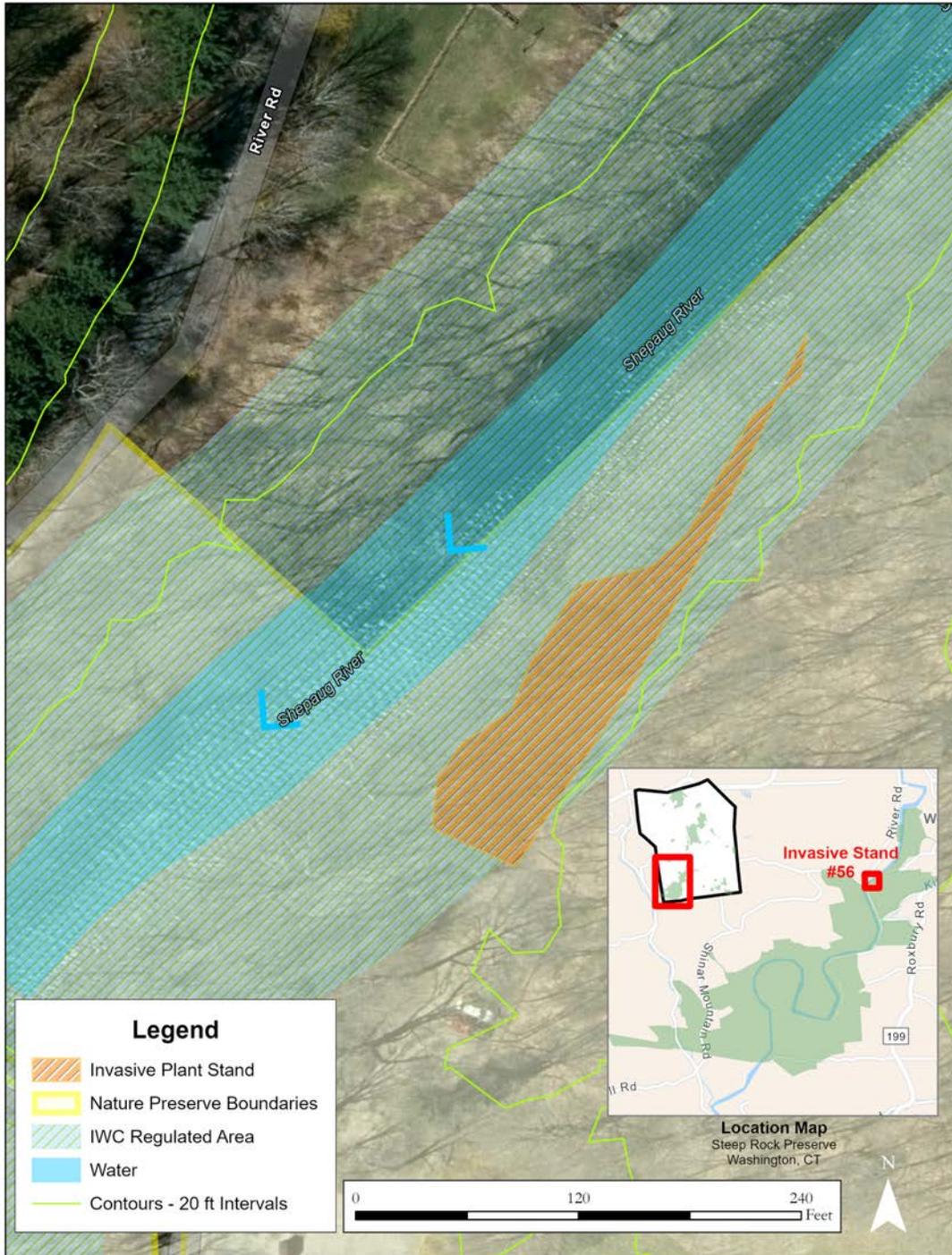
Steep Rock Preserve (61 Barnes Road, Washington, CT)
 Management Unit 3 (Steep Rock Forest, Northeast)

Species: Japanese Barberry
Stewardship Committee Approved June 2022

Density: High

Acreage: 0.5 acres

Invasive Stand Priority Score (ISPS): 3.55



Management Summary

Timeframe: 2020 - 2023

Objective: Eradication by 2023

Management History: (2020 – Present) This stand has been actively managed through hand-pulling and mechanical control.

Strategy: Control is primarily achieved by hand-pulling. Generated debris is left on site. Management efforts are conducted between April and July of each year, prior to seed production.

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Estimated Staff Time (hours)	4	4	0	0	0

Permits: Active permits are open for management efforts. See #IW-20-02, which expires February 12, 2025.

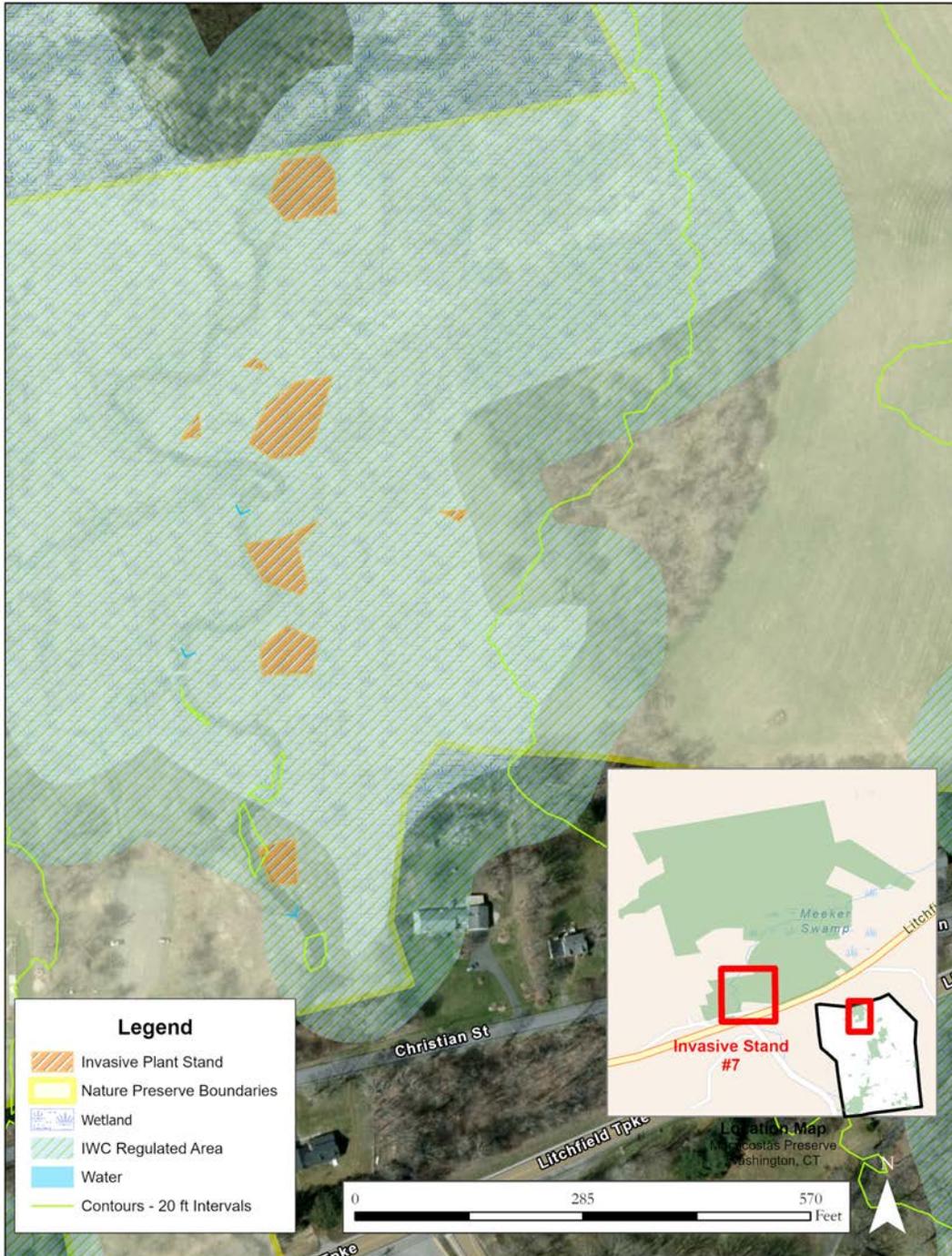


Invasive Plant Stand #7

Macricostas Preserve (124 Christian St., New Preston, CT)
 Management Unit 23 (Macicostas Meadows)

Species: Reed Canary Grass/Purple Loosestrife
Stewardship Committee Approved June 2022
Density: High
Acres: 0.5 acres

Invasive Stand Priority Score (ISPS): 3.36



Management Summary

Timeframe: 2019 - 2024

Objective: Eradication by 2024

Management History: (2019 – Present) Foliar spray applications have been conducted on an annual basis. All Habitat was contracted to perform foliar spray applications in 2019 and again in 2021. Staff performed foliar applications in 2020.

Strategy: Staff will continue to perform foliar spray applications on an annual basis.

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Estimated Staff Time (hours)	30	24	24	TBD	TBD

Permits: Active permits are open for management efforts. See #IW-19-13, which expires April 10, 2022.

Invasive Plant Stand #3

Macricostas Preserve (124 Christian St., New Preston, CT)
 Management Unit 18 and 21 (Macricostas Forest, East and Meeker Swamp)

Species: Mixed Woody (Japanese Barberry, Winged Euonymus, Oriental Bittersweet, Multiflora Rose)
Stewardship Committee Approved June 2022
Density: Medium to High
Acreage: 41 acres

Invasive Stand Priority Score (ISPS): 3.2

Management Summary

Timeframe: 2016 - 2026

Objective: Eradication by 2026

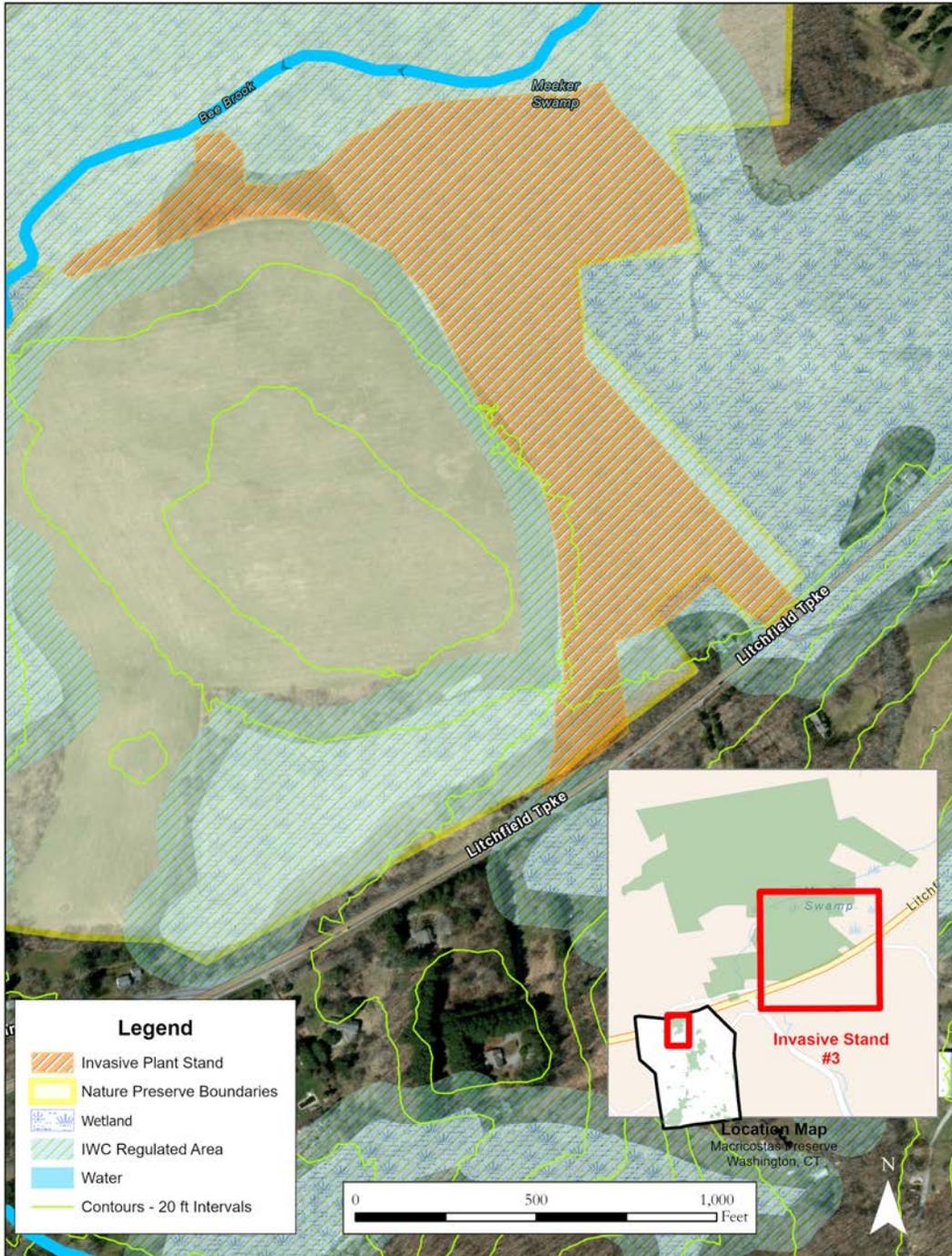
Management History: (2016 – Present) In 2014, SRA was awarded an NRCS-EQIP grant to manage woody brush, particularly invasive species, within the target area. In 2016, cut stump treatments were performed in multiple stands. Mechanical treatments (i.e. cutting with chainsaws and forestry mulcher) were conducted in the winter of 2018/2019, with follow-up foliar herbicide and targeted burning applications to treat re-growth in August and September of 2019. In October 2021, SRA staff performed a cut stump herbicide application across the target area.

Strategy: Annual treatment of regrowth (via cut stump, burning, and foliar spray applications) are necessary to limit infestation reestablishment and control the seedbank.

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Estimated Staff Time (hours)	20	16	16	8	8

Permits: Active permits are open for management efforts. See #IW-18-36, which expires August 22, 2023.

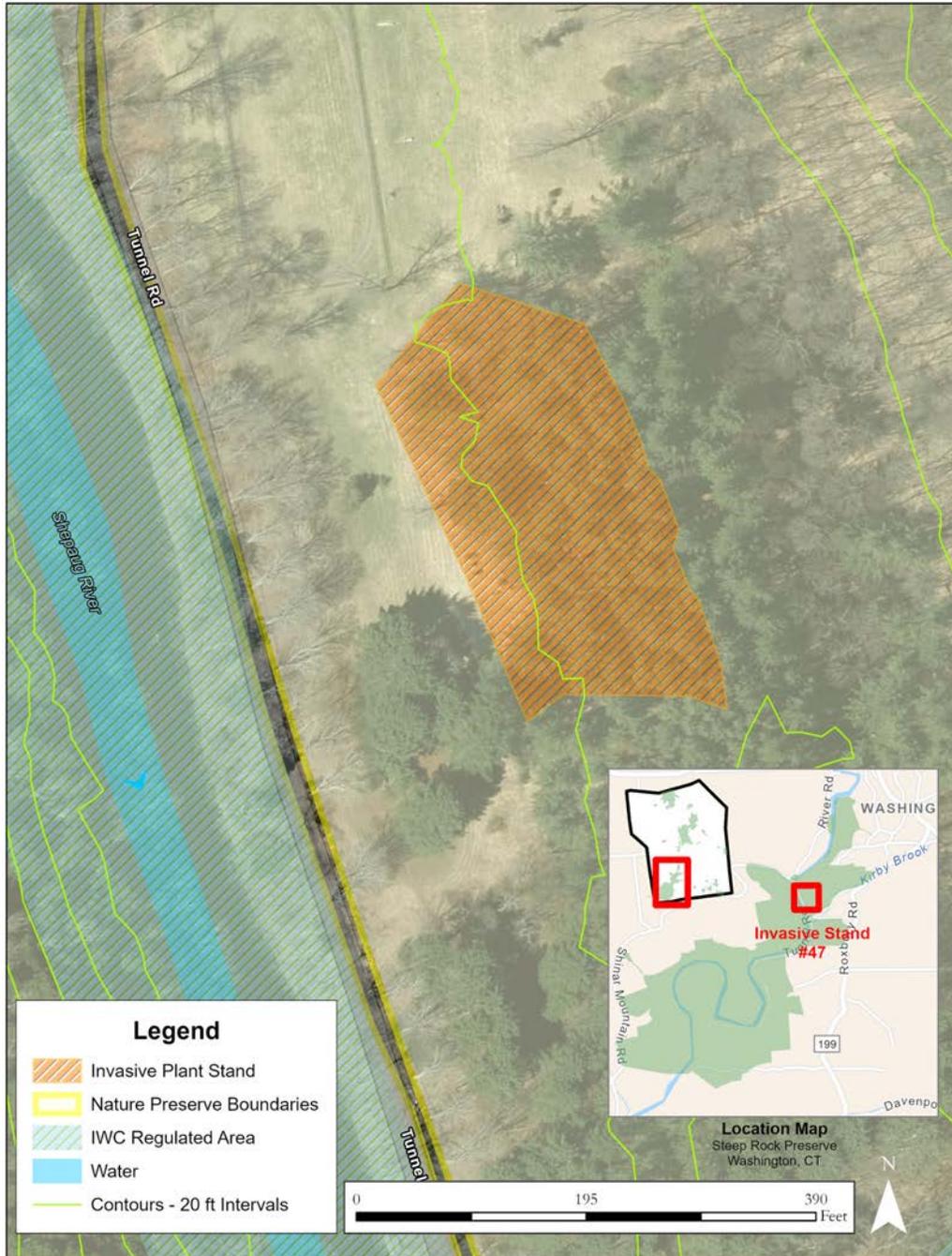


Invasive Plant Stand #47

Steep Rock Preserve (2 Tunnel Rd. Washington, CT)
 Management Unit 3 and 9 (Steep Rock Forest, Northeast and Fields)

Species: Japanese Barberry
Stewardship Committee Approved June 2022
Density: High
Acreage: 2.5 acres

Invasive Stand Priority Score (ISPS): 3.1



Management Summary

Timeframe: 2022-2025

Objective: Eradication by 2025

Management History: N/A

Strategy: Volunteers and staff will hand pull invasive plants within the target area, beginning in the transition zone between the field and coniferous forest (i.e. the western and northern extents of the stand). Once invasive pressure is reduced in the transition zone, efforts will focus on the remaining perimeter of the stand, hand pulling plants along the eastern and southern boundaries and so minimizing the extent and spread of the stand.

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Estimated Staff Time (hours)	8	8	8	4	4

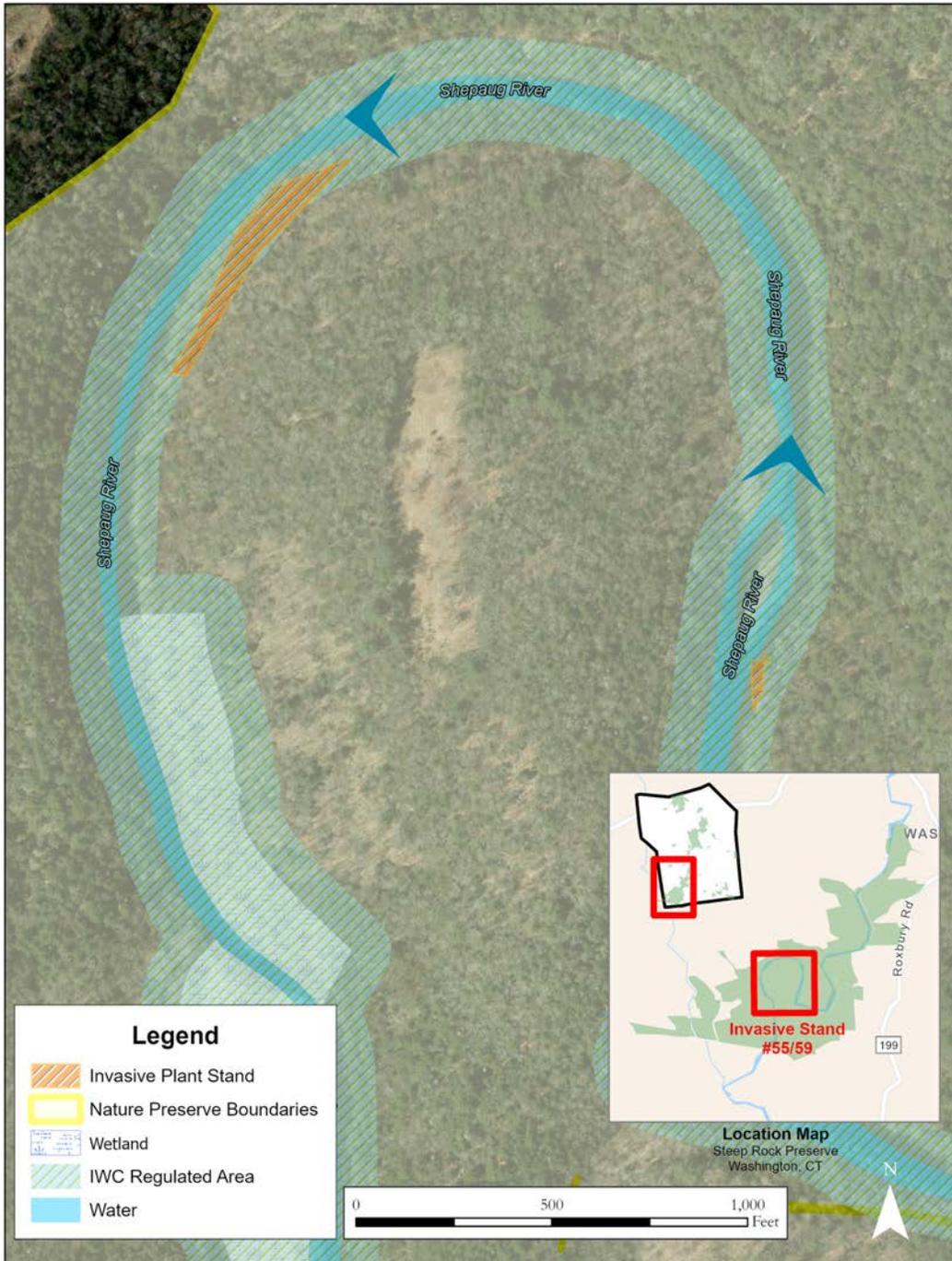
Permits: No permits are required.

Invasive Plant Stand #55/59

Steep Rock Preserve (2 Tunnel Rd. Washington, CT)
Management Unit 2 (Steep Rock Forest, Southeast)

Species: Japanese Knotweed
Density: Variable
Acres: 1.7 acres (currently mapped)

Invasive Stand Priority Score (ISPS): 3.1



Management Summary

Timeframe: 2022 - TBD

Objective: Survey and Define Management Objective in 2022

Management History: N/A

Strategy: The currently mapped stands of Japanese Knotweed along the Shepaug River represent only a small sample of the overall infestation. In the summer of 2022, the remaining stands will be mapped and incorporated within this management card. Once the extent and density of the stands are better understood, a management objective and corresponding strategy will be defined for 2023 and beyond.

Costs and Labor Estimates: TBD

Permits: IWC permits will be required.

