

Invasive Plant Species and Habitat Management Plan for Petersburg National Battlefield

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Executive Summary

This management plan:

- 1) describes the process to prioritize habitat management zones and invasive species treatments in Petersburg National Battlefield
- 2) determines park-specific priorities for invasive species management
- 3) provides detailed recommendations for the implementation of invasive species management in the park.

Invasive Plant Species and Habitat Management Plan for Petersburg National Battlefield

Background

Invasive plants threaten the natural and cultural resources of Petersburg National Battlefield (PETE). These unwelcome invaders reduce native biodiversity, alter forest structure, suppress tree regeneration, degrade wildlife habitat, and pose significant threats to the long-term condition of parks' natural and cultural resources. A recent analysis by NPS scientists of 12 years' worth of data collected from over 1,400 forest plots in 39 eastern national parks showed that invasive plants are a large and, literally, growing problem for many national parks (Miller et al. 2021).

Recent forest health monitoring (2007-2023, Miller et al. 2021) in PETE showed low invasive abundance across PETE: 6.3% cover averaged across all forest plots. However, invasive species abundance varies widely between units with relatively high cover in the Eastern Front unit (14.7%) and remarkably low cover in the Five Forks and Western Front units (0.02%). Japanese stiltgrass (*Microstegium vimineum*) and Japanese honeysuckle (*Lonicera japonica*) are widespread in the Eastern Front unit. Japanese stiltgrass significantly increased in plot frequency, quadrat frequency, and percent cover since monitoring began in 2007 (Miller et al. 2021). Japanese honeysuckle, while at lower abundance than Japanese stiltgrass, was present in over 80% of forest plots. Effective management of these species is challenging, as invasive plants are inherently difficult to control once established. Therefore, a primary goal of this plan is maintaining the low levels of invasion in the Five Forks and Western Front units, as well as protecting the less invaded areas of the Eastern Front unit and ecologically significant areas throughout the park (e.g., wetlands, riparian corridors, etc).

This plan recommends a three-pronged approach to managing invasive species in PETE:

- 1) early detection and rapid response
- 2) release of approved biological controls
- 3) strategic treatment of invasive species to protect the park's special places

Early Detection and Rapid Response

The most cost-effective and ecologically viable method to control invasive species is to stop the spread of new and emerging invasive species before they become established in the park. The Mid-Atlantic Inventory and Monitoring Network (MIDN) maintains a target list of invasive species for early detection and rapid response (Table 1). These species may be present at very low levels or are not yet established in the park and are likely to invade given their regional distribution. The forest monitoring crew keeps track of and notifies park management of any early detection species observed during their surveys. For more information about the target list or species detections in PETE, contact Camilla Seirup, Biologist, NETN/MIDN (camilla_seirup@nps.gov).

Biological Controls

For invasive plants that are widespread, biological controls (also known as biocontrols) are often the only realistic management options for species that are highly invasive and well-established. Biocontrols are host-specific insects or pathogens that feed only on one particular invasive plant. The biocontrols weaken the target invasive plant, limiting its spread and its ability to displace nearby native plants. The use of biocontrols is strictly regulated and guided by federal and state laws, an International Code of Best Practices, and specific protocols that are all designed to ensure the safety and effectiveness of biocontrol programs. While we are unaware of biocontrols available for species of most concern in PETE, there are several promising biocontrols for several species of concern in the mid-Atlantic region, and that could become more established in PETE. For example, psyllid insects are currently being released as a biocontrol for Japanese knotweed (*Fallopia japonica*). These insects have been released in several national park units in the eastern US (contact the US Forest Service Morgantown Field Office for more information). A verticillium wilt (*Verticillium nonalfalfae*) specific to tree-of-heaven (*Ailanthus altissima*) is also in the process of being approved as a bio-pesticide through the US Environmental Protection Agency. This non-chemical control agent is extremely effective at treating tree-of-heaven, and we recommend its use to control tree-of-heaven in parks once it becomes available.

Table 1. Early detection and rapid response (EDRR) species list for PETE. Species with asterisk (*) are EDRR for the forest interior of the Five Forks unit only.

Scientific Name	Common Name
<i>Ampelopsis brevipedunculata</i>	porcelainberry
<i>Berberis thunbergii</i>	Japanese barberry
<i>Celastrus orbiculatus</i>	oriental bittersweet
<i>Euonymus fortunei</i>	climbing euonymus
<i>Heracleum mantegazzianum</i>	giant hogweed
<i>Lonicera maackii</i>	Amur honeysuckle
<i>Lonicera</i> spp. (exotic)	Exotic shrub honeysuckles - many species
* <i>Microstegium vimineum</i>	Japanese stiltgrass
<i>Paulownia tomentosa</i>	princess tree
<i>Persicaria perfoliata</i>	mile-a-minute weed
<i>Phyllostachys aurea</i>	golden bamboo
<i