Invasive Plant Stand #51

Steep Rock Preserve (185 Tunnel Rd. Washington, CT)
Management Unit 4 (Steep Rock Forest, Northwest)

Species: Mixed Woody (Honeysuckle, Japanese Barberry)
Density: Low to Medium
Acres: 2.1 acres

Invasive Stand Priority Score (ISPS): 3.06

Management Summary

Timeframe: 2022 - 2026

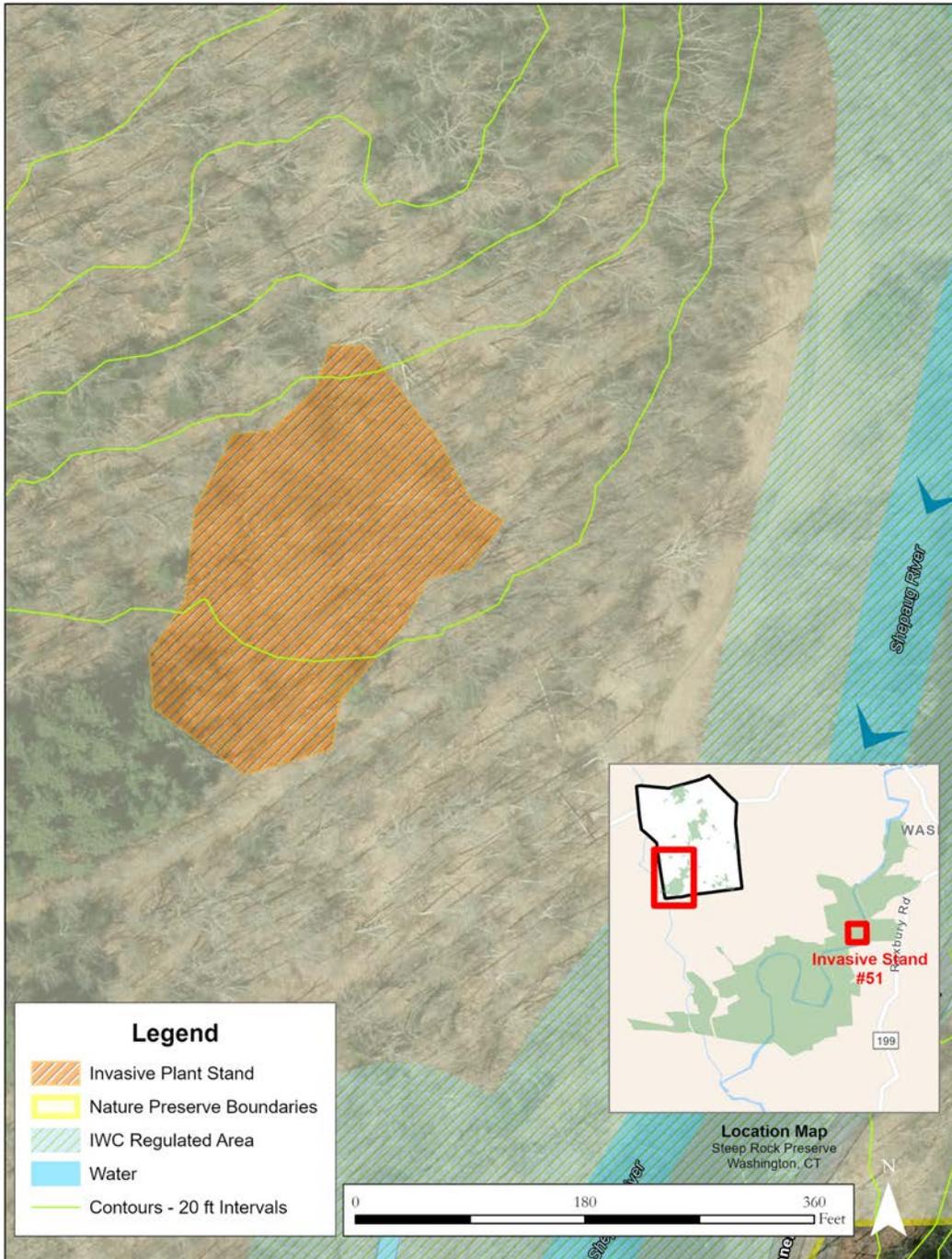
Objective: Eradication by 2026 (Funding dependent)

Management History: N/A

Strategy: Assess stand and hire a contractor to perform a mechanical and/or mixed mechanical-chemical treatment of the entire stand. Site conditions need to be better understood to further refine the strategy. Treatment of this stand is dependent on external funding.

Costs and Labor Estimates: TBD

Permits: No permits are required

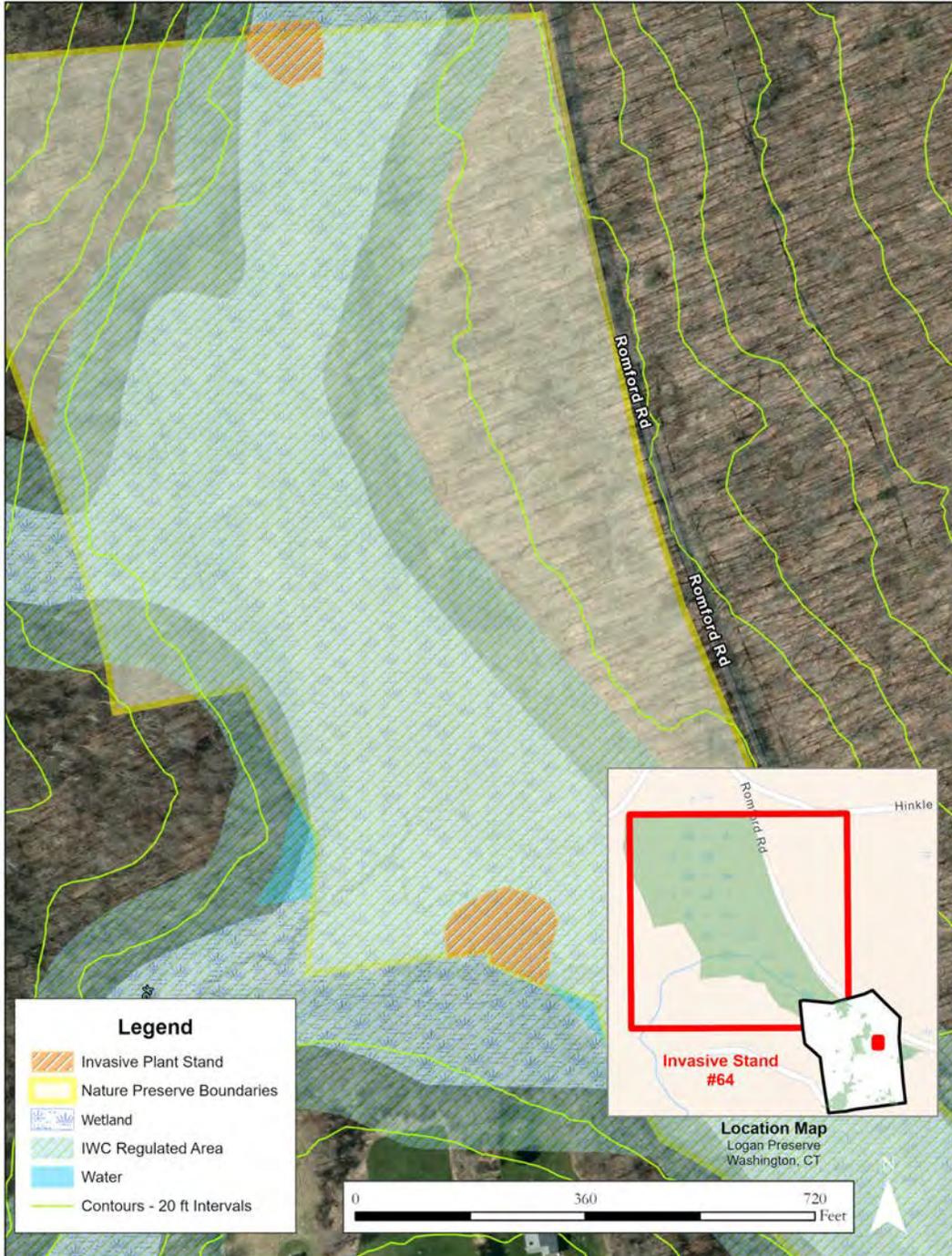


Invasive Plant Stand #64

Logan Preserve (55 Romford Rd. Washington, CT)
Management Unit 35 (Logan)

Species: Phragmites
Stewardship Committee Approved June 2022
Density: High
Acres: 0.63 acres

Invasive Stand Priority Score (ISPS): 2.95



Management Summary

Timeframe: 2023 - 2026

Objective: Eradication by 2026

Management History: N/A

Strategy: Eradicate existing stands by 2026, contracting with All Habitat to initiate a mowing and foliar herbicide application. Additional unmapped stands should be surveyed and incorporated within the map. Beginning in 2023 or earlier, initiate conversations with neighbor on the northern extent of the Preserve, requesting permission to treat invasive stand where it crosses the property boundary.

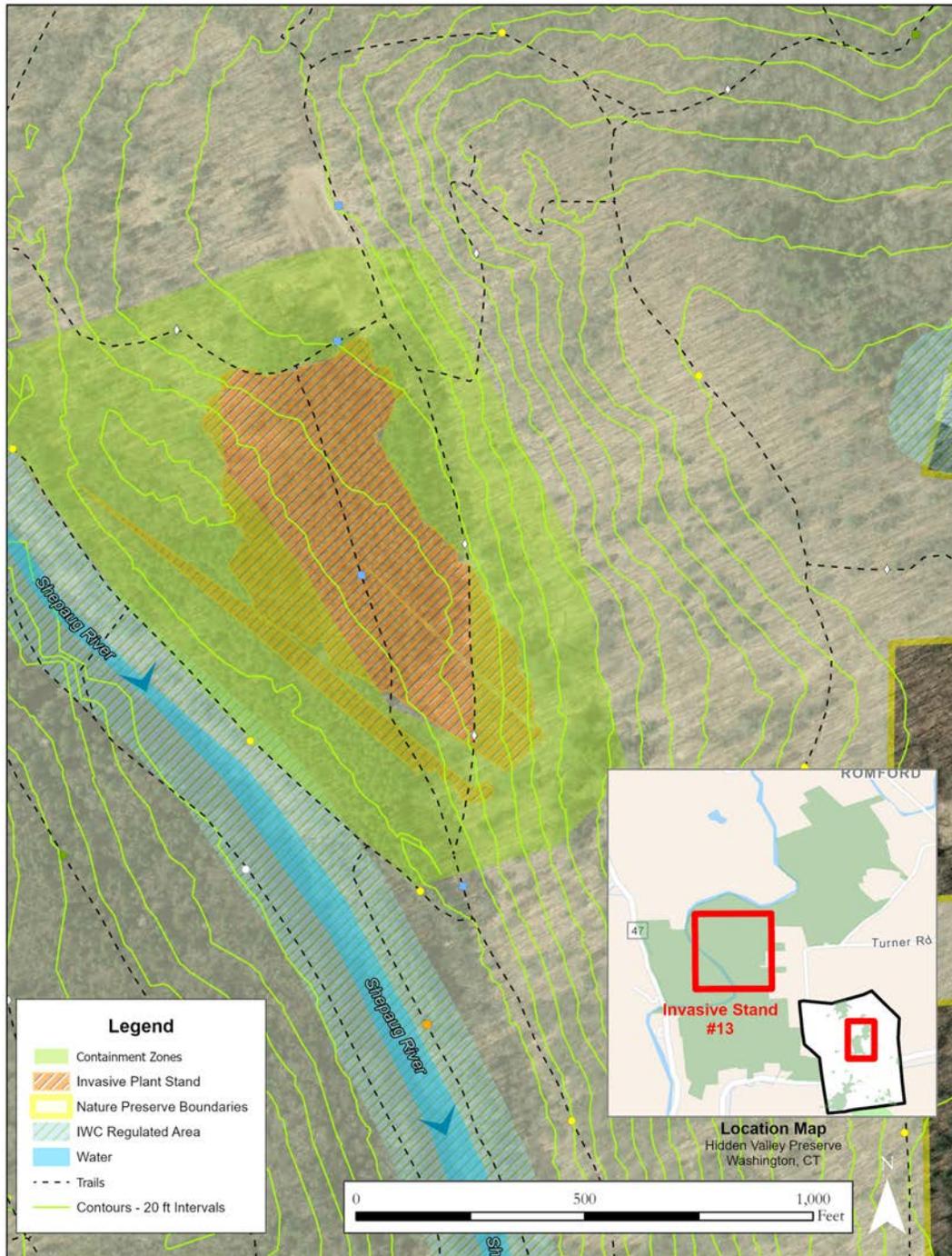
Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ 2,000.00	\$ 1,000.00	\$ 1,000.00
Estimated Staff Time (hours)	0	16	8	8	8

Permits: IWC permits are required; DEEP permits may also be required.

Invasive Plant Stand #13

Hidden Valley Preserve (147 Sabbaday Ln. Washington, CT)
 Management Unit 11 (Hidden Valley Forest, East)



Species: Mixed Woody (Japanese Barberry, Winged Euonymus)/Garlic Mustard
Stewardship Committee Approved June 2022
Density: Variable
Acreage: 15.25 acres

Invasive Stand Priority Score (ISPS): 2.94

Management Summary

Timeframe: 2024-2026

Objective: Eradication within Containment Zone by 2025
 Suppression of Remaining Stand by 10% by 2026

Management History: N/A

Strategy: A combination of hand pulling and cut stump treatments will be used within the containment zone to push back the stand and remove species presence. Trail systems within the area will act as natural barriers to minimize continued spread. Infestation levels not within the containment zone will be suppressed by 10 percent to limit seed spread through a combination of cutting, hand pulling, and chemical applications. Management efforts will be closely monitored to assess viability for future eradication.

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Estimated Staff Time (hours)	0	0	40	32	24

Permits: A small, unnamed brook passes near the stand. The brook will be mapped and incorporated into this card to determine the need for IWC permits.

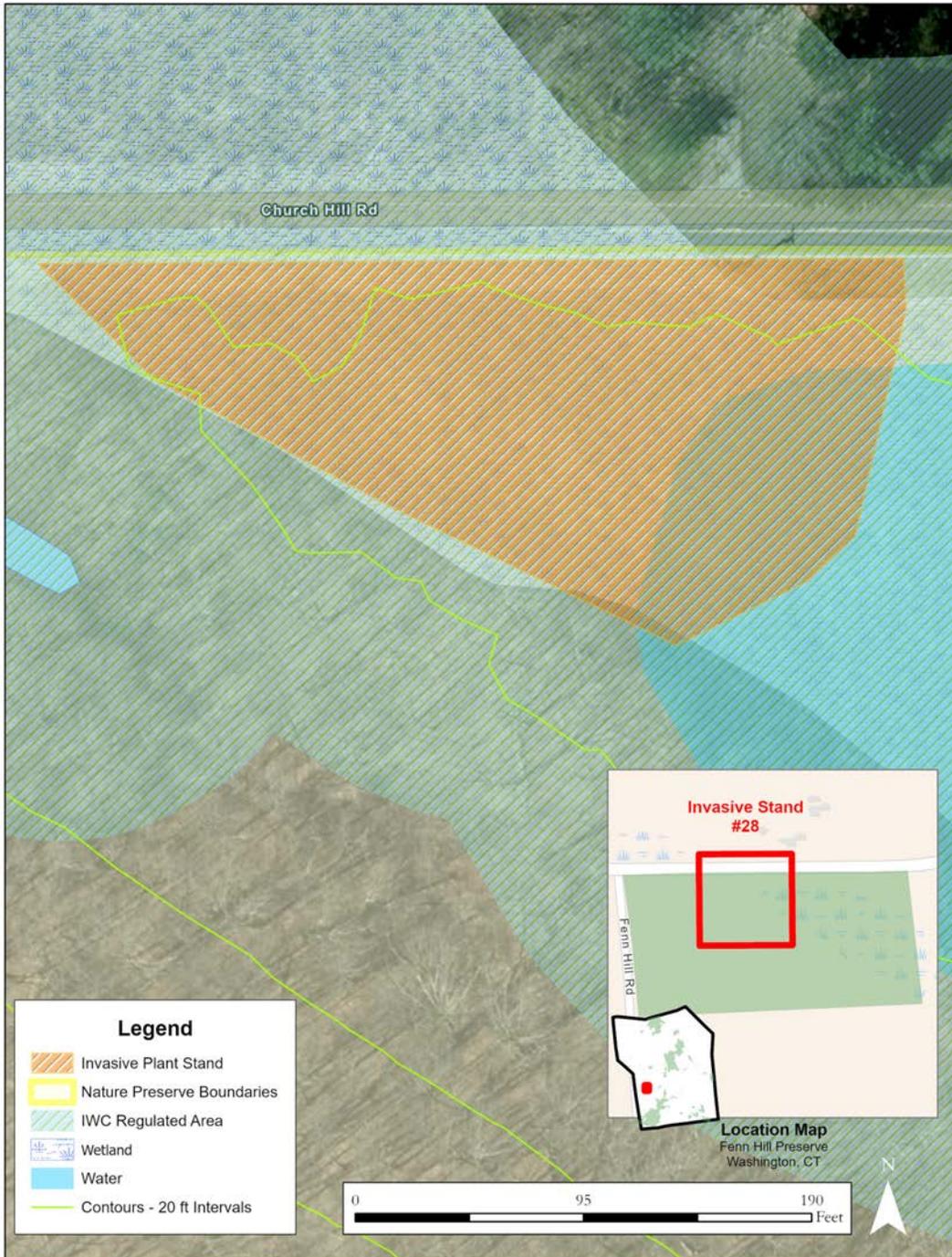


Invasive Plant Stand #28

Fenn Hill Preserve (149 Church Hill Rd. Washington, CT)
 Management Unit 32 (Fenn Hill)

Species: Phragmites
 Stewardship Committee Approved June 2022
Density: High
Acres: 0.83 acres

Invasive Stand Priority Score (ISPS): 2.9



Management Summary

Timeframe: 2022 - 2026

Objective: Eradication by 2026

Management History: All Habitat has been contracted to perform a cutting and two foliar spray applications in 2022.

Strategy: Three consecutive years of foliar spray applications is anticipated. The target area stand's extension across Route 109 and located on private property.

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$2,000.00	\$2,000.00	\$2,000.00	\$ -	\$ -
Estimated Staff Time (hours)	30	24	24	TBD	TBD

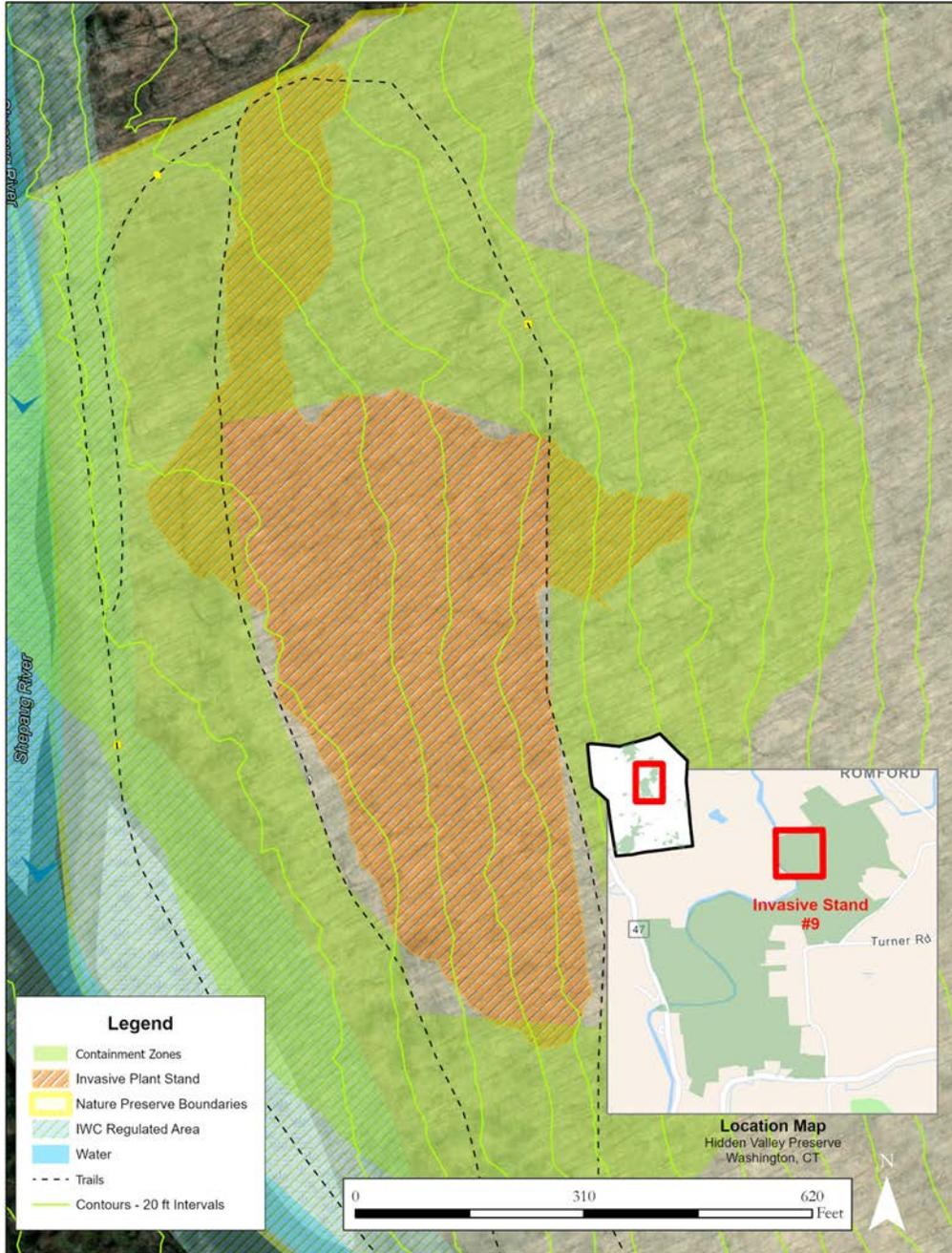
Permits: Active permits are open for management efforts. See #IW-21-62, which expires December 8, 2026. DEEP permit application submitted February 4, 2022.

Invasive Plant Stand #9

Hidden Valley Preserve (147 Sabbaday Ln. Washington, CT)
 Management Unit 13 (Hidden Valley Forest, North)

Species: Japanese Barberry
 Stewardship Committee Approved June 2022
Density: Low to Medium
Acres: 5.34 acres

Invasive Stand Priority Score (ISPS): 2.89



Management Summary

Timeframe: 2024 - 2026

Objective: Eradication within Containment Zone by 2026
 Suppression of Remaining Stand by 25% by 2026

Management History: N/A

Strategy: A combination of hand pulling and cut stump treatments will be used within the containment zone to push back the stand and remove species presence. Trail systems within the area will act as natural barriers to minimize continued spread. Infestation levels not within the containment zone will be suppressed by 25 percent to limit seed spread through a combination of cutting, hand pulling, and chemical applications. Management efforts will be closely monitored to assess viability for future eradication.

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Estimated Staff Time (hours)	0	24	24	24	24

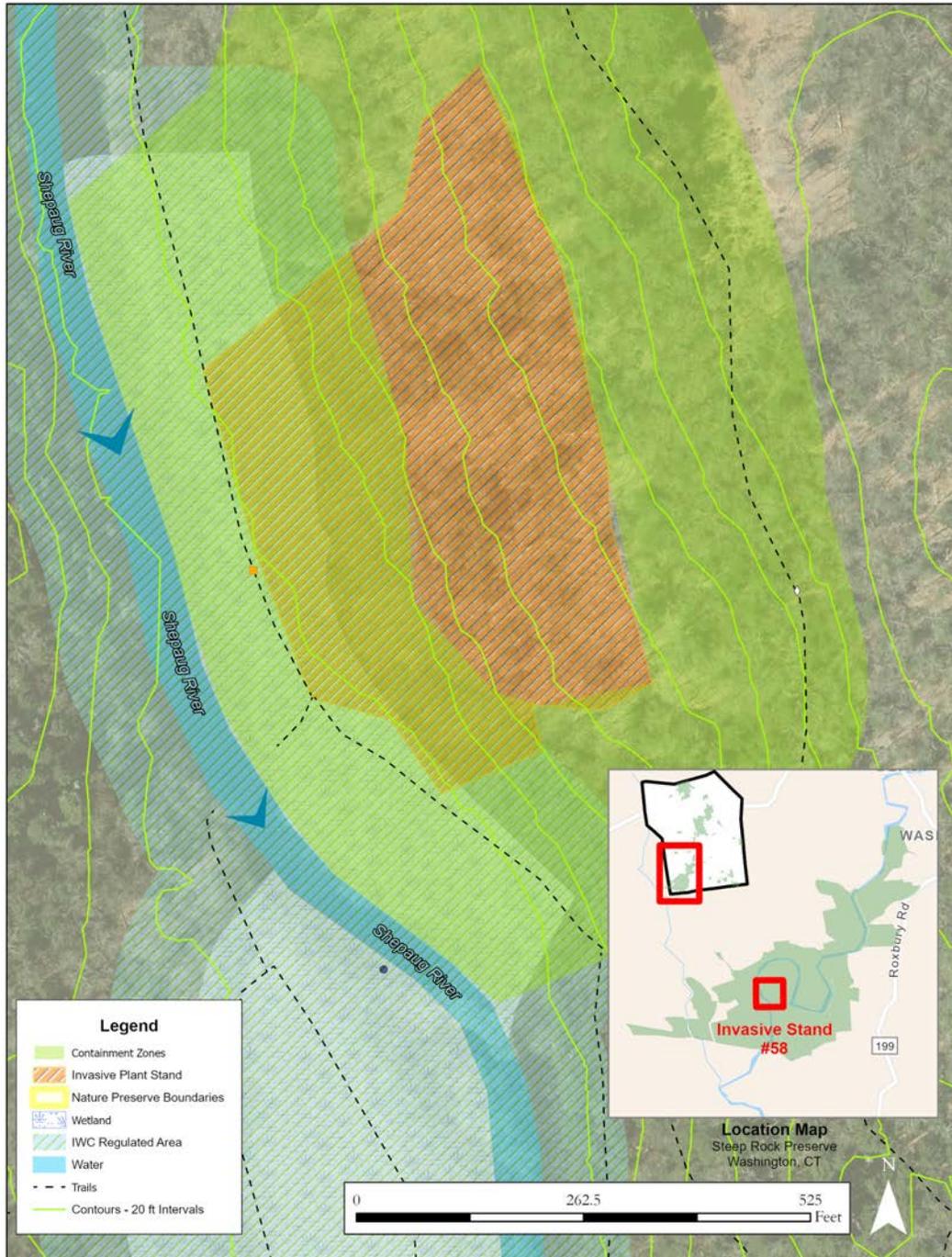
Permits: Depending on extent of spread within the containment zone, IWC permits may be required.

Invasive Plant Stand #58

Steep Rock Preserve (185 Tunnel Rd. Washington, CT)
 Management Unit 2 (Steep Rock Forest, Southeast)

Species: Japanese Barberry
Stewardship Committee Approved June 2022
Density: High
Acres: 4.6 acres

Invasive Stand Priority Score (ISPS): 2.89



Management Summary

Timeframe: 2026 - TBD

Objective: Initiate Eradication within Containment Zone by 2026

Management History: N/A

Strategy: Using cut stump treatment and hand pulling, eradicate the infestation within 100 feet of the floodplain forest (i.e. within the Containment Zone). In 2026, success of containment efforts will be assessed, and a broader objective for the stand identified.

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Estimated Staff Time (hours)	0	0	0	0	40

Permits: IWC permits are required.

Invasive Plant Stand #61

Steep Rock Preserve (83 Shinar Mountain Rd. Washington, CT)
Management Unit 1 and 9 (Steep Rock Forest, Southwest and Fields)

Species: Mixed Woody (Japanese Barberry, Oriental Bittersweet, Winged Euonymus, Autumn Olive)
Density: High
Acreage: 3.4 acres

Invasive Stand Priority Score (ISPS): 2.89

Management Summary

Timeframe: TBD

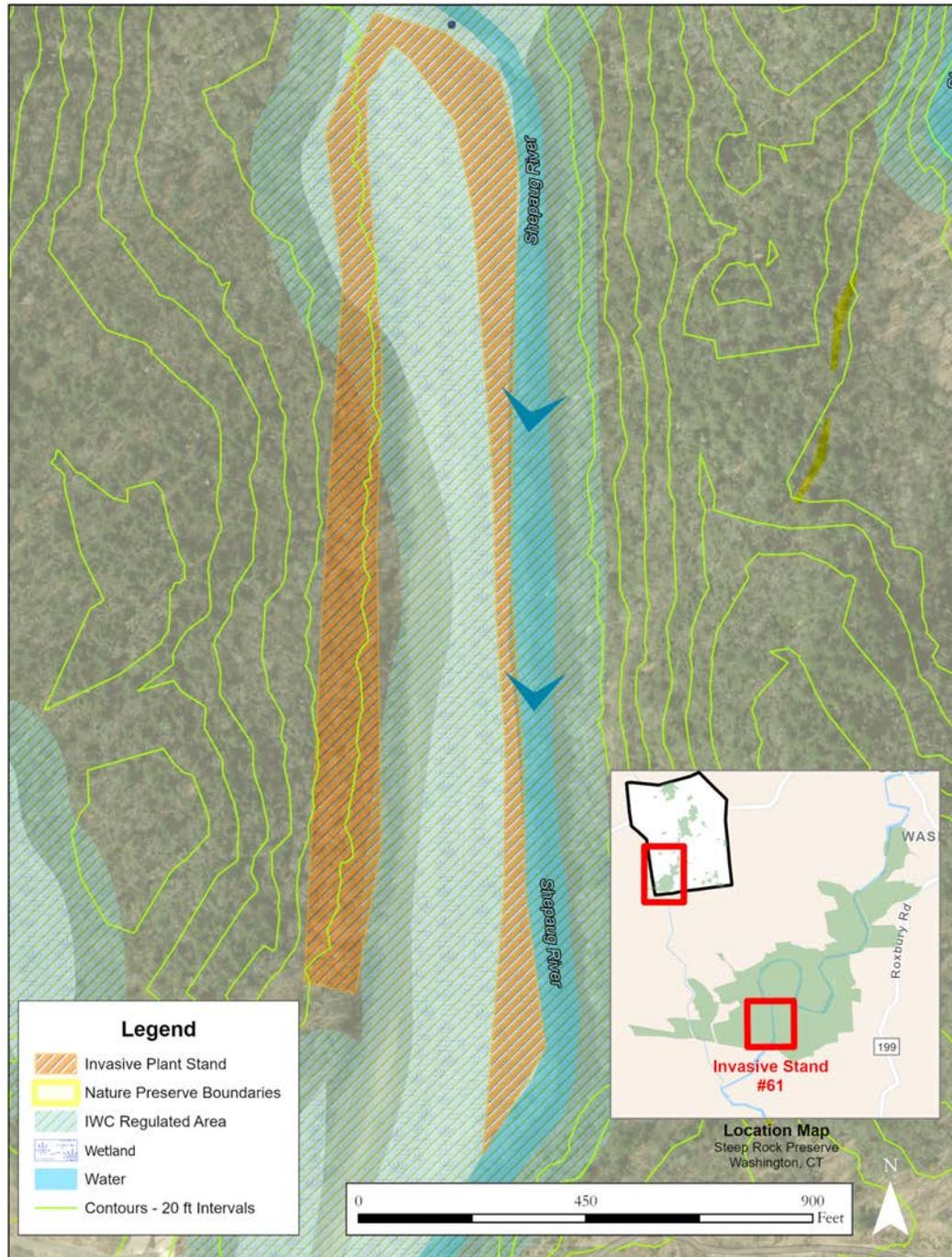
Objective: Asset Based Protection

Management History: N/A

Strategy: Manage invasive stand to enhance rare and threatened flora and fauna habitat. Opportunity for DEEP collaboration may be available in 2023. This card will be updated with appropriate information when available.

Costs and Labor Estimates: TBD

Permits: IWC permits are required.

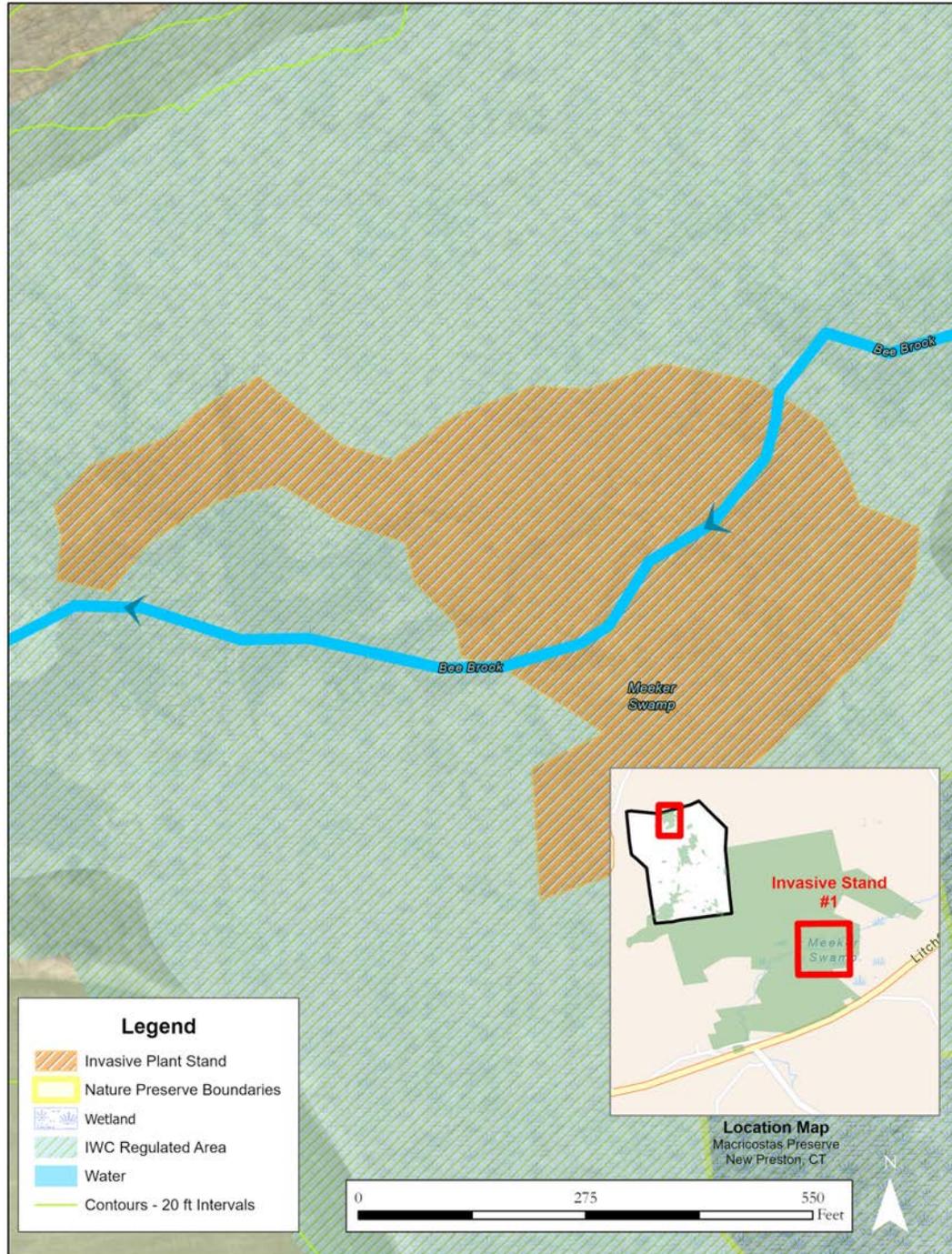


Invasive Plant Stand #1

Macricostas Preserve (124 Christian St. New Preston, CT)
Management Unit 21 (Macricostas Meeker Swamp)

Species: Phragmites
Stewardship Committee Approved June 2022
Density: Medium
Acreage: 11.8 acres

Invasive Stand Priority Score (ISPS): 2.80



Management Summary

Timeframe: 2022 - 2026

Objective: Survey and Define Management Objective in 2022

Management History: (2015) – Phragmites and Reed Canary Grass in Meeker Swamp were treated in 2015 by All Habitat Services. For more information, see the map “2015 Treatment Areas – Macricostas Preserve”, on file in the Steep Rock Association office.

Strategy: The GIS boundaries of the surveyed area appear disproportionate to visual inspections. The stand should be resurveyed in 2022 to clarify the boundaries. Additionally, SRA should initiate conversations with the adjoining property owner to the east to determine their interest in treating phragmites within their property.

Costs and Labor Estimates: TBD

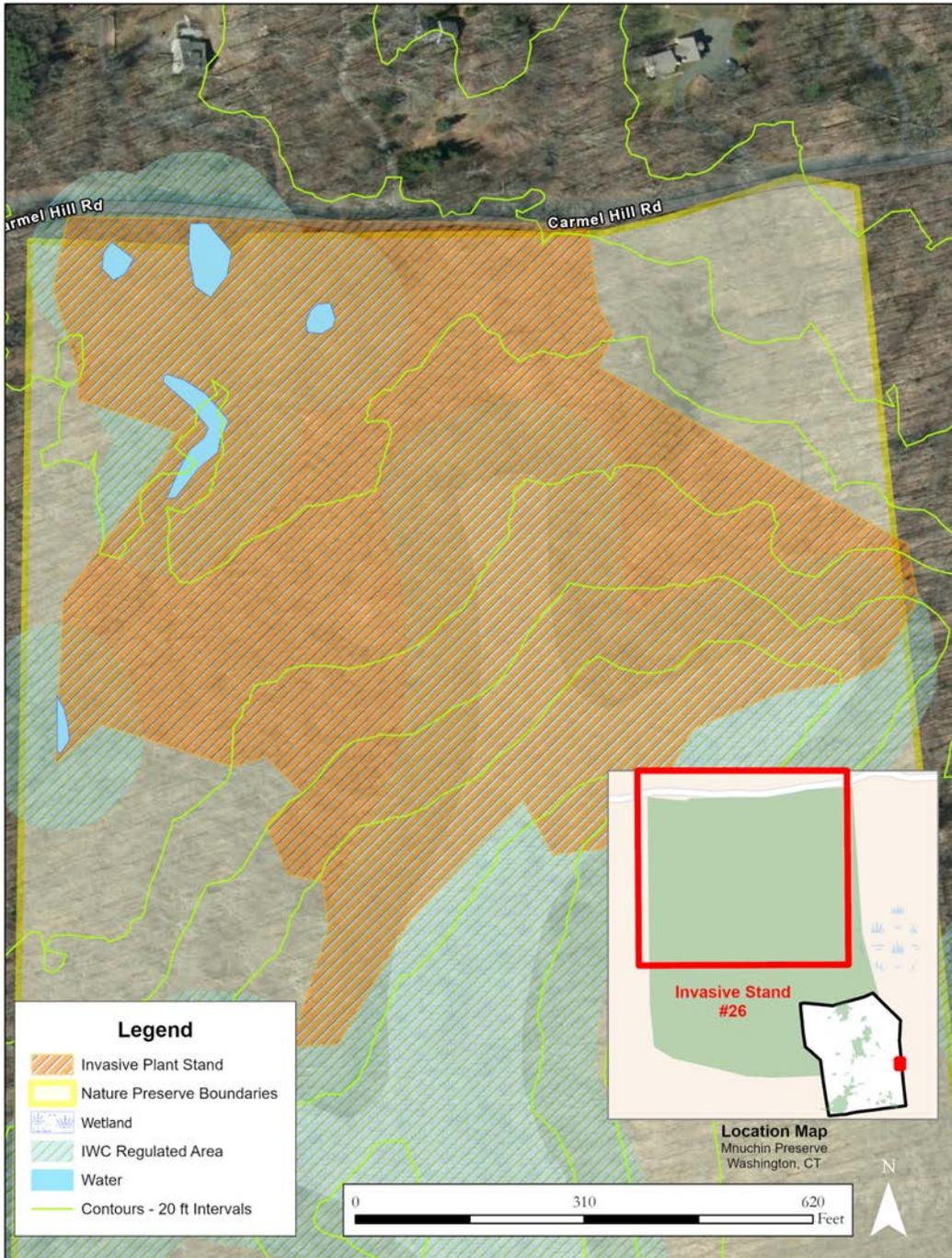
Permits: IWC and DEEP permits are required.

Invasive Plant Stand #26

Mnuchin Preserve (67 Carmel Hill Rd. Washington, CT)
Management Unit 37 (Mnuchin)

Species: Winged Euonymus
Stewardship Committee Approved June 2022
Density: High
Acres: 30.3 acres

Invasive Stand Priority Score (ISPS): 2.78



Management Summary

Timeframe: 2025 - TBD

Objective: Initiate Asset Based Protection in 2025

Management History: (2019) – Volunteers hand pulled burning bush along the roads, just outside of the vernal pool envelope.

Strategy: Eradicate plants within the vernal pool envelope (i.e. 100 feet from vernal pool edge) using a combination of hand pulling and cut stump treatment. Continue treatment through critical terrestrial habitat (i.e. 750 feet from vernal pool edge).

Costs and Labor Estimates:

	2022	2023	2024	2025	2026
Estimated Capital Costs	\$ -	\$ -	\$ -	\$ -	\$ -
Estimated Staff Time (hours)	0	0	0	40	20

Permits: IWC permits are required.

Compiled Tables of Estimated Capital Expenditures and Labor Hours						
Stand	2022	2023	2024	2025	2026	
46	4	4	0	0	0	
7	30	24	24	0	0	
3	20	16	16	8	8	
55/59	16	0	0	0	0	
28	30	24	24	0	0	
47	8	8	8	4	4	
64	0	16	8	8	8	
9	0	24	24	24	12	
13	0	0	40	32	24	
58	0	0	0	0	40	
26	0	0	0	40	20	
Total	108	116	144	116	116	

Stand	2022	2023	2024	2025	2026	
46	\$ -	\$ -	\$ -	\$ -	\$ -	
7	\$ -	\$ -	\$ -	\$ -	\$ -	
3	\$ -	\$ -	\$ -	\$ -	\$ -	
55/59	\$ -	\$ -	\$ -	\$ -	\$ -	
28	\$ 2,000.00	\$ 2,000.00	\$ 2,000.00	\$ -	\$ -	
47	\$ -	\$ -	\$ -	\$ -	\$ -	
64	\$ -	\$ -	\$ 2,000.00	\$ 2,000.00	\$ 2,000.00	
9	\$ -	\$ -	\$ -	\$ -	\$ -	
13	\$ -	\$ -	\$ -	\$ -	\$ -	
58	\$ -	\$ -	\$ -	\$ -	\$ -	
26	\$ -	\$ -	\$ -	\$ -	\$ -	
Total	\$ 2,000.00	\$ 2,000.00	\$ 4,000.00	\$ 2,000.00	\$ 2,000.00	

Bowie Invasive Species Management Study Final



March 2013

Prepared by



Prepared for



EXECUTIVE SUMMARY

The City of Bowie contracted Biohabitats in the fall of 2012 to conduct an Invasive Species Management Study for 328 acres of city owned parcels including Whitemarsh Park, Tanglewood Park and 55 acres of previously afforested sites throughout the City. The purpose of this study was to assist the City in evaluating the extent to which invasive species are located on the parcels and to recommend how the City can manage these species to achieve successful afforestation and improved forest condition.

Furthermore, this project is intended to provide the City with 1) an assessment of and prioritization for control of invasive plant concentrations within the study area, 2) the current intervention methodologies available for allocating limited invasive suppression resources, and 3) the budget required to conduct an effective invasive species management plan.

The project efforts included an assessment of the invasive species and evaluation of site conditions, a site prioritization and operational review of City policies and practices, and both short- and long-term maintenance recommendations, as well as planning-level cost estimates for their implementation.

Predictable patterns of non-native plant invasion were evident in areas of forest edge conditions. Vectoring sources include roadway edges, rail lines, right-of-way, paths and other disturbance areas such as former dump sites. The large suite of invasive species present threaten the older afforestation site planting success, pose future threats to less invaded newer afforestation sites, and have compromised tree health and native species regeneration within areas of more mature forests. Although none of the sites were ranked less than medium in priority for intervention based on multiple metrics, ranging from ecological to cultural factors, the three top priority sites included the Tanglewood and Whitemarsh parks and the newly planted Pope's Creek Park.

Management techniques and estimated costs for the initial management and continued maintenance of controlling the suite of invasive species present varied from site to site and through time. However, it is estimated that an initial overall annual budget of \$500,000.00 would be the upper range of what would be required in the first year to adequately address the threat posed by the current invasive vegetation and to achieve the desired conditions requested by the City of Bowie. Annual costs are anticipated to decrease with each subsequent treatment year until monitoring and "spot" treatment efforts are required.

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1.0 INTRODUCTION

As Maryland's 5th largest city, Bowie covers about 18 square miles of land in northeastern Prince George's County. Many important natural resources are either contained within or adjacent to the City's boundaries. Large park areas such as Whitemarsh Park and Tanglewood Park can be found within the City. Adjacent to the City are the Patuxent River to the east, the National Patuxent Wildlife Research Center to the north, and Belt Woods National Natural Landmark to the southwest. All of these sensitive natural features are threatened by a host of factors but one of the most influential is invasive plant species.

A healthy green infrastructure network can provide many and varied benefits if is not stressed by invasive species encroachment. Some of the benefits of a robust green infrastructure network include improving water quality, saving energy, lowering city temperatures, reducing air pollution, enhancing property values, and providing wildlife habitat, etc. With an Environmental Infrastructure Action Strategy Plan, the City of Bowie is ahead of many municipalities in efforts to protect and enhance existing natural resources and amenities. This invasive species management study will assist the City with continuing to meet the goals of its Action Strategy Plan.

The National Invasive Species Council defines an invasive species as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Considered by conservation biologists as the second greatest threat to biodiversity following habitat destruction, these organisms are estimated to cause economic damages and losses of over \$120 billion per year in the United States alone (Pimentel et al., 2004).

From an ecological standpoint the most problematic invasive species tend to be early-successional, highly reproductive strategists that are adapted to colonize disturbed systems. Examples of the type of ecosystem disruptions attributable to invasive species include:

- Biodiversity reduction
- Habitat loss
- Reduction in quality and quantity of food sources and nesting sites
- Altered community succession
- Changes in hydrologic and fire regimes
- Altered soil microbiology and decomposition processes
- Disrupted plant-animal and host-plant relationships

The purpose for this project is to provide the City with 1) an assessment of and prioritization for control of invasive plant concentrations within the study area, 2) the current intervention methodologies available for allocating limited invasive suppression resources, and 3) the budget required to conduct an effective invasives management plan.

2.0 SITE ASSESSMENTS

Biohabitats conducted the field inspection visits of the sites primarily in October 2012, with two follow-up visits to selected sites in November 2012. The site investigations focused on the 8 areas identified for the study by the City including the two large parks of Whitemarsh and Tanglewood, and six other afforestation sites (Appendix A). Biohabitats made observations of non-native invasive plant (NNIP) occurrence and relative abundance on these open space and park parcels. In addition to assessment information notes on invasive species occurrence and distribution, Biohabitats also collected digital photographs of representative site conditions and invasive species occurrence (Appendix B). Maps of each of the study sites depicting significant invasive species cover zones and photo point mapping can be found in Appendix A.

Collectively the sites were observed to be affected by an assemblage of more than a dozen known non-native invasive plant species variably distributed across the landscape. The list of invasive species identified included: English ivy, Callery pear, oriental bittersweet, lespedeza, Japanese stiltgrass, winged burning bush, multiflora rose, bush honeysuckle, Norway maple, princess tree, Chinese wisteria, autumn olive, privet, Japanese honeysuckle, Japanese barberry and mile-a-minute. Based on initial review the priority species of concern include multiflora rose, Japanese honeysuckle, Oriental bittersweet, Japanese stiltgrass and in certain areas English ivy and Callery pear (see Species List in Appendix B for a complete list with *scientific names*).



In Tanglewood Park there are large interior forested areas that appear to be in good health overall with non-native invasive species occurring at the forest edge areas along the perimeter of the site and historic road/parking areas. The same is true for forest edges in Whitemarsh Park along with the added area around and adjacent to the former residential estate. This zone and along the heavily used trails include extensive coverage of invasive species that have moved into the forest. The other afforestation study areas show some distinct patterns and processes of invasive species colonization. The relatively newer afforestation sites (Pope's Creek, Gallant Fox, Glen Allen and Entzian Farm) generally have few invasive species within the majority of the planting site; however, in most cases there are significant zones of invasive species near the sites and along the site boundaries providing clear nexus for future invasion. The older afforestation sites (Collington Manor and Church Road Park) are already invaded with an assemblage of non-native invasive species particularly climbing and ground cover vines and shrub species.

3.0 WORK PRIORITIZATION PLAN & BASELINE OPERATIONAL REVIEW

3.1 Work Prioritization Protocol

The primary goal of this work effort was assessing the relative level and risk of biological invasion on pre-determined City owned parcels and in determining the proper allocation of limited resources for control. The two primary objectives in inspecting the study parcels were to become acquainted with the distribution and ecological processes behind NNIP occurrence in the park system and to gain insight into the variability of ecological resources located on park lands.

These site assessments involved field visits to the study parcels by Biohabitats staff experienced in invasive assessment and suppression. Larger park units were inspected in multiple locations as a high degree of vegetative spatial and attribute variability was apparent both between, and within, parks. Qualitative field observations were performed and the relative ecological integrity of individual sites ranked. Metrics ranked included, but were not limited to, plant community type, vegetative composition of forest strata, successional stage, regeneration levels, invasive species composition and cover percentage, presence of deer herbivory, and evidence of recent site disturbance.

After a field review of the study sites it was determined that there was a need for a strategy in the City of Bowie based upon both prioritized intervention and prevention. As most land management agencies face a chronic limitation in maintenance funding, it is important that resources be applied to areas that produce the greatest return on investment. Prioritized intervention and prevention offer opportunities to maximize the benefits realized from limited invasive suppression funds. This section of the document provides a prioritization of the study sites while the operational recommendation section offers guidance on prevention.



3.1.1 Site Treatment Prioritization

In the City of Bowie and the surrounding region extensive urbanization and forest fragmentation have created conditions that foster the establishment of non-native invasive plant species. Several city afforestation sites and two city owned parks are under direct threat from these species and are at risk of being negatively impacted. Left unchecked, invasive plant species will undermine the regenerative capacity of these City parcels and ultimately result in a degraded resource that fails to meet many of the key objectives desired of the park and afforestation sites.

Given the dynamic nature of the invasive species threat, along with the need to maximize the effectiveness of finite control resources, this document provides the City of Bowie a comprehensive response strategy including a site treatment prioritization. This document also summarizes the results of that prioritization.

3.1.2 Methodology

Using various elements of existing invasive threat ranking models, research and professional knowledge, Biohabitats developed a prioritized treatment plan to guide City of Bowie work efforts related to invasive plant intervention within the study parcels. Field work consisted of a numerical rapid assessment that enabled the comparative ranking of study sites for invasive treatment. Scoring was undertaken in three domains; ecosystem, non-native invasive species, and cultural value. Total site scoring can range from between 23 to 84 points. Sites with higher total scoring values are given priority for invasive intervention. Below is a detailed description of the criteria used to determine the ranking within each domain.

Ecosystem Score

Biodiversity - This metric is designed to assess the desirable natural elements of a site and how valuable, unique, and difficult they are to replace.

High –a diversity of large mature trees in the canopy, many diverse native shrubs, and a healthy forest floor dominated by native plants, tree seedlings, leaf litter, and downed deadwood.

Medium –a closed canopy that is primarily composed of trees of the same size and species (forest systems), a shrub layer with few native species and a ground layer with limited native species diversity.

Low –a limited level of canopy cover composed of mostly the same species with only one or two of the trees exceeding 18 inches in diameter, large gaps in the canopy, lacking desirable native plants in the understory and, tree regeneration is limited to less than a third of the available area.

Disturbance - As invasive plants thrive in disturbed habitat, this metric rates the relative stability of the site.

Low – evidence of deer damage and or presence is rare, evidence of erosion and stormwater flooding absent, and trails are either footpaths or not present

Med – some deer browse evident, minor surface flooding, minimal erosion, and dirt or crushed stone trails only

High – visible deer browse line, concentrated flooding and evidence of site scouring or significant erosion, wide paved trails

Non-native Invasive Species Score

Infestation Level – This metric is a visual estimation of the percent of the site that is occupied by invasive vegetation. On the scoring sheet this field has five categories based upon invasive cover percentage.

Percentage of the vegetation layer that is composed of invasive plant material based upon the species growth habit, for instance, stiltgrass cover is based on the ground level, but tree of heaven would be based on its percent of the tree canopy.

Control Difficulty – The feasibility of controlling an invasive plant infestation at a given site is dependent upon the biology of the plant, the location of the site, the probability of new infestation, and the control treatments available.

Readily susceptible to control – single treatment will remove majority of plants species, does not likely have a persistent level of propagules in soil, site has easy accessibility, little potential for reinfestation from adjacent areas.

Requires repeated control efforts – multi-year program will be needed, location is in close proximity for maintenance vehicles, neighboring sites have generally low populations of target plants

Difficult/Poor Response to Control Efforts – site has limited potential for control, high reinfestation probability, difficult species to treat, low accessibility, large populations of invasive plant adjacent to, or upstream from, treatment location

Cultural Use Score

Visitation Level – This metric reflects the relative popularity of a given location.

High – structured parking, frequent trail use, trails used by more than hikers (bikers, equestrians etc.), numerous amenities installed (benches, swings, etc.), regular mowing

Medium – unstructured parking, daily trail use during peak periods, moderate level of amenities, low levels of physical disturbance

Low – access limited to street parking, infrequent trail use or trails absent, little or no infrastructure present, minimal to no physical disturbance

Planning – This metric captures the expressed interest in controlling invasives at a site.

Formal Program – site has a current habitat or restoration planting, multiple requests for management have been received, has a management plan and/or has a conservation designation

Informal Program –a request for treatment has been received, has a habitat or restoration planting proposed, but lacks a management plan

No Apparent Public Involvement – focus of site is not resource protection (e.g. a ball field or recreational buffer area); no requests for treatment have been recorded

3.1.3 Prioritization Results

The prioritization scores for all of the eight sites within the study ranged by only 14 points. The scores and ranking of each parcel are shown in Table 3.1.

Table 3.1 Score and priority ranking for Bowie Invasive Management Study.

<u>Score</u>	<u>Priority</u>	<u>Parcel</u>
56	High	WHITEMARSH
54	High	TANGLEWOOD
49	High	POPE'S CREEK
45	Medium	GALLANT FOX
44	Medium	COLLINGTON MANOR
43	Medium	ENTZIAN
42.5	Medium	GLEN ALLEN
42	Medium	CHURCH ROAD

The treatment of Whitemarsh and Tanglewood parks were ranked highest in priority due to the combination of both high existing ecosystem and cultural use scores. These were the only two sites large enough to contain more than just edge conditions having numerous acres of non-impacted forest. Also of note is the fact that most afforestation sites had invasives present adjacent to the study area and not significantly present within. Five of the afforestation sites ranked as a moderate priority for invasive species management.

In general, predictable patterns of non-native plant invasion were evident in forest edge areas and vectoring sources including roadway edges, rail lines, right-of-way, paths and other disturbance areas such as former dump sites. The invasive species present threaten the older afforestation site planting success, pose future threats to less invaded newer afforestation sites, and have compromised tree health and native species regeneration within areas of more mature forests.

4.0 ORDINANCE, POLICY & REGULATION

4.1 City Ordinance, Policy & Regulation Review

Biohabitats review of the current ordinance, policies and regulations as related to the management of non-native invasive plants (NNIP) indicates that the City of Bowie follows the following documents:

- Prince George’s County Woodland, Wildlife Habitat and Tree Conservation Act
- City of Bowie Forest Mitigation Policies: Policy 6

Forest mitigation plans shall be prepared with the following objectives: (1) to recapture, rejuvenate and/or enhance existing forested and woodland areas; (2) to enhance and/or establish wildlife habitats and greenways/corridors; (3) to establish riparian forest buffers along streams and tributaries to the Patuxent River; and (4) tree species plantings on City-owned mitigation sites shall create biodiversity among tree species to avoid monoculture situations.

However, outside of the 2-year maintenance agreement tasks required for afforestation and forest conservation areas no further treatment of NNIP is required. Other non-binding or regulatory guidance documents related to discouraging the use of NNIP in the City of Bowie include:

- Prince George’s County Landscape Manual
- Development Review Guidelines and Policies

4.2 City Ordinance, Policy & Regulation Recommendations

It is recommended that the City of Bowie add to the current Forest Mitigation Policy #6 the long-term (ie.5-10 years) control and monitoring for NNIP. Ongoing maintenance and management is essential to accomplishing any of the four objectives listed in Policy #6 on most afforestation sites as well as currently forested parcels.

5.0 OPERATIONS & BUDGET

5.1 Operational Review

Biohabitats also reviewed the current operations conducted at the study sites as they relate to the management of vegetation. Through visiting each location and from information provided by City staff the following list provides a breakdown of maintenance and management that can influence the presence and impact of NNIP:

- Whitmarsh Park – Asphalt paths with regularly mowed margins; use of rip-rap in channels for temporary stabilization of head cut
- Tanglewood Park– Limited roadside mowing; spraying (presumably by the RR) along railroad right-of- way; existing trails unmaintained but trail markers and benches are present
- Church Road Park – none
- Collington Manor – none
- Gallant Fox – some regular mowing in grass areas
- Popes Creek – mulch of new trees and use of tree protection
- Entzian Farm – mulching and tree tubes
- Glen Allen – mowing of grass areas and along asphalt paths

5.2 Operational Recommendations

As stated in Section 3.1 the strategy in the City of Bowie should be based upon both prioritized intervention and prevention. As most land management agencies face a chronic limitation in maintenance funding, it is important that resources be applied to areas that produce the greatest return on investment. Prevention and prioritized intervention offer opportunities to maximize the benefits realized from limited invasive suppression funds. Described below are suggested operational practices and preferred labor force requirements in developing a successful NNIP treatment and prevention strategy.



5.2.1 Prevention

As half of the study sites visited are currently free of NNIP, prevention is a multi-faceted tool that can be implemented in a cost-effective manner within the City. As a municipal land management entity, the City can practice management strategies within and adjacent to the target parcels that minimize opportunities for NNI plant populations to become established and to expand into new uninfested areas. Outreach is also a logical corridor for the City to pursue in implementing prevention. Invasive species do not respect legal property boundaries and, given the fragmented nature of the park system, land management activities of park neighbors will directly impact the sustainability of park ecosystems. While outreach recommendations to City parcel neighbors were outside of the scope of this project, it is strongly recommended that the City continue to pursue these initiatives in order to protect target parcel resources.

5.2.2 Best Management Practices (BMPs)

As witnessed during the field inspection, one of the primary drivers of disturbance and invasion biology in the study parcels is the operational procedures followed during maintenance activities. Relatively minor changes in field operations, such as modifications in mowing timing, mowing sequence and vehicle cleaning, can yield major returns on reduced infestations and, ultimately, avoided expenditures for intervention.



The following is a list of operational procedures to assist in the prevention, control, and eradication of NNIP on City maintained properties.

BMP 1: Minimize the area and intensity of ground disturbance associated with construction and/or maintenance activities.

Rationale: Disturbance of the soil facilitates the establishment of invasive plants. For example, stiltgrass can become established along trails following their construction then spread into adjacent forest land. Minimizing such disturbance will help minimize the area susceptible to establishment of invasive plants. Ground disturbance can be minimized during the project planning process by clearly delineating zones in which heavy equipment can operate. Language can be incorporated in contracts that establish penalties for contractors that operate heavy equipment outside of permitted zones.

BMP 2: Control invasive plant species in areas to be disturbed prior to disturbance.

Rationale: During construction and maintenance activities, seeds and fragments of invasive plants can be spread throughout the disturbed site. The disturbance also facilitates the establishment of invasive plants through processes such as increasing soil seed contact, increasing light availability, and reducing competition. Pre-construction or pre-maintenance invasive plant control is especially important in situations where only a few invasive plants are already present, because these can be killed prior to disturbance or when an invasive plant species that is a high-priority for control is present. Pre-construction or maintenance plant control would likely employ herbicides. Control should occur early enough such that the invasive plants are dead when construction or maintenance begins and should be part of the project budget.

BMP 3: Inspect and clean plant materials and soil from all pieces of heavy construction equipment (e.g., loaders, graders, backhoes, bulldozers) prior to their entry on parklands.

BMP 3.1: Clean maintenance equipment prior to operating in areas currently uninvaded by NNI species.

BMP 3.2: Schedule daily operations in areas of low NNI infestation first in order to reduce the need for multiple vehicle cleanings during the work day.

Rationale: Seeds or living fragments of invasive plant species that are capable of establishing new plants can lodge in the tracks, wheels, or undercarriages of heavy equipment. Such seeds and plant fragments can be transported from one location to another on the equipment. Inspecting and removing plant fragments will reduce the likelihood of introducing invasive plants to new locations. Water from high-pressure hoses or leaf blowers is particularly effective in dislodging seeds and plant fragments from heavy equipment. Language can be incorporated in contracts that require contractors to clean heavy equipment prior to working on City parcels.

BMP 4: Promptly revegetate all significant disturbances resulting from construction and/or maintenance activities.

Rationale: Minimizing the time that disturbed soil remains bare will help minimize the likelihood that non-native invasive plants will be able to colonize a disturbed site. Language should be incorporated in contracts that require contractors to re-seed disturbed areas within 7 days following cessation of ground-disturbing activities.

BMP 5: Re-seed disturbed areas with a diverse mixture of desirable native plant species suitable to the disturbed site.

Rationale: Re-seeding is important because it speeds the rate at which disturbed areas are revegetated and helps suppress invasive plant species. We recommend that the City specify seed mixes for different environmental conditions and require contractors to use one (or more if appropriate) of the approved seed mixes.

BMP 5.1: Seed and establish native warm season grass communities on open afforestation sites.

Rationale: Afforestation sites are often only planted with woody plants. However, until woody plants get tall enough and the canopy closes, there will be a great deal of light and intense competition from non-woody plants. By establishing a healthy community of native warm season grasses and forbs, non-native invasive plant occurrence can be minimized and the wildlife benefit greatly increased. This will mimic an old field habitat until the woody plants mature. A certified weed free compost blanket may additionally speed up natural system recovery.

BMP 6: Utilize weed-free straw/mulch on construction and/or maintenance projects where mulch is specified.

Rationale: Straw is commonly used as mulch to promote plant establishment. However, straw and other mulches can harbor seeds of non-native invasive plants. Where mulch is specified it should be free of NNI plant seeds and propagules. North American Weed Management Association standards for weed free forage and mulch should be followed where possible.

BMP 7: Use native plant species and non-invasive introduced plant species for landscaping parklands.

Rationale: It is counter productive to use invasive plants for landscaping or wildlife habitat purposes regardless of any aesthetic value that they may have. Examples of such invasive plant species include Amur Honeysuckle, Russian olive, and Bradford pear. The City could create a list of approved landscaping plant species for parklands like the one currently used in the Prince George's County Landscape Manual (2010).

BMP 8: Monitor areas disturbed during new construction or maintenance activities for at least two growing seasons and control any high-priority invasive plant species that appear.

Rationale: In spite of preventative measures used during and after construction, invasive plants may appear in disturbed areas. It will be much more cost-effective in the long run to control high-priority invasive species as soon as they do appear rather than waiting until they become firmly established. Depending on the presence of invasive species in adjacent and nearby areas, it may not be

reasonable to control all invasive plant species in disturbed areas. We recommend focusing management actions on high-priority invasive plant species.

BMP 9: Preserve existing canopy cover during park infrastructure modifications.

Rationale: Early successional invasive plant species have a competitive advantage in canopy gaps that increase light levels on the forest floor. Tree conservation during park renovations or improvements will minimize changes in ambient light levels.

BMP 10: Preserve existing hydrologic regime during park infrastructure modifications.

Rationale: Changes in surface flow and soil moisture levels can result in increased opportunities for invasive plant activity due to both a decline in the tree canopy on a given site and the transportation of undesirable plant propagules.

BMP 10.1: Restore hydrology where appropriate and feasible.

Rationale: Many floodplains in suburban parks have been cut off from their streams through channel incision. The result is a drier condition with periodic scour and human disturbance that is often favorable to non-native invasive species. By reconnecting the floodplain with the stream, increased overall moisture combined with lower levels of human disturbance and lower relative scour during flood events may favor native wetland and or facultative species and help restore wetland communities.

BMP 11: Reduce vectoring of NNI species onto park lands from neighboring properties.

Rationale: NNI species do not recognize legal property boundaries. Undesirable vegetation on lands adjacent to park boundaries can act as a potential seed and vegetative propagule source resulting in infiltration of NNI species onto park property. In addition, encroachment onto park property through the direct disposal of yard waste can introduce NNI species. Monitoring park boundaries and targeting adjacent residential areas for education and partnership offers a low cost intervention tactic that can potentially reduce vectoring and increase community involvement in local parks.

BMP 12: Minimize site disturbance and vectoring of NNI species associated with park visitation.

Rationale: Concentrated impacts of park visitation and/or the direct, unintentional introduction of invasive propagules by park patrons can create new opportunities for NNI species establishment within park boundaries. Identification

of these pathways, along with monitoring and public education can assist in reducing the impact of this vectoring mechanism.

5.2.3 Site Specific BMP Recommendations

Where possible and feasible, as funding allows, the following examples show where and how the above BMPs may be used:

Trails

Relevant BMPs - 1, 2, 3.5, 4, 9, 10, 10.1

The network of pedestrian trails within Whitemarsh Park is a major asset that is enjoyed by a significant number of park visitors, supplemented by social and deer trails that are unmaintained. Trail use, construction and/or maintenance have been identified as one of the leading vectoring mechanisms encouraging the intrusion and establishment of non-native invasive species. Without careful consideration of trail placement and management, these pathways can undermine and damage the very resource they were designed to celebrate. Fortunately the implementation of sound best management practices can dramatically reduce the disturbance associated with trails without dramatically increasing costs.



The following trail BMPs are recommended for the City of Bowie –

Tree Canopy Preservation

- Trees provide a number of functional benefits. Minimizing tree loss during trail construction directly impacts invasive plant populations. Canopy gaps from tree loss results in additional light reaching the forest floor. Invasive plants are typically early successional species that respond rapidly to this change and will proliferate accordingly.
- Careful attention to tree conservation during trail construction should reduce disturbance and the corresponding competitive advantage of invasive plant species.
- All proposed new trails and routing modifications to existing trails should require an approved Tree Conservation Plan prepared by a qualified certified arborist or suitable equivalent. The plan should include map locations of all canopy level trees whose critical root zone is intersected at a level of greater than 20% by the proposed trail footprint.

- Critical root zone should be defined as an area surrounding the tree stem such that the radius of the critical root zone is equal to one foot for each inch of tree diameter (measured at 4.5 feet above grade)
- Tree Conservation Plans should include detailed critical root zone protection strategies for all plants meeting the above criteria.
- Tree removal required to meet project designs or for site safety should be conducted in a manner to minimize damage to desirable vegetation.
- Where feasible, large woody debris (greater than 4 inches in diameter) generated during tree removal operations should be left on site in long log lengths (greater than 6') to minimize soil exposure and create micro-habitat on the forest floor.
- Woody debris left on site from tree removal should have significant surface area in contact with the forest floor and should not exceed 2 feet in height above ground level.
- Areas of tree removal should be monitored for NNI species and treated for a minimum of two growing years post removal.

Protection of Surface Hydrology

- Changes in stormwater flow patterns on the forest floor can result in major incursions of invasive vegetation, in particular the invasive Japanese stiltgrass. Concentration of propagules trailside and the subsequent dispersal into the adjacent forest has been identified as a significant risk factor within the parks.
- All proposed new trails should be designed to minimize disruption of existing surface drainage patterns.

Maintenance

- Disturbance of trail shoulders as a result of maintenance activities (primarily mowing) is currently a significant source of invasive plant dispersal along the City trail system.
- Maintenance equipment should be stored in an area free of NNIS.
- Maintenance equipment should be inspected and cleaned of weed seed, mud, and soil particles immediately following use in an area of NNIS infestation.
- In order to reduce equipment cleaning time, where possible trail maintenance activities should begin in an area free of invasive plant infestation.
- Mowing should not be performed in areas of NNIS infestation following emergence of seed heads and fruiting structures.
- Soil disturbance during maintenance activities should be minimized.
- Soil and vegetative debris should not be relocated or transferred from areas of known NNIS infestation to uninfested areas.
- Blading and drainage ditch clearing should not be conducted between areas of infestation and non-infested areas.

Design

- Once constructed, trail location is a fixed variable that can adversely impact the understory and regenerative potential of a forest stand. Modifications to design at

- this phase of the construction process can prevent unnecessary disruption of ecological processes and the subsequent increase in maintenance costs.
- All proposed trail locations should be inspected for pre-existing invasive plant activity and ecological integrity.
 - Spatial data on invasive plant populations along all proposed trail routes should be compiled prior to final determination of trail position.
 - Proposed trail locations should undergo a minimum of one year's invasive plant suppression action prior to construction.

Construction and Maintenance

Relevant BMPs - 1, 2, 5, 6, 8

- Modifications to any park infrastructure, by definition, will result in site disturbance. As disturbance is a primary driver of invasive infestation it is of critical importance that careful attention be given to reducing opportunities for invasive establishment.
- All proposed construction locations should be inspected for pre-existing invasive plant activity and ecological integrity.
- In order to reduce invasive propagule movement and diminish the invasive seed bank in the soil all proposed construction sites should undergo a minimum of one year of invasive plant suppression action prior to construction.
- Soil disturbance should be minimized and desirable vegetation maintained at project site to the fullest extent possible.
- Staging areas should be selected that are free of invasive plant populations wherever possible.
- Construction equipment should be inspected and cleaned of weed seed, mud, and soil particles immediately following use in an area of NNI infestation.
- Fill material brought to site should be free of NNI propagules.
- Borrow pit areas should be inspected for NNI presence prior to soil, gravel, or rock extraction
- Construction sites should have an approved invasive plant monitoring and treatment program conducted for a minimum of two growing seasons following project completion.
- Funds to support the above outlined activities should be included in the project budget in the scoping phase.

Landscaping

Relevant BMPs - 2, 4, 5, 6, 7

- Horticultural plantings and maintenance activities constitute a major vectoring mechanism for new invasive plant infestation. In addition to the direct introduction of invasive propagules, landscape introductions of exotic earthworms and nitrogen fertilization can indirectly promote NNIS establishment. Earthworms reduce the forest duff layer and have been positively correlated with invasive plant colonization.

- Artificial enhancement of soil nitrogen (fertilization) enhances the growth of NNI in formally nitrogen limited forest environments. Careful attention to selection and use of appropriate landscape materials can help assure a healthier transition between the manicured and natural area park environments.
- Revegetation of disturbed sites should occur in the first planting season feasible following construction.
- Landscape staging areas should be selected that are free of invasive plant populations wherever possible.
- Landscape equipment should be inspected and cleaned of weed seed, mud, and soil particles immediately following use in an area of NNI infestation.
- Weed-free straw & mulch should be used on all City landscaping or maintenance projects.
- Certified weed-free seed should be used on all City landscaping or maintenance projects.
- Landscaping stock, products, soil, and mulch should be free of earthworms when material is to be placed within 100 feet of undisturbed forest
- Vegetation native to the region should be preferred for all park landscaping projects.
- Non-native invasive species are not to be used in park landscaping projects
- Areas identified as potential landscape installation sites should be inspected for NNI and undergo a suppression program for a minimum of one year prior to landscape installation if NNI are present.
- Landscape installations should be monitored and treated for NNI for a minimum of two growing seasons following project completion.
- Landscape fertilization should only be conducted in conjunction with a documented nutrient deficiency as identified by a soil test.

Visitation Impact Management

Relevant BMPs – 11,12

- Damage to desirable vegetation and the exposure of mineral soil by concentrated visitor activities can increase the risk of NNI species establishment. In addition, the potential exists for direct introduction of undesirable plants onto park property via weed seeds and propagules adhering to visitor clothing and equipment.
- Enhanced public awareness of invasive species issues coupled with focused efforts to reduce localized site disturbances associated with visitor activities can help reduce new infestation sites.
- Areas of park vegetation identified as negatively impacted by visitation activities should be targeted for restoration and/or managed in order to reduce additional spread of invasive species.
- Activities of potential high-impact to desirable vegetation should be sited and directed to areas of low ecological value whenever possible.
- Public outreach and education activities should be focused and targeted to the needs and concerns of specific park user groups.

As an example, the movement of Japanese stiltgrass populations along trail corridors is currently being fostered by mowing and maintenance activities that physically transport seeds of this annual plant to previously uninfested locations. As stiltgrass seed viability in the soil can last for several years, any activity that redistributes or transfers contaminated soil will promote the spread of this organism. Three simple solutions are available:



1. Do not operate mowing equipment during the period when seed heads are present on the plants (late summer, early fall).
2. Sequence mowing regimes such that equipment does not move directly from infested areas into uninfested areas.
3. Carefully clean and wash all equipment after operating in an infested area.

6.0 MONITORING & MANAGEMENT

6.1 Vegetation Monitoring

Monitoring is a critical, yet often neglected aspect of NNIP management. Even the best programs reviewed across the country typically failed to dedicate adequate resources to this aspect of a control program. Without routine monitoring of the changes in plant composition on a treatment site it is impossible to determine if the ultimate goal of a desirable complex of native plants has been achieved.

A monitoring program need not be a labor intensive undertaking as the information recorded should not exceed the data collected during the initial site prioritization effort. In fact, it could be as simple as a visual estimate the invasive plant species present and their respective abundance as a percentage of the vegetative cover. This effort is well-suited to the use of a combination of staff, contractor and/or volunteer participants as it does not require manual labor or the use of specialized equipment.



6.2 Labor

Several types of labor are required to implement a successful invasive plant management program. Utilizing all forms of labor will enable your organization to establish a long-term management strategy. Three labor choices are discussed below.

- In House
- Contract
- Volunteers

6.2.1 In House

In house labor would include any full time employees of the City. The only time in house labor is efficient within a municipality is when there are full time employees that are able to dedicate a portion of their time to on the ground activities. It is recommended that the City of Bowie use in-house personnel to participate in select activities of invasive plant management, primarily when a project is in the maintenance stage or levels 1-2.

6.2.2 Contract

Contract labor is best utilized by land managers in the initial stages of invasive plant management. When a project requires treating an area designated level 3-5, qualified contractors can provide the most efficient and reliable labor source. Larger infestations require tools and time not available through volunteers or in house labor.

6.2.3 Volunteers

It is recommended that the City of Bowie utilize volunteers in the later stages of invasive plant management or when a plant is still at a level 1-2 infestation. At this later management stage mechanical removal through pulling or grubbing is ideally suited for volunteer labor. The type of plant also has an effect on how effective a volunteer can be. These are examples of species that do not require the use of chemicals or gas powered equipment when they are at a level 1-2 intensity. The invasive species that would be most suitable for volunteer management are highlighted in bold below.

- **Japanese stiltgrass**
- Bush honeysuckle (<2 feet in height)
- Callery Pear (<2 feet in height)
- Norway Maple (<2 feet in height)
- Princess tree (<2 feet in height)
- Oriental bittersweet (cut from the base of trees)
- **Japanese honeysuckle** (cut from the base of trees)
- **English ivy** (cut from the base of trees)
- Chinese wisteria (cut from the base of trees)

6.2.4 Operations

Different labor types are efficient at differing stages of invasive vegetation management. The labor types described above are suggested for the following operating scenarios in Table 6.1:

Table 6.1 General Invasive Vegetation Management Labor Use types

Treatment Method	Low Level (1-2) Infestation			Medium Level (3) Infestation			High Level (4-5) Infestation		
	In House	Contract	Volunteers	In House	Contract	Volunteers	In House	Contract	Volunteers
<i>Cut and Treat</i>	X	X	X	X	X			X	
<i>Girdle</i>	X	X	X		X			X	
<i>Foliar Spray</i>	X	X		X	X			X	
<i>Grub</i>	X	X	X	X	X	X		X	
<i>Basal Bark</i>	X	X			X			X	

6.2.5 Training Resources

The Mid-Atlantic Invasive Plant Council (MAIPC) <http://www.maipc.org/> provides regional leadership to effectively address the threat of invasive plants to the native flora, fauna, and natural habitats of the Mid-Atlantic. The council coordinates regional efforts to gather and share information on the identification, management and prevention of invasive species, provide training and volunteer opportunities and to identify research needs. The Council is represented by members from Delaware, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia, and the District of Columbia.

6.3 Job Descriptions

Each type of labor requires different employee groupings. The conceptual job descriptions below describe the type of worker required for each type of labor:

In House Invasive Plant Manager

Position: Invasive Plant Coordinator

Job requirements: background in biology/botany, experience using chainsaws, brush cutters, tractors, ATV's, GPS; 5 years experience supervision in related activities, pesticide application license, CPR/first aid certified.

Preferences: bilingual, computer experience using technical programs such as GIS.

General duties & responsibilities: Oversee and manage the operations in the USA:

- Site management: Project planning and execution including material management (herbicides, biocontrol agents, equipment, tools) and mapping. Personnel planning for each project (affordable and appropriate). Keep daily logs of activities in the field and transfer information to R&D for short and long term monitoring purposes. Prepares bi-monthly reports on project performance and progress.
- Equipment Management: purchase and maintenance of field equipment.
- Personnel Management: hiring and training of field workers, direct supervision, time sheets, and performance evaluations.
- Participation in marketing activities

Contractors

Position: Crew Leader

Job requirements: College degree from an accredited university in biology/botany, Trained in the use of chainsaws, brush cutters, tractors, ATV's, GPS; 5 years experience supervision in invasive plant management, pesticide application license, CPR/first aid certified.

Preferences: bilingual, computer experience using technical programs such as GIS.

General duties & responsibilities: Oversee and manage the projects classified as 1-5 intensity

- Site management: Project planning and execution including material management (herbicides, biocontrol agents, equipment, tools) and mapping. Personnel planning for each project (affordable and appropriate). Keep daily logs of activities in the field and transfer information to R&D for short and long term monitoring purposes. Prepares bi-monthly reports on project performance and progress.
- Equipment Management: purchase and maintenance of field equipment.
- Personnel Management: hiring and training of field workers, direct supervision, time sheets, performance evaluations.
- Participation in marketing/educational activities

Volunteers

Position: Volunteer Crew Leader

Job requirements: experience in biology/botany, experience using chainsaws, brush cutters, CPR/first aid certified.

Preferences: experience using GPS technology; a degree or training in some resource management related field; certified as a pesticide applicator in Maryland

General duties & responsibilities: Oversee and manage volunteer crews during invasive plant management workdays:

- Responsible for managing a crew of <11 volunteers
- Responsible for understanding the difference between native and non-native species
- Responsible for educating volunteers in differences in native and non-native plants
- Responsible for operating gas powered machinery during volunteer events
- Responsible for applying all herbicides during volunteer events

6.4 Recommended Control Strategies

Before considering implementation of any control strategy, staff must consider four key components:

1. Selectivity
2. Timing
3. Type of Plant
4. Type of Control

6.4.1 Selectivity

It is extremely important when determining the best control methodology to first consider what desirable species co-exist in the control area. Understanding this will allow for choosing the methodology most appropriate for management. Consider all variables prior to choosing a control methodology. When determining the best methodology to control an invasive plant, it is important to consider several variables including whether the target species are located in a:

- *Natural area*
- *Right of way*
- *Landscaped area around facilities*
- *Endangered species*
- *Proximity to a water source*
- *Long term management area*

6.4.2 Timing

Timing invasive plant control projects properly can make the difference between a 99% mortality rate and a 10% mortality rate. Generally speaking, the best seasons to treat invasives in descending order of preference are:

1. *Fall*: Fall is the best season for controlling many invasives plants. In the fall plants are sending their resources back into the root system in late August through November. This is an ideal time to send an herbicide into action.
2. *Summer*: During the hottest days of summer, most herbicide methods, with a few exceptions, are very effective. Being selective is more difficult this time of year because both desirable and undesirable plants are in full bloom. Also, there is the threat of drought which could hinder translocation of chemical.
3. *Winter*: Winter is an excellent time of year to treat multi-stemmed and evergreen vine species. Herbaceous species are usually dormant now and tree species will not react as well to herbicides in the winter. Multi-stemmed and evergreen vine species' smaller root systems allow certain "winter" herbicides to be relatively effective during the colder months.
4. *Spring*: Spring is generally the worst time of year to treat certain invasives when using herbicides. This is because the plants are sending resources out, effectively

slowing down and disturbing herbicides in action. Most invasives show their foliage a month or so before natives making easier targets. Spring is the best time to work on several herbaceous plants, i.e. Japanese stiltgrass.

Seasonality of treatment for each species present on the City study parcels is included in Table 6.2.

6.4.3 Type of Vegetation

The following recommendations are general and are broken down according to plant type (unless otherwise indicated): 1) tree and shrubs; 2) vines; and 3) broadleaf herbaceous material. Due to the invasive character of these plants, a five to ten year maintenance program should be put into place with constant monitoring for an indefinite time period. The species identified in this study are classified as follows:



Trees & Shrubs

- Callery pear
- Norway maple
- Princess tree
- Bush honeysuckle
- Privet
- Winged burning bush
- Autumn and Russian olive
- Japanese barberry
- Multiflora rose

Vines

- Oriental bittersweet
- Japanese honeysuckle
- English ivy
- Chinese wisteria
- Mile-a-Minute

Herbaceous

- Japanese stiltgrass
- Lespedeza

Trees & Shrubs: Trees and shrubs can be managed 1 of 3 ways: mechanically-grubbing or pulling, chemically- foliar treatment, or cut and treat.

Grubbing or pulling is labor intensive and requires moist and loose soils. Seedlings and saplings are excellent candidates for grubbing and is a good project for volunteers. When grubbing or pulling, be sure to remove the entire root system to prevent regrowth. When pulling on hillsides, be sure to have firm footing to prevent falls. Locations for pulling would be in areas with low

intensity levels and smaller plants, and areas that have been cut where seedlings are emerging.

Foliar treatment of trees and shrubs is a useful tool when there are areas of low intensity and smaller plants, or when an area has been cut and-treated and seedlings or regrowth are emerging. *Only certified pesticide applicators should handle or administer herbicides.* There are two chemicals recommended for natural area plant management: glyphosate and triclopyr. Glyphosate is available with upland, wetland, and aquatic labels. The most common form of glyphosate is Round Up for upland use and Rodeo for wet area use, although there are generic products now available. It is recommended to use a non-surfactant form of glyphosate, in order to be able to add Nu-Film (a sticker/spreader) to the solution. Triclopyr is most commonly known by the trade name Garlon 3A or 4. Use only Garlon 3A when foliar spraying. Solutions for foliar applications should be mixed at a rate of 2% glyphosate or triclopyr and 1 to 2 ounces Nu-Film/5 gallons and water. It is recommended to use a color dye such as Bulls Eye to track treated areas. Application can be administered while the plant is actively growing.

Cutting-and-treating of trees and shrubs is the most successful form of management to control larger plants. Cutting can be done with lopping shears, bow saws, chainsaws, or brush cutters. *Only trained personnel should operate gas powered cutting devices.* Cut the stems three inches or lower to the ground and immediately apply the chemical to the outer 20% of the stem ensuring complete coverage of the cambium layer. *Only certified pesticide applicators should handle or administer herbicides.* The two chemicals generally recommended for natural area shrub cutting and treating plant management are glyphosate and triclopyr. The solutions for cut-stem applications should be mixed at a rate of 25% glyphosate or triclopyr (Garlon 3A) and 0.25% Nu-Film and water. If using Garlon 4 (the ester formulation), use 25% Garlon 4, 0.25% Nu-Film, and horticultural oil (JLB oil). Cutting-and-treating can be administered at any time unless the ground is frozen, although spring application results produce a lesser mortality rate. The optimal time to cut-and-treat is mid-summer to late fall.

Vines: Vines can be managed 1 of 2 ways: mechanically—grubbing or cutting, and chemically—foliar treatment or cut-and-treat.

Grubbing is labor intensive and requires moist and loose soils. Small, dense areas are excellent candidates for grubbing. When grubbing, or pulling, be sure to remove the entire root system to prevent regrowth. When grubbing evergreen vines, such as English ivy, it may be necessary to bag the debris and dispose of it to prevent re-rooting.

Foliar treatment of vines is a useful tool when there are areas of high intensity within a large area. *Only certified pesticide applicators should handle or administer herbicides.* The two chemicals recommended for natural area plant management of vines are glyphosate and triclopyr. Solutions for foliar

applications should be mixed at a rate of 2% glyphosate or triclopyr and 1 to 2 ounces Nu-Film/5 gallons and water. If using Garlon 4, substitute the water with horticultural oil. Garlon 4 should not be applied when temperatures are above 75 degrees to prevent an ester cloud formation underneath the canopy resulting in tree mortality. Application can be administered while the plant is actively growing, although because the targeted vines are either semi-evergreen or evergreen, the optimal time of treatment would be in the fall when non-target species are dormant.

Cutting-and-treating of vines ascending the trees will prevent seed production. Cutting can be done with lopping shears, bow saws, chainsaws, or brush cutters. *Only trained personnel should operate gas powered cutting devices.* Cut the stems three inches or lower to the ground and another cut above the original. This will create a space to immediately apply the chemical to the outer 20% of the stem ensuring complete coverage of the cambium layer. *Only certified pesticide applicators should handle or administer herbicides.* The two chemicals recommended for natural area vine cutting and treating plant management are glyphosate and triclopyr. Solutions for stem-cut applications should be mixed at a rate of 25% glyphosate or triclopyr (Garlon 3A) and 0.25% Nu-Film and water. Do not use Garlon 4 on cut stumps when the vine is attached to the tree, because of the bark penetrating character of the chemical. Cutting-and-treating can be administered at any time unless the ground is frozen, although spring application results produce a lesser mortality rate. The optimal time to cut-and-treat is mid-summer to late fall.

Broadleaf herbaceous plants: Herbaceous plants can be managed 1 of 2 ways: by grubbing or by foliar treating.

Grubbing is labor intensive and requires moist or loose soils. Low intensity areas, covering a large tract, are excellent candidates for grubbing and are a good project for volunteers. When grubbing or pulling, be sure to remove the entire root system to prevent regrowth. If the plant is pulled and has seeds, it may be necessary to bag the debris and dispose of properly.

Foliar treatment of herbaceous plants is a useful tool when there are areas of high intensity and cover a large area. *Only certified pesticide applicators should handle or administer herbicides.* The two chemicals recommended for natural area herbaceous foliar plant management are glyphosate and triclopyr. When applying Triclopyr use only Garlon 3A for foliar spraying. Solutions for foliar applications should be mixed at a rate of 2% glyphosate or triclopyr and 1 to 2 ounces Nu-Film/5 gallons and water. It is recommended to use a color dye such as Bulls Eye to track treated areas. Therefore an application can be administered in the fall when most not-target species are dormant as long as the temperatures are 65 degrees or above.

Grasses—Grasses can be managed 1 of 2 ways: mechanically—grubbing or cutting, and chemically—foliar. A multi-year (i.e., 5-10) maintenance program should follow the initial treatment.

Pulling or Grubbing is labor intensive and requires moist and loose soils. Low intensity areas covering a small tract are excellent candidates for grubbing and are a good project for volunteers. Certain species, such as stiltgrass are also good candidates for this method because they are an annual grass, and the root system is relatively non-existent making it easy to pull. When grubbing and pulling be sure to remove the entire root system to prevent regrowth. If the plant is pulled and has seeds, it may be necessary to bag the debris and dispose of properly.

Cutting requires the use of a weed eater or a mowing device. Annual grasses, such as stiltgrass, will produce seeds once a year and die. Cutting would be a tool to stop the production of seeds for that one year. Cutting should be done in late summer while the plant is flowering. If the cut is too early the plant will still produce seeds.

Foliar treatment of grasses is a useful tool when there are areas of high intensity and coverage of a large area. *Only certified pesticide applicators should handle or administer herbicides.* Some recommended chemicals for natural area management are glyphosate, imazapar or sethoxydin. Sethoxydin is most commonly known by the trade names Vantage or Poast. Solutions for glyphosate foliar applications should be mixed at a rate of 2% glyphosate and 1 to 2 ounces Nu-Film/5 gallons and water. Solutions for sethoxydin foliar applications should be mixed at a rate of 1.5% sethoxydin and 1 to 2 ounces Nu-Film/5 gallons and water. It is recommended to use a color dye such as Bulls Eye to track treated areas. On annual grasses like stiltgrass, if the chemical treatment is applied early in the growing season a second consecutive crop may emerge producing seeds. If this occurs, re-treat the area. This will at least, deplete the seed bank of one more year of seeds.

Imazapic is grass selective and works as a pre-emergent killing seedlings as they germinate. The rate of application is approximately 0.25-1.5% with 1-2 ounces of Nu-Film and blue dye. In large infestations the rate would be 8-12 oz per gallon.

6.4.4 Type of Control

Mechanical

Mechanical control of NNI's includes tools such as chain saws, brush cutters, weed wrenches, mattocks and sometimes larger machinery. Care is taken to evaluate the reciprocal damages that may be caused by such equipment prior to selecting this methodology. While large machinery is sometimes used to control invasive species, such equipment is not selective and unacceptable in most control environments. Mechanical methods are sometimes effective in sensitive areas as well. Weed wrenches and mattocks are excellent tools for volunteers and staff alike to grub out multi-stemmed species such

as bush honeysuckle and privet located in the forest interior. Mechanical control is most effective when utilized in the maintenance stages of a project.



The weed wrench is a good tool for mechanically removing stems no more than three inches in diameter but is not ideal for plants like buckthorn or privet.

Chemical

Herbicides are often selected in combination with mechanical methods of controlling NNI's. Prior to using any herbicides, a detailed analysis of the chemical components of the herbicide and its effects on the environment are considered. An impact assessment is conducted which determines whether the ramifications of chemical control override the biological pitfalls of invasive plants. Selection of herbicides for chemical control is based on the species being managed, landscape position and proximity to sensitive features (e.g., wetlands and waterways), manufacturers labels and instructions, and applicable laws.



Brush cutters are used to cut and treat smaller multi-stemmed and tree species on the more level terrain



Girdling followed by a chemical application of 25% Round Up Pro on Ailanthus can help to eliminate the larger seed bearing invasive trees

Chemical Application Methods

Management methodologies range from aerial foliar applications of herbicide on aquatic plants to needle injections of herbicide into the cut *stems*. The methods listed below are general and are followed by more specific recommendations for shrub, vine and tree species.

Foliar Treatments

Foliar applications should be made with a low pressure (20-50 psi) backpack sprayer at rates of one gallon or less per minute. All foliar treatments should be made after full leaf expansion in the spring and before fall colors are visible. Allow herbicide treatments to dry for at least three hours at an air temperature above 60°F to ensure adequate absorption and translocation. In areas that receive significant public use, it may be necessary to close off the treatment area until the herbicide has completely dried.

Use a nonionic surfactant with all herbicide solutions, unless otherwise specified by the manufacturer's label. Surfactants increase the effectiveness of the herbicide by 1) reducing surface tension and ensuring complete foliar coverage, and 2) increasing the rate of absorption through the leaf cuticle.

Apply herbicide with a backpack or similar hand-operated pump sprayer equipped with a flat spray tip or adjustable cone nozzle. Apply herbicide to the leaves and stems of target plants using a consistent back and forth motion. Herbicide should thoroughly cover foliage, but not to the point of run-off. All recommended herbicides require complete foliar coverage to be effective. Applications made while walking backward will reduce the risk of the herbicide wicking onto the applicator's clothing.

Cut Surface Treatments

Cut surface treatments include hack and squirt, girdle, and cut stump methods. The main advantages to these methods are: 1) they are very economical, 2) there is minimal probability of non-target damage, 3) there is minimal application time, and 4) they can sometimes be used in the winter as long as the ground is not frozen. Backpack sprayers or spray bottles are very effective for all of these methods.

Hack and Squirt Method: Using an axe or similar cutting tool, make uniformly spaced cuts around the base of the stem. The cuts should angle downward, be less than 2.5 cm (1 in) apart, and extend into the sapwood. Apply herbicide to each cut to the point of over flow.

Cut Stump Method: Horizontally cut shrub/sapling stems, or tree trunks, at or near ground level; all cuts should be level, smooth, and free of debris. Immediately apply the herbicide to the outer 20% (cambial area) of the stump; delayed treatment may reduce the effectiveness of treatment.

Girdling Method: Chainsaws are used to make a continuous cut around the base of larger invasive tree species. An herbicide is immediately applied to the cut just to the point of run-off.

Basal Bark Treatments

Basal bark treatments are effective for controlling woody vines, shrubs, and trees. Treatments can be made any time of year, including the winter months, except when snow or water prevents spraying the basal parts of the stem. Proper plant identification is crucial during the dormant season due to the absence of foliage.

Apply herbicide with a backpack sprayer using low pressure (20-40 psi) with a straight stream or flat fan tip. To control vegetation with a basal stem diameter of less than 3 inches, apply specified herbicide-oil mixture on one side of the basal stem to a height of 6 inches from the base to the point of run-off. For stems greater than 3 inches in diameter or with thick bark, treat opposite sides of the stem to a basal height of 12 to 24 inches.

All herbicides should be applied in accordance with specific label instructions, which include personal protective equipment, storage requirements, and applicable laws.

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Table 6.2 City of Bowie Invasive Plant Control Method Chart

Invasive Species	Control Method	Products Typically Used	Potential Impact on Non-Target Organisms	Comments
Callery Pear (<i>Pyrus calleryana</i>)	BB, CT	20% Garlon 4 BB, 2% RoundUp Pro CT	BB is selective to the treated species. RoundUp Pro is non-selective and requires accurate application.	Summer/Fall Treatment
Princess Tree (<i>Paulownia tomentosa</i>)	BB, CT	20% Garlon 4 BB, 2% RoundUp Pro CT	BB is selective to the treated species. RoundUp Pro is non-selective and requires accurate application.	Summer/Fall Treatment
Norway Maple (<i>Acer platanoides</i>)	BB, CT	20% Garlon 4 BB, 2% RoundUp Pro CT	BB is selective to the treated species. RoundUp Pro is non-selective and requires accurate application.	Summer/Fall Treatment
Privets (<i>Ligustrum vulgare</i> , <i>L. obtusifolium</i> , <i>L. sinense</i> , <i>L. japonicum</i>)	FT, CT	2% RoundUp Pro FT, 25% RoundUp Pro CT	RoundUp Pro non-selective...requires accurate application. CT is 100% selective.	Apply in late fall/early winter to avoid non target damage
Exotic Bush Honeysuckle (<i>Lonicera</i> : <i>L. maackii</i> , <i>L. morrowii</i> , <i>L. tatarica</i> , <i>L. standishii</i>)	FT, CT	2% RoundUp Pro FT and 25% CT	RoundUp Pro non-selective...requires accurate application. CT is 100% selective.	Apply in fall to avoid non target damage
Japanese and European Barberries (<i>Berberis thunbergii</i> , <i>Berberis vulgaris</i>)	FT, CT	2% RoundUp Pro	RoundUp Pro non-selective...requires accurate application.	Treat in mid-Spring (early May)
Burning Bush (<i>Euonymus alata</i>)	FT, CT	2% RoundUp Pro FT and 25% CT	Rodeo: non-selective...requires accurate application.	FT in summer/early fall, CT in mid-fall for easy id.
Multiflora Rose (<i>Rosa multiflora</i>)	FT	2% RoundUp Pro FT	RoundUp Pro non-selective...requires accurate application.	FT in mid-spring to early summer.
Autumn and Russian Olive (<i>Elaeagnus umbellata</i> and <i>Elaeagnus angustifolia</i> L.)	FT, CT	2% RoundUp Pro FT and 25% CT	RoundUp Pro non-selective...requires accurate application.	
Japanese Honeysuckle (<i>Lonicera japonica</i>)	FT, CT	2% RoundUp Pro FT and 25% CT	RoundUp Pro non-selective...requires accurate application.	Apply in late fall to avoid non target damage
Mile-a-Minute (<i>Polygonum perfoliatum</i>)	FT, PE	6 oz./Acre Plateau PE, 2% RoundUp Pro FT	Plateau: may harm native seed germination, but very selective to grass post emergent. RoundUp Pro non-selective...requires accurate application.	Plateau is not aquatic safe, but if applied correctly in upland area can eliminate 3-4 years of seedbank. Used upon COR approval. Application in March. Rodeo application Sept.
Oriental Bittersweet (<i>Celastrus orbiculatus</i>)	FT, CT	2% Garlon 3A FT, 25% Garlon 3A CT	Broadleaf selective	Cut ascending vines and treat stump. Treat for reprints
English Ivy (<i>Hedera helix</i>)	FT, CT	5% RoundUp Pro FT, 25% CT	RoundUp Pro non-selective...requires accurate application.	Although SOW calls for 1.5-2.5% glyphosate, IPC research indicates 5% is more effective. Used upon COR approval
Wisteria (<i>Wisteria sinensis</i>)	FT, CT	2% Garlon 3A FT, 25% Garlon 3A CT	Broadleaf selective	Mid Summer Treatment
Lespedeza (<i>Lespedeza cuneata</i>)	FT	2% Garlon 3A FT	RoundUp Pro non-selective...requires accurate application.	FT in early/mid summer.
Japanese Stiltgrass (<i>Microstegium vimineum</i>)	FT, PE	4 oz./Acre Plateau PE, 2% RoundUp Pro FT	Plateau: may harm native seed germination, but very selective to grass post emergent. RoundUp Pro non-selective...requires accurate application.	Plateau is not aquatic safe, but if applied correctly in upland area can eliminate 3-4 years of seedbank. Used upon COR approval. Application in March. R application Sept.

Basal Bark (BB), Cut & Treat (CT), Foliar Treatment (FT), Pre-Emergent (PE)

7.0 INTERVENTION BUDGET RECOMMENDATIONS

7.1 Budget Review

It is understood that current NNIP management budgets within the City relate to construction project specific afforestation efforts. These efforts tend to be limited in scope and duration as they relate to policy requirements. Once regulatory requirements are fulfilled, funding for the ongoing maintenance of these sites becomes the responsibility of the City of Bowie. Further development of specific budgets for the targeted study parcels is discussed in Section 8.0 Site Summaries.

7.2 Budget Recommendations

Budgetary estimates and recommendations are based upon a semi-quantitative inventory of infrastructure conditions and maintenance requirements. A professional opinion as to the current extent and severity of the invasive situation on the study parcels has been developed by the Biohabitats team. This estimate is grounded in the qualitative assessment of field conditions that was performed during the course of this project. While the total study parcel acreage is over 328, a GIS analysis indicates that only approximately 141 acres (on-site and adjacent to study areas) are occupied by NNIP. The invasive recommendations have thus been based upon a potential treatment area of 141 acres.

As the infestation analysis resulted in a range of values for the expected variability in invasive levels, the Biohabitats team created both a high and a low range of potential cover values. This information was used to create two potential treatment scenarios for the entire treatment area. Realistic per acre contract treatment costs were then integrated into each scenario based upon professional experience on the labor inputs that are required to address the various cover levels of invasives in each scenario. The intent of this computation was to produce an overview of the resource allocation that would be required to address the entire invasive suppression in the Bowie study parcels over a period of five years.

7.3 Labor Budget Estimates

A rough estimate of the cost of maintaining an in-house crew member with the proper equipment to treat NNIP would be approximately \$90,000 per year. There is the potential to significantly reduce this rate through the hiring of individuals without the prerequisite educational background; however the Biohabitats team does not support this strategy. As it is anticipated that most of the areas these individuals will be working on will have been pre-treated by professional contractors, the cover levels of invasive plants should be low. This will greatly enhance the daily per acre productivity of crews. As a point of comparison, the anticipated average productivity of two-person invasive field crews using backpack foliar techniques should fall within the ranges shown in Table 7.1.

Table 7.1 Estimated productivity of invasive treatment field crews by level of invasive infestation cover.

Invasive Cover Level	Two-Person Crew Productivity
1-2 (low)	4 acres per day
3 (medium)	2 acres per day
4-5 (high)	1 acre per day

It is anticipated that a large proportion of the treated acreage will eventually require no active treatment for extended periods of time as native plant communities and limitations on site disturbance reduce new infestations to a minimum.

7.4 Generalized Treatment Budget Estimates

It is difficult to put a static cost on an invasive plant project due to several inter-related variables. Hydrology (presence of water), topography, access, density, endangered/sensitive species, citizen concerns, and others tend to affect pricing. The following matrixes (Table 7.2) are designed as a guide for budgeting invasive plant programs. They are categorized by vegetation-type which includes trees, shrubs, vines, and herbs (grass & forbs). There are five distinct cover-classes and differing methodologies for each vegetation-type.

Table 7.2 Per Acre Invasive Species Management Costs by Vegetation Type

TREE COST PER ACRE SCHEDULE

% Cover	BASAL BARK	F/T (BACKPACK)	HACK/SQUIRT	GIRDLE	CUT/TREAT
1 (81-100%)	\$2500-\$2000	\$1500-\$1000	\$3000-\$2500	\$5000-\$4000	\$5000-\$4000
2 (61-80%)	\$2000-\$1500	\$1000-\$750	\$2500-\$1800	\$4000-\$3000	\$4000-\$3000
3 (41-60%)	\$1500-\$1000	\$750-\$500	\$1800-\$1200	\$3000-\$2000	\$3000-\$2000
4 (21-40%)	\$1000-\$500	\$500-\$250	\$1200-\$500	\$2000-\$1000	\$2000-\$1000
5 (1-20%)	\$500-\$10	\$250-\$10	\$500-\$10	\$1000-\$10	\$1000-\$10

SHRUB COST PER ACRE SCHEDULE

% Cover	BASAL BARK	F/T (BACKPACK)	F/T (ATV)	CUT/TREAT	GRUB
1 (81-100%)	\$2500-\$2000	\$1500-\$1000	\$600-\$450	\$5000-\$4000	\$10,000-\$8000
2 (61-80%)	\$2000-\$1500	\$1000-\$750	\$450-\$350	\$4000-\$3000	\$8000-\$6000
3 (41-60%)	\$1500-\$1000	\$750-\$500	\$350-\$250	\$3000-\$2000	\$6000-\$4000
4 (21-40%)	\$1000-\$500	\$500-\$250	\$250-\$100	\$2000-\$1000	\$4000-\$2000
5 (1-20%)	\$500-\$10	\$250-\$10	\$100-\$10	\$1000-\$10	\$2000-\$10

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VINE COST PER ACRE SCHEDULE

% Cover	F/T (BACKPACK)	F/T (ATV)	F/T (SPRAY RIG)	CUT/TREAT
1 (81-100%)	\$1500-\$1000	\$1500-\$1000	\$1500-\$1000	\$5000-\$4000
2 (61-80%)	\$1000-\$750	\$1000-\$750	\$1000-\$750	\$4000-\$3000
3 (41-60%)	\$750-\$500	\$750-\$500	\$750-\$500	\$3000-\$2000
4 (21-40%)	\$500-\$250	\$500-\$250	\$500-\$250	\$2000-\$1000
5 (1-20%)	\$250-\$10	\$250-\$10	\$250-\$10	\$1000-\$10

HERB COST PER ACRE SCHEDULE

% Cover	F/T (BACKPACK)	F/T (ATV)	F/T (BOOM)	GRUB
1 (81-100%)	\$2500-\$2000	\$1500-\$1000	\$600-\$450	\$5000-\$4000
2 (61-80%)	\$2000-\$1500	\$1000-\$750	\$450-\$350	\$4000-\$3000
3 (41-60%)	\$1500-\$1000	\$750-\$500	\$350-\$250	\$3000-\$2000
4 (21-40%)	\$1000-\$500	\$500-\$250	\$250-\$100	\$2000-\$1000
5 (1-20%)	\$500-\$10	\$250-\$10	\$100-\$10	\$1000-\$100

8.0 SITE SUMMARIES

8.1 Site Descriptions

The following section provides a site specific summary of each prioritized treatment study areas (Figure 8.1). Each summary includes the rank, acreage, existing condition, extent of invasive presence, volunteer opportunities, management action item recommendations and anticipated planning-level cost estimates for 5 years of implementation.

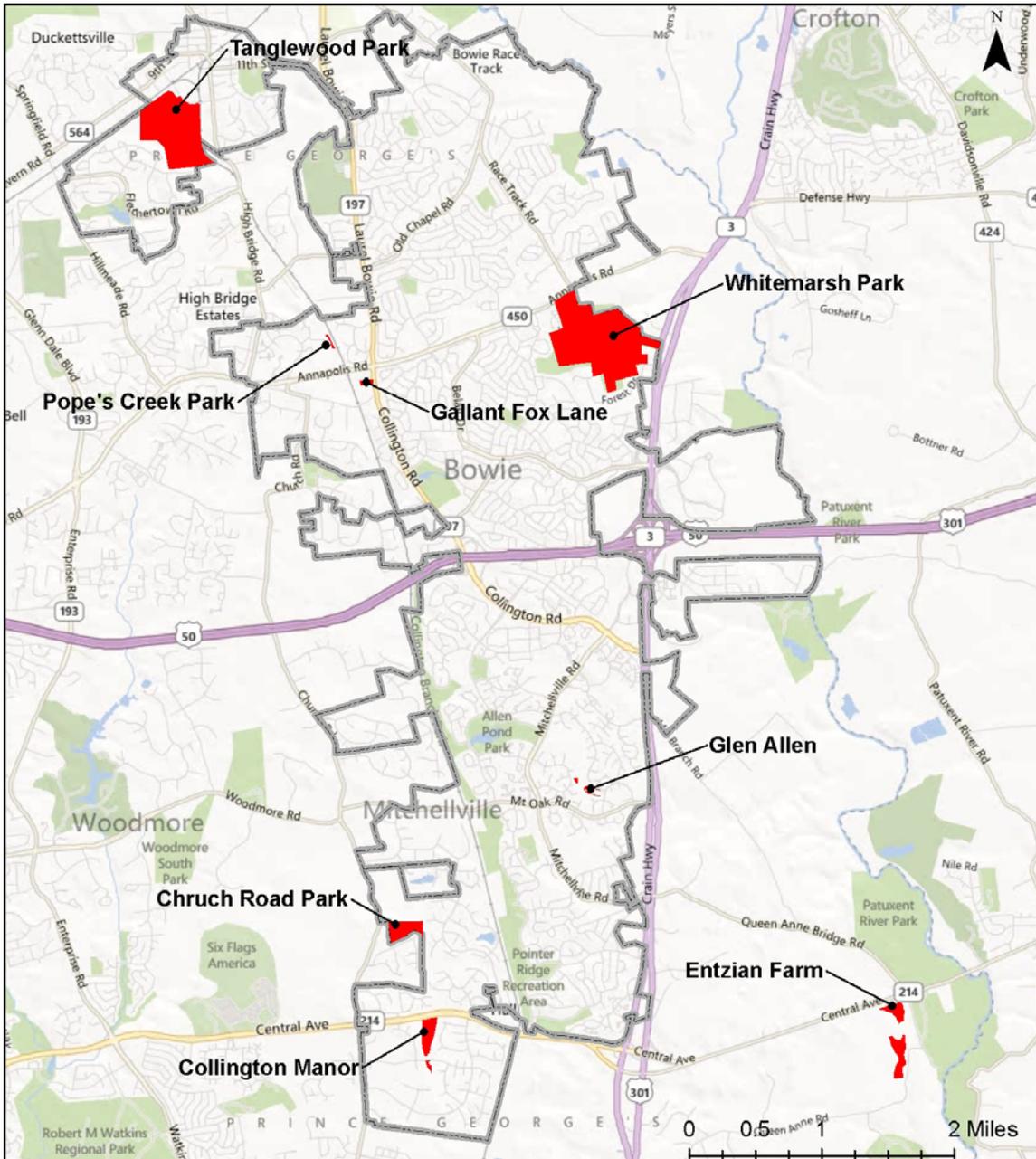


Figure 8.1 Location map for parcels targeted in the Bowie Invasive Species Management Study 2012.

Site Name: Whitemarsh Park

Priority Rank: 1 (Score 56, High)

Acreage of Parcel(s): 70.7, 97.5, 16.74, 1.69, 0.52, 3.93

Acreage of Study Site(s): 191

Use: Active Recreation, Passive Recreation, Open Space, Riparian Forest

Existing Conditions:

A large portion of this parcel contains active recreational buildings and fields. The other portion is predominantly mature mesic hardwood forest bisected with paved and wood chip paths. Once a residential estate, landscape plants have moved into the adjacent forested areas and now dominate the understory with ivy covered tulip poplar trunks on the eastern edge. NNIP densities become greatly reduced as you head west.



Extent Invasive Species On-Site:

Most of the NNIP species currently occur along the perimeter of the recreational open space along the forest edges and adjacent to paved paths through the forest. All other forested areas on site are relatively free of NNIP. Species observed include: Japanese honeysuckle, bittersweet, multiflora rose, Japanese stiltgrass, wisteria, privet, winged burning bush, barberry, autumn olive, and mile-a-minute.

Extent Invasive Species Adjacent to Site: The site is bound on the east and west by roads, and residential neighborhoods to the north and south. The forested edges along the north and south contain NNIP and the likelihood of migration of NNIP into the un-invaded forest area is high especially as older canopy tree begin to fall and gaps are created.

Volunteer Opportunities: Concentrate on cutting vines attached to trees easily accessible from paths and forest edges, preferably working in conjunction with herbicide applicators. Work from the outer edge of the infestation towards the areas of higher concentration. Pulling and/or grubbing of small shrubs can also be conducted with a group of volunteers.

Estimated Acreage of Treatment: 62.6

Recommended Action Items:

<u>Year</u>	<u>Recommended Action Item</u>	<u>Target</u>	<u>Timing</u>	<u>Estimated Cost</u>
1	Pre-emergent application	Annual herbaceous	Early Spring	\$250,000.00
	Cut and treat stems	Large Shrubs and Vines	Late Summer/Autumn	
	Basal bark application	Large Trees	Late Summer/Autumn	
2	Monitor		Spring	\$175,000.00
	Foliar application	Re-growth on cut shrubs and vines	Early Spring and Summer	
	Cut and treat stems	Trees and shrubs missed in Year 1	Late Summer/Autumn	
3	Monitor		Spring	\$65,000.00
	Foliar application	Re-growth of trees, shrubs and vines	Early Spring and Summer	
4	Monitor		Spring	\$16,000.00
	Grubbing/pulling	Small shrub and tree seedlings	Early Spring and Summer	
	Foliar application as needed	Spot treat new vine seedlings	Early Spring and Summer	
5	Monitor		Spring	\$16,000.00
	Grubbing/pulling as needed	New small seedlings	Spring and Summer	

Site Name: Tanglewood Park

Priority Rank: 2 (Score 54, High)

Acreage of Parcel(s): 2.25, 21.89, 56.41, 47.8

Acreage of Study Site(s): 128.35

Use: Open Space, Passive Recreation, Riparian Forest

Existing Conditions:

This site is primarily mature mixed hardwood (oak-hickory) forest with a mix of upland and wetland habitats across the site. An underutilized but well marked trail system bisects the forest community. A road into the site from the north has been abandoned and reverting back to forest. Main forest appears to be in good health with good species diversity and understory. Signs of deer impact on and around site not apparent.



Extent Invasive Species On-Site:

Most of the NNIP species currently occur along the perimeter of the site along the forest edge and along the north entrance and parking area. All other forested areas on site are relatively free of NNIP. Species observed include: Japanese honeysuckle, bittersweet, lespedeza, multiflora rose, Japanese stiltgrass, wisteria, privet, winged burning bush, Norway maple and princess tree.

Extent Invasive Species Adjacent to Site: The site is bound on two sides by rail lines, a residential neighborhood to the south and commercial property to the north. The likelihood of migration into the un-invaded forest area is high especially as older canopy tree begin to fall and gaps are created.

Volunteer Opportunities: Concentrate on cutting vines attached to trees easily accessible from paths and forest edges, preferably working in conjunction with herbicide applicators. Work from the outer edge of the infestation towards the areas of higher concentration. Pulling and/or grubbing of small shrubs can also be conducted with a group of volunteers.

Estimated Acreage of Treatment: 16.6

Recommended Action Items:

<u>Year</u>	<u>Recommended Action Item</u>	<u>Target</u>	<u>Timing</u>	<u>Estimated Cost</u>
1	Pre-emergent application	Annual herbaceous	Early Spring	\$66,000.00
	Cut and treat stems	Large Shrubs and Vines	Late Summer/Autumn	
	Basal bark application	Large Trees	Late Summer/Autumn	
2	Monitor		Spring	\$70,000.00
	Foliar application	Re-growth on cut shrubs and vines	Early Spring and Summer	
	Cut and treat stems	Trees and shrubs missed in Year 1	Late Summer/Autumn	
3	Monitor		Spring	\$17,000.00
	Foliar application	Re-growth of trees, shrubs and vines	Early Spring and Summer	
4	Monitor		Spring	\$5,000.00
	Grubbing/pulling	Small shrub and tree seedlings	Early Spring and Summer	
	Foliar application as needed	Spot treat new vine seedlings	Early Spring and Summer	
5	Monitor		Spring	\$5,000.00
	Grubbing/pulling as needed	New small seedlings	Spring and Summer	

Site Name: Pope’s Creek Park

Priority Rank: 3 (Score 49, High)

Acreage of Parcel(s): 12.52

Acreage of Study Site(s): 0.9

Use: Active/Planned Recreation, Open Space, Afforestation

Existing Conditions:

This site is an afforestation site consisting of a narrow strip of planted trees along a railroad in an actively used park containing baseball and soccer fields. It appears to have been chosen to increase the existing buffer of the park from the railroad. The afforestation site was previously mowed grass and is now reverting to an unmaintained herbaceous community currently free of NNIP species.



Extent Invasive Species On-Site: No NNIP currently within the selected afforestation site.

Extent Invasive Species Adjacent to Site: Adjacent forested narrow hedgerow areas moderately invaded with a variety of tree, shrub, herbaceous and vine NNIP species. Species observed include: Japanese honeysuckle, multiflora rose, Callery pear, bush honeysuckle, and lespedeza. The likelihood of migration into the afforestation area is high.

Notes: The afforestation trees appear to be in good health with high survival rate. Signs of heavy deer usage on and around the site show potential for severe impact to natural regeneration of native plant communities.

Volunteer Opportunities: Most of this treatment area is very accessible. Girdling Callery pear trees, cut vines, and pulling and/or grubbing of small shrubs can also be conducted with a group of volunteers.

Estimated Acreage of Treatment: 1.7

Recommended Action Items:

<u>Year</u>	<u>Recommended Action Item</u>	<u>Target</u>	<u>Timing</u>	<u>Estimated Cost</u>
1	Cut and treat stems	Large Shrubs and Vines	Late Summer/Autumn	\$7,000.00
	Basal bark application	Large Trees	Late Summer/Autumn	
2	Monitor		Spring	\$3,500.00
	Foliar application	Re-growth on cut shrubs and vines	Early Spring and Summer	
	Cut and treat stems	Trees and shrubs missed in Year 1	Late Summer/Autumn	
3	Monitor		Spring	\$1,800.00
	Foliar application	Re-growth of trees, shrubs and vines	Early Spring and Summer	
4	Monitor		Spring	\$500.00
	Grubbing/pulling	Small shrub and tree seedlings	Early Spring and Summer	
	Foliar application as needed	Spot treat new vine seedlings	Early Spring and Summer	
5	Monitor		Spring	\$500.00
	Grubbing/pulling as needed	New small seedlings	Spring and Summer	

Site Name: Gallant Fox Lane

Priority Rank: 4 (Score 45, Medium)

Acreage of Parcel(s): 1.57, 3.43, 0.24, 1.78, 1.3

Acreage of Study Site(s):

Use: Open Space, Passive Recreation, Afforestation

Existing Conditions:

This site was previously a parking lot for the Bowie Business Park and was converted to forested open space. Minimal site preparation and soil amendments have left poor growing conditions for planted native trees and shrubs.



Extent Invasive Species On-Site: A couple NNIP species currently occur sporadically within the selected afforestation site. Species observed include: lespedeza and multiflora rose.

Extent Invasive Species Adjacent to Site: Adjacent forested areas are heavily invaded with a variety of tree, shrub, herbaceous and vine NNIP species especially along the forest edge. Species observed include: Japanese honeysuckle, multiflora rose, Callery pear, bush honeysuckle, privet and English ivy. The likelihood of migration into the afforestation area is high.

Notes: The planting are showing poor health and low survival rates. A short cinder path bisects a portion of the site. Signs of heavy deer usage on and around the site show potential for severe impact to natural regeneration of native plant communities.

Volunteer Opportunities: Most of this treatment area is very accessible. Girdling Callery pear trees, cut vines, and pulling and/or grubbing of small shrubs can also be conducted with a group of volunteers.

Estimated Acreage of Treatment: 1

Recommended Action Items:

<u>Year</u>	<u>Recommended Action Item</u>	<u>Target</u>	<u>Timing</u>	<u>Estimated Cost</u>
1	Cut and treat stems	Large Shrubs and Vines	Late Summer/Autumn	\$3,000.00
	Basal bark application	Large Trees	Late Summer/Autumn	
2	Monitor		Spring	\$2,000.00
	Foliar application	Re-growth on cut shrubs and vines	Early Spring and Summer	
	Cut and treat stems	Trees and shrubs missed in Year 1	Late Summer/Autumn	
3	Monitor		Spring	\$1,000.00
	Foliar application	Re-growth of trees, shrubs and vines	Early Spring and Summer	
4	Monitor		Spring	\$300.00
	Grubbing/pulling	Small shrub and tree seedlings	Early Spring and Summer	
	Foliar application as needed	Spot treat new vine seedlings	Early Spring and Summer	
5	Monitor		Spring	\$300.00
	Grubbing/pulling as needed	New small seedlings	Spring and Summer	

Site Name: Collington Manor

Priority Rank: 5 (Score 44, Medium)

Acreage of Parcel(s): 1.69, 11.77, 2.68, 4.73, 1.73, 0.73

Acreage of Study Site(s): A- 14.6, B- 1.8

Use: Open Space, Afforestation Area

Existing Conditions:

This site appears to be two open space afforestation sites situated between two residential neighborhoods. Larger planting stock was used in this afforestation and weed suppression has occurred immediately around the trees. Most of the site is upland with pockets of wetland towards the northern end. Many volunteer black locust trees are spread across the site. The planting has served to fill in canopy gaps.



Extent Invasive Species On-Site: A couple NNIP species currently occur ubiquitously within the selected afforestation site. Species observed include: lespedeza and Japanese honeysuckle.

Extent Invasive Species Adjacent to Site: Adjacent forested areas heavily invaded with a variety of tree, shrub, herbaceous and vine NNIP species. Species observed include: Japanese honeysuckle, multiflora rose, Callery pear, autumn olive, bittersweet, and lespedeza. The likelihood of migration into the afforestation area is high.

Notes: Afforestation trees appear to be in good health with high survival rate. Signs of heavy deer usage on and around the sites were observed, with potential for severe impact to natural regeneration. An 8' wide dirt dual track trail bisects the site and some dumping of trash and debris has occurred. GIS data shows proposed hiker/biker trail through the site.

Volunteer Opportunities: Most of this treatment area is very accessible. Girdling Callery pear trees, cut vines, and pulling and/or grubbing of small shrubs can also be conducted with a group of volunteers.

Estimated Acreage of Treatment: 23

Recommended Action Items:

<u>Year</u>	<u>Recommended Action Item</u>	<u>Target</u>	<u>Timing</u>	<u>Estimated Cost</u>
1	Cut and treat stems	Large Shrubs and Vines	Late Summer/Autumn	\$70,000.00
	Basal bark application	Large Trees	Late Summer/Autumn	
2	Monitor		Spring	\$50,000.00
	Foliar application	Re-growth on cut shrubs and vines	Early Spring and Summer	
	Cut and treat stems	Trees and shrubs missed in Year 1	Late Summer/Autumn	
3	Monitor		Spring	\$24,000.00
	Foliar application	Re-growth of trees, shrubs and vines	Early Spring and Summer	
4	Monitor		Spring	\$6,000.00
	Grubbing/pulling	Small shrub and tree seedlings	Early Spring and Summer	
	Foliar application as needed	Spot treat new vine seedlings	Early Spring and Summer	
5	Monitor		Spring	\$6,000.00
	Grubbing/pulling as needed	New small seedlings	Spring and Summer	

Site Name: Entzian Farm

Priority Rank: 6 (Score 43, Medium)

Acreage of Parcel: Unknown

Acreage of Study Site(s): 1- 9.1, 2- 13.2

Use: Agriculture, Open Space, Afforestation, Riparian Buffer

Existing Conditions:

This farm site was purchased by the City to dispose of sludge which has since ceased. The site is currently leased for hay production. Two riparian areas were planted in 2012 as part of ICC mitigation requirements. Whip size stock was planted in staked tree tubes and weeds have kept down using herbicide. There appears to be a very low first year survival rate with black locust doing the best. As this is a recent planting in previously open meadow NNI plants are limited in the project sites but adjacent hedgerows provide a source of NNIP propagules.



Invasive Species Present: Currently no NNIP are present within the two planting areas.

Invasive Species Adjacent: The forested hedgerows bordering the afforestation planting areas contain numerous NNIP species. The species observed include: Japanese honeysuckle, multiflora rose, and Callery pear. Although a 10 foot wide clear swath is currently maintained between the afforestation areas and the hedgerows the likelihood of migration into the afforestation area is high.

Volunteer Opportunities: Most of this treatment area is very accessible. Girdling Callery pear trees, cut vines, and pulling and/or grubbing of small shrubs can also be conducted with a group of volunteers.

Estimated Acreage of Treatment: 6.2

Recommended Action Items:

<u>Year</u>	<u>Recommended Action Item</u>	<u>Target</u>	<u>Timing</u>	<u>Estimated Cost</u>
1	Cut and treat stems	Large Shrubs and Vines	Late Summer/Autumn	\$18,000.00
	Basal bark application	Large Trees	Late Summer/Autumn	
2	Monitor		Spring	\$12,000.00
	Foliar application	Regrowth on cut shrubs and vines	Early Spring and Summer	
	Cut and treat stems	Trees and shrubs missed in Year 1	Late Summer/Autumn	
3	Monitor		Spring	\$6,500.00
	Foliar application	Regrowth of trees, shrubs and vines	Early Spring and Summer	
4	Monitor		Spring	\$2,000.00
	Grubbing/pulling	Small shrub and tree seedlings	Early Spring and Summer	
	Foliar application as needed	Spot treat new vine seedlings	Early Spring and Summer	
5	Monitor		Spring	\$1,500.00
	Grubbing/pulling as needed	New small seedlings	Spring and Summer	

Site Name: Glen Allen

Priority Rank: 7 (Score 42.5, Medium)

Acreage of Parcel(s): 5.63, 13.85

Acreage of Study Site(s): 1- 0.6, 2- 0.6, 3- 0.2, 4- 0.6

Use: Stormwater Management, Passive Recreation, Open Space, Riparian Forest, Afforestation

Existing Site Conditions: Recently planted afforestation sites that fill in canopy gaps surrounding a drainage/SWM facility in residential development. Afforestation sites previously mowed grass and currently unmowed herbaceous community free of NNIP.



Extent Invasive Species On-Site: No NNIP currently within the selected afforestation sites.

Extent Invasive Species Adjacent to Site: Adjacent forested areas heavily invaded with a variety of tree, shrub, herbaceous and vine NNIP species. Species observed include: Japanese honeysuckle, multiflora rose, Callery pear, autumn olive, bush honeysuckle, and Japanese stiltgrass. The likelihood of migration into the afforestation area is high.

Notes: Afforestation trees appear to be in good health with high survival rate. Signs of heavy deer usage exist on and around the sites with potential for severe impact to natural regeneration.

Volunteer Opportunities: Most of this treatment area is very accessible, start at trail and forest edge working into the impacted area. Girdling Callery pear trees, cut vines, and pulling and/or grubbing of small shrubs can also be conducted with a group of volunteers.

Estimated Acreage of Treatment: 5.7

Recommended Action Items:

<u>Year</u>	<u>Recommended Action Item</u>	<u>Target</u>	<u>Timing</u>	<u>Estimated Cost</u>
1	Pre-emergent application	Annual herbaceous	Early Spring	\$17,000.00
	Cut and treat stems	Large Shrubs and Vines	Late Summer/Autumn	
	Basal bark application	Large Trees	Late Summer/Autumn	
2	Monitor		Spring	\$12,000.00
	Foliar application	Regrowth on cut shrubs and vines	Early Spring and Summer	
	Cut and treat stems	Trees and shrubs missed in Year 1	Late Summer/Autumn	
3	Monitor	Regrowth of trees, shrubs and vines	Spring	\$6,000.00
	Foliar application		Early Spring and Summer	
4	Monitor		Spring	\$2,000.00
	Grubbing/pulling	Small shrub and tree seedlings	Early Spring and Summer	
	Foliar application as needed	Spot treat new vine seedlings	Early Spring and Summer	
5	Monitor		Spring	\$1,500.00
	Grubbing/pulling as needed	New small seedlings	Spring and Summer	

Site Name: Church Road Park

Priority Rank: 8 (Score 42, Medium)

Acreage of Parcel: 97.6

Acreage of Study Site(s): Bank – 8; Site #1 – 2.81; and Site #2 – 1.56

Use: Afforestation, Open Space

Existing Conditions:

This site is a mosaic of varying degrees of afforestation and ecological succession. Previously a fallow farm parcel, this site contains numerous “weedy” tree and shrub species both NNIP and natives growing from the hedgerows into abandoned fields.



Invasive Species Present Onsite: A couple of NNIP species currently occur throughout the Bank, Site #1 and Site #2. Species observed include: Japanese honeysuckle, bittersweet, Callery pear, mile-a-minute, Japanese stiltgrass, and multiflora rose.

Invasive Species Adjacent: The Bank, Site #1 and Site #2 are bounded by residential development and old field. The NNIP species observed along these boundaries are the same as the ones occurring throughout the site.

Notes: The plantings in the Bank and Site #1 are showing moderate survival rates. The plantings in Site #2 are in good health, but have outgrown their tree tubes. Signs of heavy deer usage within Church Road Park show a potential for severe impact to natural regeneration of native plant communities.

Volunteer Opportunities: Most of this treatment area is accessible from roads but there are no trails. Work from the forest edge into impacted areas. Girdling Callery pear trees, cut vines, and pulling and/or grubbing of small shrubs can also be conducted with a group of volunteers.

Estimated Acreage of Treatment: 24.6

Recommended Action Items:

<u>Year</u>	<u>Recommended Action Item</u>	<u>Target</u>	<u>Timing</u>	<u>Estimated Cost</u>
1	Pre-emergent application	Annual herbaceous	Early Spring	\$74,000.00
	Cut and treat stems	Large Shrubs and Vines	Late Summer/Autumn	
	Basal bark application	Large Trees	Late Summer/Autumn	
2	Monitor		Spring	\$50,000.00
	Foliar application	Regrowth on cut shrubs and vines	Early Spring and Summer	
	Cut and treat stems	Trees and shrubs missed in Year 1	Late Summer/Autumn	
3	Monitor		Spring	\$25,000.00
	Foliar application	Regrowth of trees, shrubs and vines	Early Spring and Summer	
4	Monitor		Spring	\$6,000.00
	Grubbing/pulling	Small shrub and tree seedlings	Early Spring and Summer	
	Foliar application as needed	Spot treat new vine seedlings	Early Spring and Summer	
5	Monitor		Spring	\$6,000.00
	Grubbing/pulling as needed	New small seedlings	Spring and Summer	

8.2 Five-year Implementation Budget Estimate

The following information in Table 8.1 provides an estimated cost range for invasive vegetation treatment for all eight of the study area sites for each year over a period of five years. Upper and lower estimated cost limits are based on prices developed through comparison projects conducted within the region over the last 5-7 years. Current costs may vary due to fluctuations in materials, equipment and labor over time.

The range of estimated costs for treating the entire study area over a five year period varies from \$600,000 to approximately \$1 million USD. Variability in timing and methodology of treatment, climatic conditions, and labor type used can impact the effectiveness of treatment and ultimately the cost. However, it can generally be expected that annual costs should reduce with each consecutive treatment.

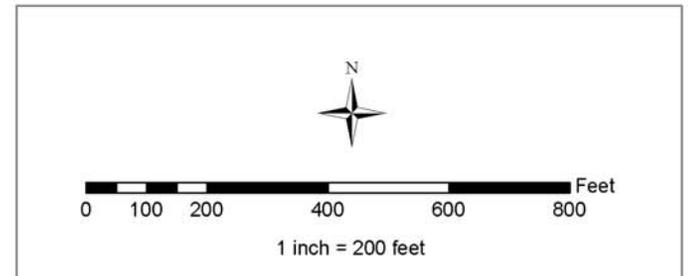
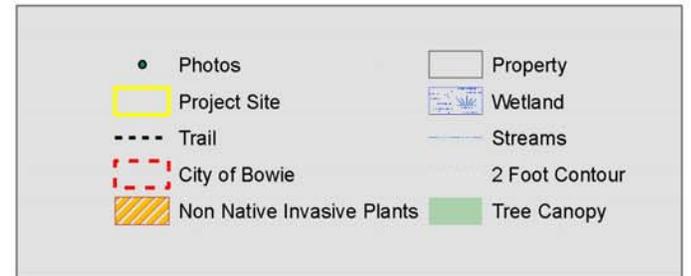
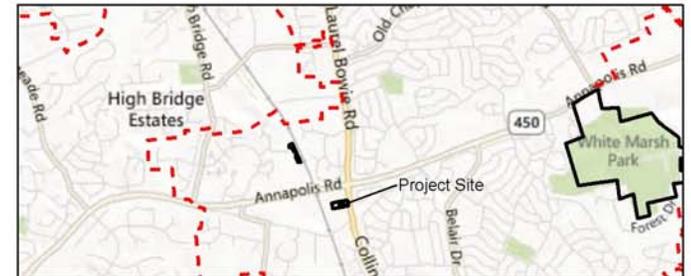
City of Bowie
INVASIVE SPECIES MANAGEMENT STUDY
 Bowie, Maryland

Table 8.1 Estimated annual invasive treatment cost range comparison for all Bowie study sites.

Parcel		Pope's Creek	Gallant Fox	Entzian Farm	Glen Allen	Collington Manor	Tanglewood Park	Whitemarsh Park	Church Road Park	
Acreage		1.7	1	6.2	5.7	23	16.6	62.6	24.6	
Year 1	Upper	\$7,000	\$3,000	\$18,000	\$17,000	\$70,000	\$66,000	\$250,000	\$74,000	\$505,000
	Lower	\$5,000	\$2,000	\$12,000	\$11,000	\$46,000	\$50,000	\$175,000	\$50,000	\$351,000
Year 2	Upper	\$3,500	\$2,000	\$12,000	\$12,000	\$50,000	\$70,000	\$175,000	\$50,000	\$374,500
	Lower	\$1,800	\$1,000	\$6,500	\$6,000	\$24,000	\$50,000	\$130,000	\$25,000	\$244,300
Year 3	Upper	\$1,800	\$1,000	\$6,500	\$6,000	\$24,000	\$17,000	\$65,000	\$25,000	\$146,300
	Lower	\$100	\$100	\$100	\$100	\$300	\$200	\$1,000	\$300	\$2,200
Year 4	Upper	\$500	\$300	\$2,000	\$2,000	\$6,000	\$5,000	\$16,000	\$6,000	\$37,800
	Lower	\$100	\$100	\$100	\$100	\$300	\$200	\$600	\$300	\$1,800
Year 5	Upper	\$500	\$300	\$1,500	\$1,500	\$6,000	\$5,000	\$16,000	\$6,000	\$36,800
	Lower	\$100	\$100	\$100	\$100	\$300	\$200	\$600	\$300	\$1,800
Sum	Upper	\$13,300	\$6,600	\$40,000	\$38,500	\$156,000	\$163,000	\$522,000	\$161,000	\$1,100,400
	Lower	\$7,100	\$3,300	\$18,800	\$17,300	\$70,900	\$100,600	\$307,200	\$75,900	\$601,100

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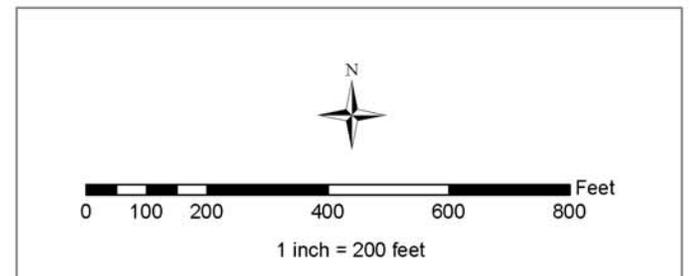
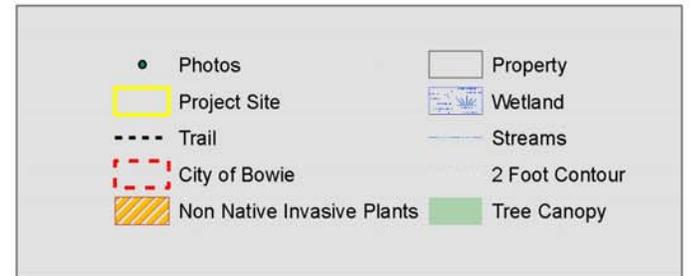
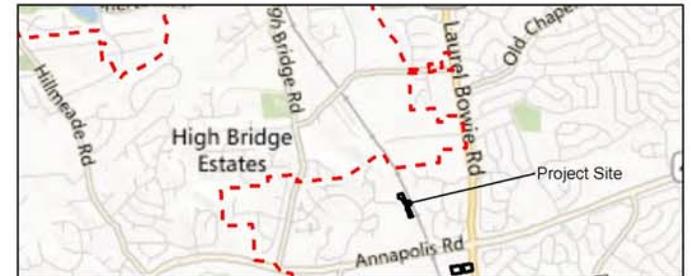
Appendix A- Bowie Invasive Management Study Area Maps



Gallant Fox

City of Bowie Invasive Species Management Study

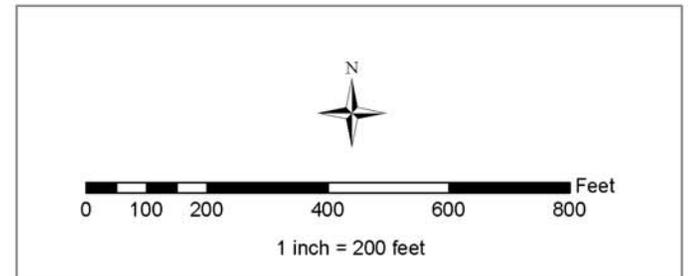
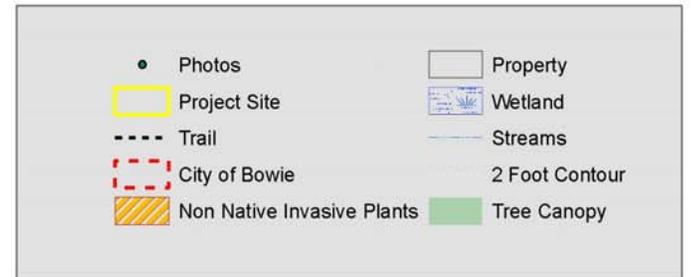
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2/13/2013



Popes Creek Park

City of Bowie Invasive Species Management Study

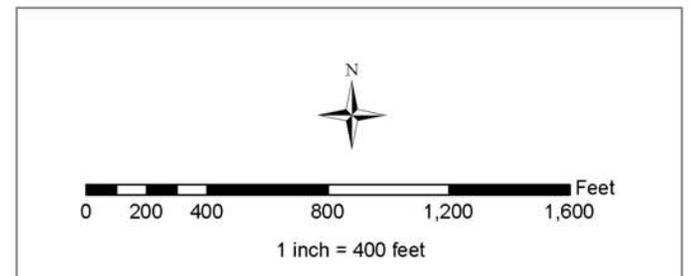
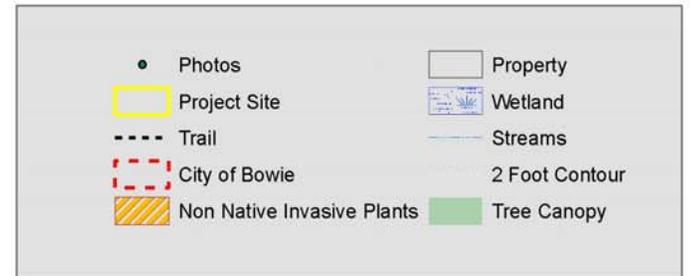
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2/13/2013



Glen Allen

City of Bowie Invasive Species Management Study

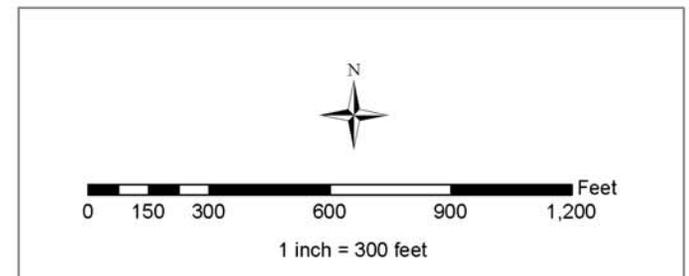
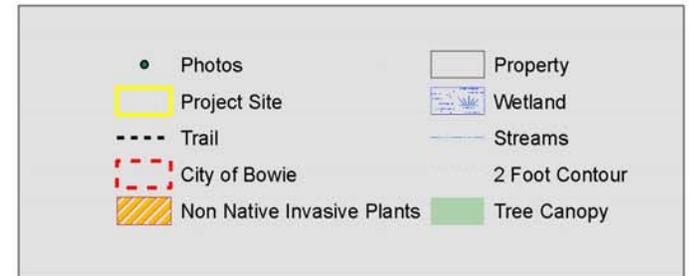
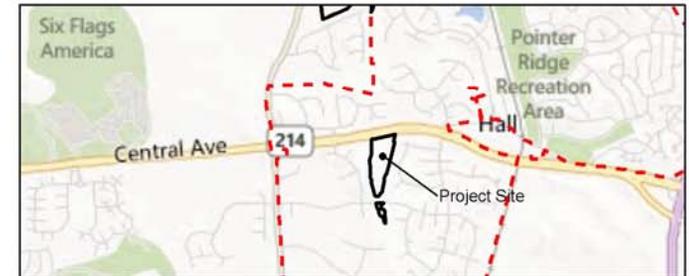
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Entzian Farm

City of Bowie Invasive Species Management Study

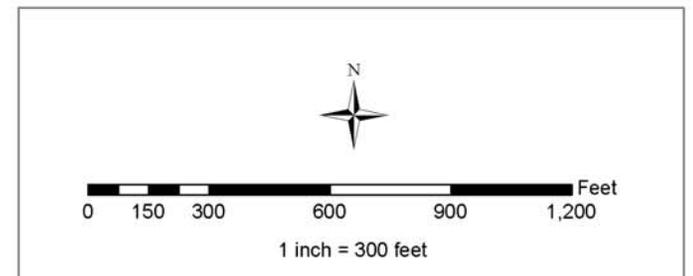
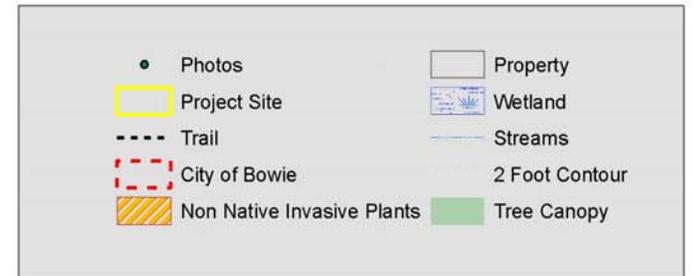
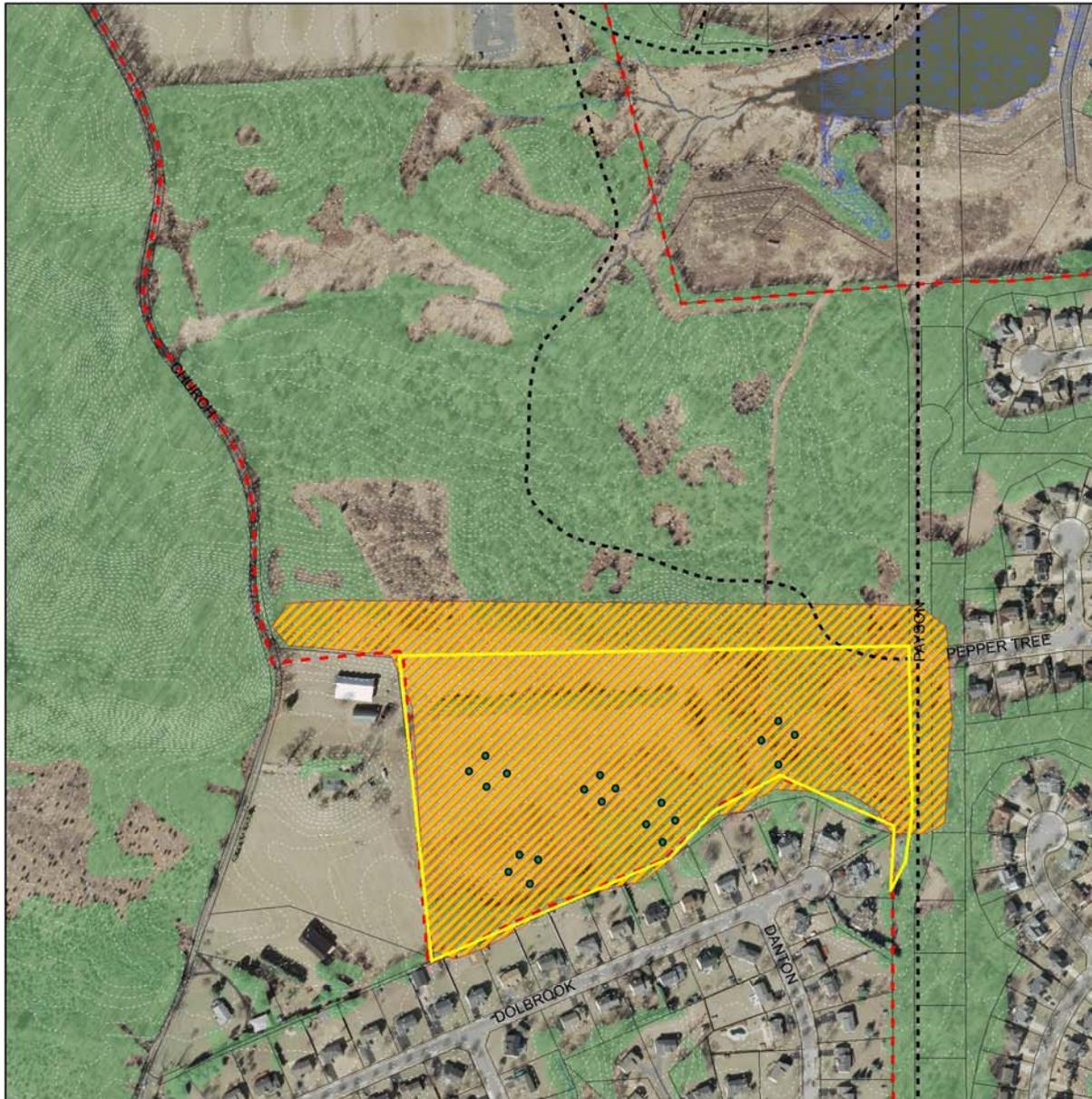
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Collington Manor

City of Bowie Invasive Species Management Study

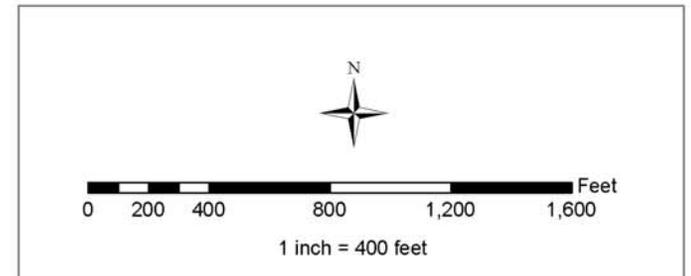
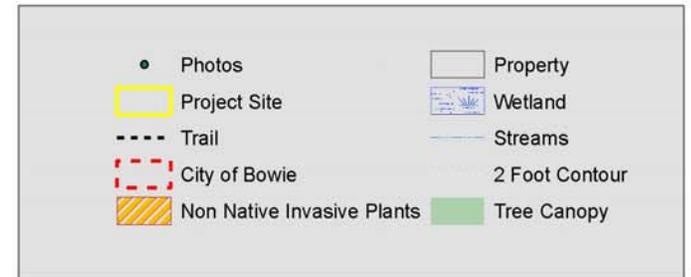
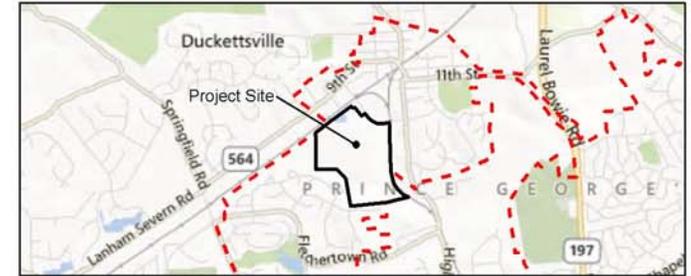
Bowie, Prince George's County, Maryland
2/13/2013



Church Road Park

City of Bowie Invasive Species Management Study

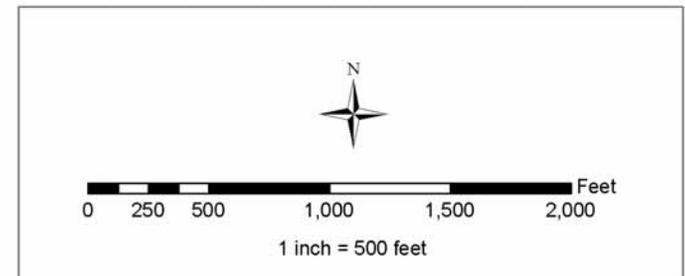
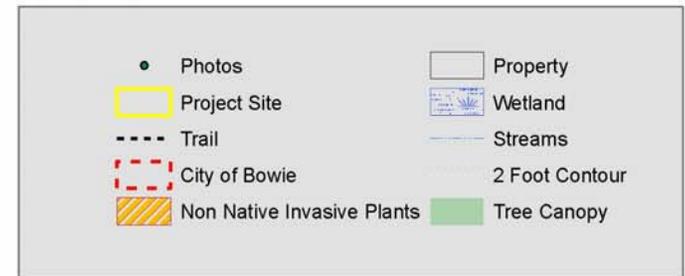
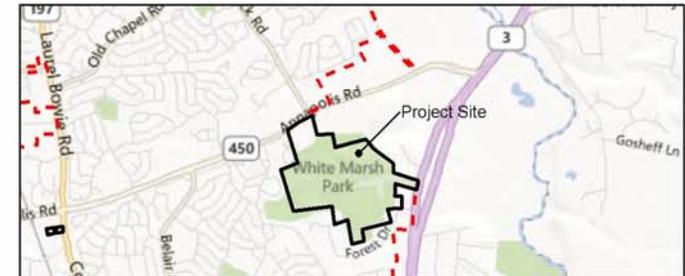
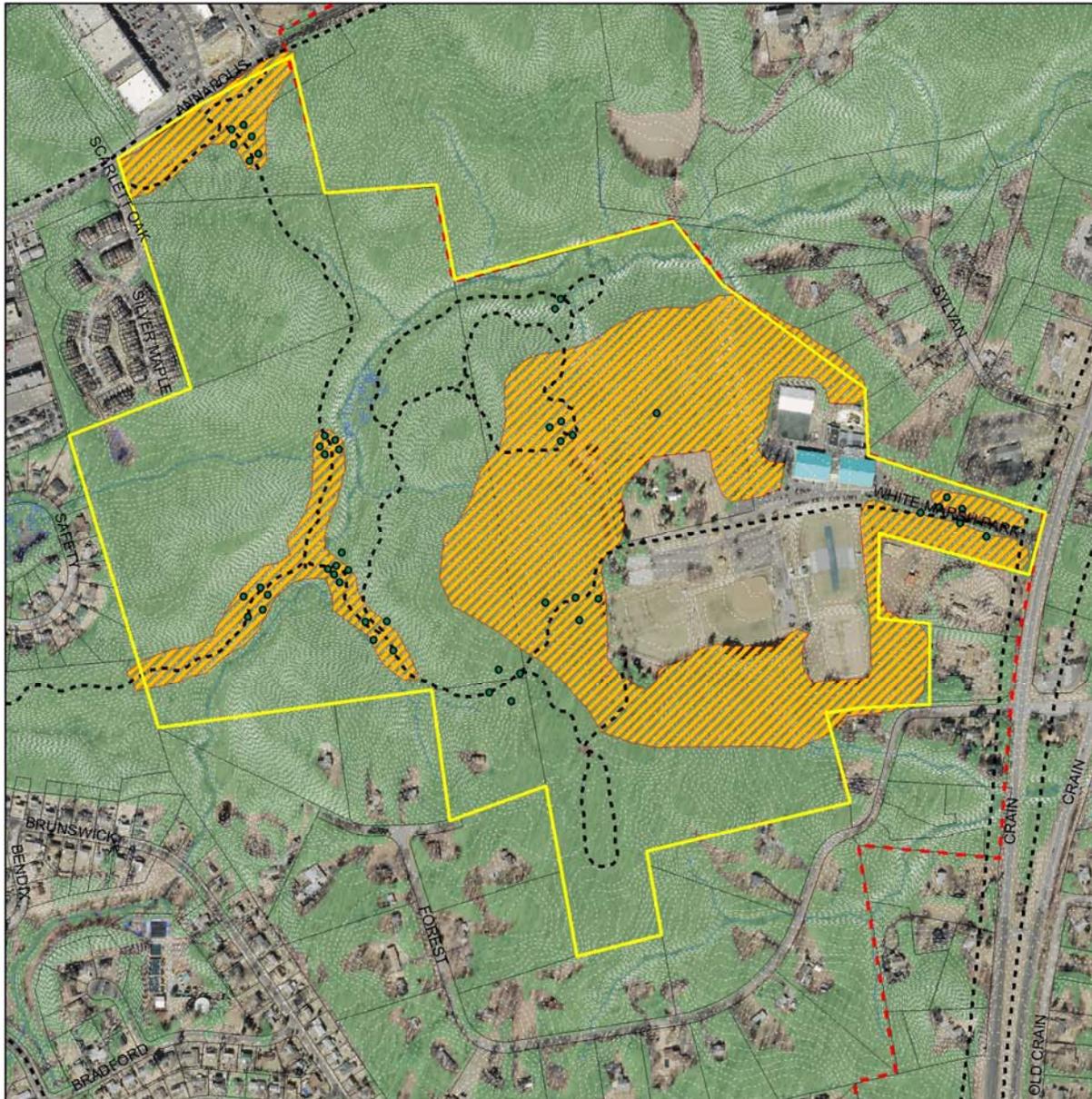
Bowie, Prince George's County, Maryland
2/13/2013



Tanglewood Park

City of Bowie Invasive Species Management Study

Bowie, Prince George's County, Maryland
2/13/2013



Whitemarsh Park

City of Bowie Invasive Species Management Study

Bowie, Prince George's County, Maryland
2/13/2013

Appendix B- Bowie Invasive Management Study Area List of Species

Appendix B Complete list of study area invasive plant species.

<u>Common Name</u>	<u>Scientific Name</u>
Japanese Honeysuckle	<i>Lonicera japonica</i>
Callery Pear	<i>Pyrus calleryana</i>
Multiflora Rose	<i>Rosa multiflora</i>
Bush Honeysuckle	<i>Lonicera spp.</i>
Lespedeza	<i>Lespedeza cuneata</i>
Privet	<i>Ligustrum spp.</i>
English Ivy	<i>Hedera helix</i>
Bittersweet	<i>Celastrus orbiculatus</i>
Japanese Stiltgrass	<i>Microstegium vimineum</i>
Chinese Wisteria	<i>Wisteria sinensis</i>
Winged Burning Bush	<i>Euonymus alatus</i>
Norway Maple	<i>Acer platanoides</i>
Princess Tree	<i>Paulownia tomentosa</i>
Japanese Barberry	<i>Berberis thunbergii</i>
Autumn Olive	<i>Elaeagnus umbellata</i>
Mile-a-Minute	<i>Persicaria perfoliata</i>

Appendix C- Invasive Treatment Case Study Comparison

Project Name:**Great Smoky Mountains National
Park 2008 Invasive Plant Management**

Agency Contract National Park Service

Project Description:

- Mimosa, Common Privet
- Moderate infestation
- Methodology: Cut and treat

Approx. Area of Project: 125 acres
2008 \$40,300

- Cost/Acre **\$322.40**

Total Cost \$40,300

Contracted project completed for the Great Smoky Mountains National park in the fall of 2008. Two sites were managed for a total of approximately 125 Acres. These sites included 3.5 miles of Foothills Parkway with 100 foot buffer (42 Acres), 1 Acre Privet on Foothills Pkwy along bridge site and 82 acres of privet control on Peachtree Creek Branch. Each site created unique work scenarios. The Peachtree Branch site was located on steep terrain down the side of a mountain in the dense forest canopy making access difficult. The Foothills Parkway site involved typical roadside obstacles that had to be accounted for.

<i>Scientific Name</i>	Common name	Cut and Treat	Girdle	Foliar Spray	Grub	Basal Bark
Tree Species						
<i>Ailanthus altissima</i>	Tree of Heaven	X	X	X	X	X
<i>Albizia julibrissin</i>	Silk tree	X	X	X	X	X
<i>Paulownia tomentosa</i>	Princess tree	X	X	X	X	X
Multistemmed Species						
<i>Ligustrum sinense</i>	Privet	X		X	X	X
<i>L. maackii</i>	Amur honeysuckle	X		X	X	X
<i>Rosa multiflora</i>	Multiflora rose	X		X		X
<i>Elaeagnus fortunei</i>	Autumn olive	X		X		X

Project Name

Warner Parks (City of Nashville)

Agency Contract

Friends of Warner Park (NGO)

Project Description:

- Bush honeysuckle
- Heavy infestation
- Methodology: Cut and treat

Approx. Area of Project:

100 acres

- Cost/Acre

\$1300

Total Cost

\$130,000

Progress:

The 3,000 acre Warner Parks contains Oak/Hickory hardwood forests that are heavily infested with the invasives listed on the next page. The primary control interventions have been either mechanical removal or cutting and treating the multi stemmed species throughout the park.



The photo above is before cutting and treating. The photo below shows the results after a few hours of cutting and treating bush honeysuckle



Plants treated at Warner Parks:

<i>Scientific Name</i>	Common name	Cut and Treat	Girdle	Foliar Spray	Grub	Basal Bark
Tree Species						
<i>Ailanthus altissima</i>	Tree of Heaven	X	X	X	X	X
<i>Albizia julibrissin</i>	Silk tree	X	X	X	X	X
<i>Paulownia tomentosa</i>	Princess tree	X	X	X	X	X
Multistemmed Species						
<i>Berberis thunbergii</i>	Japanese barberry	X		X		
<i>Ligustrum sinense</i>	Privet	X		X	X	X
<i>L. maackii</i>	Amur honeysuckle	X		X	X	X
<i>Rosa multiflora</i>	Multiflora rose	X		X		X
<i>Elaeagnus fortunei</i>	Autumn olive	X		X		X
<i>Euonymus alatus</i>	Burning bush	X		X	X	X
<i>Lespedeza bicolor</i>	Shrub lespedeza	X		X		
<i>Poncirus trifoliata</i>	Trifoliata Orange	X		X	X	
Herbaceous Species						
<i>Microstegium vinineum</i>	Japanese stiltgrass			X	X	
<i>Lespedeza cuneata</i>	Sirecea lespedeza			X		
<i>Sorghum halepense</i>	Johnsongrass			X		
<i>Schedonorus phoenix</i>	Tall fescue			X		
<i>Cirsium arvense</i>	Canada thistle			X		
<i>Carduus nutans L.</i>	Musk thistle			X		
Vine Species						
<i>Euonymus fortunei</i>	Climbing Euonymous	X		X	X	
<i>Lonicera japonica</i>	Japanese honeysuckle	X		X	X	
<i>Vinca minor</i>	Periwinkle			X	X	
<i>Vinca major</i>	Large-leafed periwinkle			X	X	
<i>Hedera helix</i>	English ivy	X		X	X	
<i>Wisteria spp</i>	Chinese wisteria	X		X		
<i>Ampelopsis brevipedicularis</i>	Porcelain berry	X		X		

Project Name:

G. Washington Memorial Parkway, VA

Agency Contract

National Park Service

Project Description:

- Porcelain berry
- Moderate infestation
- Cut and treat
- 1 time treatment

Approx. Area of Project:
2007

170 acres

- Cut & treat
 - Cost/Acre

\$42,000

\$247.00

Progress:

Contracted treatment program involved cutting vines from trees, specifically Oriental bittersweet, English ivy and Japanese honeysuckle. Larger stumps were immediately treated with an approved herbicide. English ivy was treated separately with a foliar spray. .



Selective application timing and materials protects desirable species in treatment zones. This fern survived a foliar application along the Parkway due to awareness by contractor of non-target species.

Plants treated at George Washington Memorial Parkway:

<i>Scientific Name</i>	Common name	Cut and Treat	Girdle	Foliar Spray	Grub	Basal Bark
Vine Species						
<i>Celastrus orbiculata</i>	Oriental bittersweet	X		X	X	
<i>Lonicera japonica</i>	Japanese honeysuckle	X		X	X	
<i>Vinca minor</i>	Periwinkle			X	X	
<i>Hedera helix</i>	English ivy	X		X	X	
<i>Ampelopsis brevipedicularis</i>	Porcelain berry	X		X		



Project Name:

Rock Creek Park National Park, DC

Agency Contract

National Park Service

Project Description:

- Lesser celandine, Wisteria, Porcelain berry, Garlic Mustard
- Heavy infestation
- Cut and treat, foliar treat

2008

- Lesser Celandine (1st treatment) \$18,096.00
 - Acres 31.4
 - Cost/Acre **\$576.31**
- Lesser Celandine (2nd treatment) \$18,096.00
 - Acres 87.8
 - Cost/Acre **\$206.10**
- Foliar treat (3rd treatment) \$36,192.00
 - Acres 55.6
 - Cost/Acre **\$650.94**
- Shrubs, vines, ivy (1st treatment) \$3981.12
 - Acres 1
 - Cost/Acre **\$3981.12**

Total cost of project

42,000.82

Progress:

Rock Creek National Park has contracted treatment for five years. First year work required high selectivity in a hardwood forest setting. Subsequent work has involved 176 acres of control in hardwood forests. On these sites a large percentage of the understory were non native invasive species. Several methodologies were utilized. Garlic mustard was hand pulled, bagged and hauled away; Oriental bittersweet was treated by cutting the larger vines <2 inches from the ground and immediately stump treated with the appropriate herbicide, followed by foliar application to all bittersweet foliage no higher than three feet. Other species that were low lying were foliar sprayed. Several tree species were also basal bark treated. Recent treatments have included management in riparian areas of Rock Creek for lesser celandine, mile a minute, Microstegium and porcelain berry.



Sandwiched between the busy streets of Washington DC, Rock Creek Park has been constantly barraged with invasive species throughout the years. Control of Chinese Wisteria was achieved using cut stump methods and foliar applications.

Plants treated at Rock Creek National Park:

<i>Scientific Name</i>	Common name	Cut and Treat	Girdle	Foliar Spray	Grub	Basal Bark
Tree Species						
<i>Ailanthus altissima</i>	Tree of Heaven	X	X	X	X	X
<i>Albizia julibrissin</i>	Silk tree	X	X	X	X	X
<i>Paulownia tomentosa</i>	Princess tree	X	X	X	X	X
<i>Broussonetia papyrifera</i>	Paper mulberry	X	X	X	X	X
Acer sp.	Norway and Japanese maple	X	X	X	X	X
Multistemmed Species						
<i>Berberis thunbergii</i>	Japanese barberry	X		X		
<i>Ligustrum sinense</i>	Privet	X		X	X	X
<i>Lonicera fragrantissima</i>	Fragrant honeysuckle	X		X	X	X
<i>L. maackii</i>	Amur honeysuckle	X		X	X	X
<i>L. Morrowii</i>	Morrow's honeysuckle	X		X	X	X
<i>L. tatarica</i>	Tartarian honeysuckle	X		X	X	X
<i>Rosa multiflora</i>	Multiflora rose	X		X		X
<i>Elaeagnus fortunei</i>	Autumn olive	X		X		X
<i>Viburnum dilatatum</i>	Linden viburnum	X		X	X	X
<i>Viburnum plicatum</i>	Double file viburnum	X		X	X	X
<i>Euonymus alatus</i>	Burning bush	X		X	X	X
Herbaceous Species						
<i>Alliaria petiolata</i>	Garlic mustard			X	X	
<i>Polygonum cuspidatum</i>	Japanese knotweed			X	X	
<i>Microstegium vinineum</i>	Japanese stiltgrass			X	X	
<i>Ranunculus ficaria</i> L.	Lesser celandine			X	X	
Vine Species						
<i>Euonymus fortunei</i>	Climbing Euonymous	X		X	X	
<i>Celastrus orbiculata</i>	Oriental bittersweet	X		X	X	
<i>Lonicera japonica</i>	Japanese honeysuckle	X		X	X	
<i>Vinca minor</i>	Periwinkle			X	X	
<i>Vinca major</i>	Large-leafed periwinkle			X	X	
<i>Hedera helix</i>	English ivy	X		X	X	
<i>Wisteria spp</i>	Chinese wisteria	X		X		
<i>Ampelopsis brevipedicularis</i>	Porcelain berry	X		X		



Porcelain berry (lower vine) intertwined with grapevine (upper vine) at Rock Creek Park.



Colorant dye mixed with chemical applications at Rock Creek Park. Target species - Oriental bittersweet.

Project Name: Lubber Run Park

Contract Agency: Arlington County, VA

Period of Performance: 2006 to present

Project Description:

- English ivy, Japanese knotweed, lesser celandine, kudzu
- Heavy infestation
- Cut and treat, foliar treat
- 5 years of maintenance

Approx. Area of Project:	22 acres
2006	\$57,200
• Cost/Acre	\$2600
2007	\$29,300
• Cost/Acre	\$1331.82
2008	\$19,800.00
• Cost/Acre	\$900.00
2009	\$13,500.00
• Cost/Acre	\$613.64
2010	\$10,400.00
• Cost/Acre	\$472.73

Project Name: **South Laurel Highlands Plant Management Program**

Contract Agency: Fayette County Conservation District

Period of Performance: 2009

Project Description:

- Pre-emergent for Microstegium
- Heavy infestation
- Foliar treat

Approx. Area of Project: 40 acres

2008 \$23,300

- Cost/Acre **\$582.00**
-

Project Name: Park Fairfax, VA

Contract Agency: Park Fairfax Unit Owners Association

Period of Performance: 2007 - 2011

Project Description:

- English ivy (primary), Wisteria
- Heavy infestation
- Foliar treat
- 5 year maintenance plan

Approx. Area of Project:	6 acres
2007 (cutting vines and foliar treat)	\$23,050.00
• Cost/Acre	\$3841.67
2008 (year 2)	\$12550.00
• Cost/Acre	\$2091.67
2009 (year 3)	\$7650.00
• Cost/Acre	\$1275.00
2010 (year 4)	\$4715.00
• Cost/Acre	\$785.83
2011 (year 5)	\$4715.00
• Cost/Acre	\$491.67

Project Name:	Richmond National Battlefield
Contract Agency:	Mid-Atlantic Exotic Pest Management Team
Period of Performance:	2008
Project Description:	
<ul style="list-style-type: none">• Privet, tree of heaven• Moderate infestation• Basal bark, foliar treat• One time treatment	
Approx. Area of Project:	13 acres
2008	\$58,500
<ul style="list-style-type: none">• Cost/Acre	\$4500



Restore the Earth & Inspire Ecological Stewardship

Biohabitats Inc. • 2081 Clipper Park Road • Baltimore, Maryland • www.biohabitats.com • October 2009

SLT Herbicide Policy – October 2019

It is the policy of Simsbury Land Trust to minimize its use of herbicides. Herbicides shall only be used on Simsbury Land Trust properties when mechanical and biological methods of removing unwanted vegetation are considered ineffective or impractical. Volunteers shall never be asked to handle herbicides. The SLT shall follow current best management practices for any herbicide application should such applications be determined necessary.

Best Management Practices for Wildland Stewardship - (California)

Protecting Wildlife When Using Herbicides for Invasive Plant Management

<https://www.cal-ipc.org/docs/bmps/dd9jwo1ml8vttq9527zjhek99qr/BMPHerbicide.pdf>

Protecting wildlife habitat often requires controlling invasive plants, and those conducting invasive plant removal need to be sure their approach is safe for wildlife. This manual of Best Management Practices presents ways land managers can protect wildlife when using herbicides to control invasive plants. (While any invasive plant removal approach can potentially affect wildlife, chemical control methods are the focus of this report.) Herbicides are an important tool in the IPM (Integrated Pest Management) toolbox for controlling wildland weeds. Toxicology information is presented on herbicides most commonly used for invasive plant management in California natural areas. The BMPs are drawn from methods used by experienced land managers. Along with providing guidance for land managers, this document is designed to inform the interested public about how herbicides are used to control invasive plants in natural areas.

The 47-page manual includes field techniques from experienced land managers as well as risk charts for commonly used herbicides.

A Management Guide for Invasive Plants in Southern Forests

https://production.wordpress.uconn.edu/cipwg/wp-content/uploads/sites/244/2013/12/gtr_srs131.pdf

National Wildlife Refuge System: Managing Invasive Plants: Concepts Principles and Practices

<https://www.fws.gov/invasives/stafftrainingmodule/index.html>

REMOVE INVASIVES

Help prevent the spread of harmful invasive plants to our open space areas by removing invasive plants from your yard.

Invasive non-native plants can cause environmental or economic harm in our open space areas as well as our backyards and may even harm to human health.

In Connecticut, the **Connecticut Invasive Plant Working Group** has developed a list of these non-native invasive plants.

The invasive plants of particular concern in Simsbury that may be in your yard are shown below:



Wikipedia – photo by Chris Barton



Japanese Barberry Wikipedia – Photo by Wildfeure



Oriental Bittersweet vines Wikipedia – Photo by Richard Rowley



Japanese Multiflora Rose [Wikipedia](#)



Japanese Knotweed [Wikipedia](#)



Autumn Olive Wikipedia

Click on the links below to identify whether these plants and other invasives are in your yard and how to eradicate or control them:

- [Burning bush / Winged euonymus](#) [video](#)
- [Japanese barberry](#) [video](#)
- [Oriental bittersweet](#) [video](#)
- [Multiflora rose](#) [video](#)
- [Japanese knotweed](#) [video](#)
- [Autumn olive](#) [video](#)
- [Common & glossy buckthorn](#) [video](#)
- [Garlic mustard](#) [video](#)
- [Mugwort \(control information\)](#) [video](#)
- [Phragmites](#) [video](#)
- [Tree of Heaven](#) [video](#)

HOW TO DISPOSE OF INVASIVE PLANTS YOU HAVE REMOVED FROM YOUR GARDEN

PLANT NATIVES

Help our local birds and pollinators by planting native plants in your yard.

Our native plants support our native wildlife, providing just the right nutrition at the right time of the year. Did you know that caterpillars are the songbird food of choice to feed their chicks and that it takes between 6,000 to 10,000 caterpillars to raise just one nest of songbirds? These caterpillars are found almost exclusively on our native plants. You won't see the caterpillars because the birds will. Native plants also support the complete life cycle of our native pollinators. **To learn more about the importance of our native plants, [watch this video](#).**

If you're planning to plant in your yard this year, choose native species whenever possible.

[Learn what to plant and where to plant them](#)

[Learn how to build a bird friendly backyard.](#)

[Learn how to help our local pollinators](#)



What is the difference between native, nonnative, and invasive species?

Native plants have evolved over long time periods to local conditions. They play a crucial role in the local ecosystem by providing habitat, food, or some other service that contributes to the region's biodiversity. Importantly, they have ecological "checks and balances" to keep them under control.

Non-native and invasive species are species that have been introduced from other regions of the world with similar climates to ours. While most of these non-native species stay localized and do not spread, do not support our local ecosystems. Occasionally a non-native species spreads uncontrollably once planted due to a lack of ecological checks and balances. These "invasive" plant species outcompete native species and reduce the proportion of native species in an area. When we choose to landscape and garden with non-native and invasive plants, we reduce the ecological value of our landscapes and put nearby natural areas at risk of ecologically harmful, non-native invasive plants infestations.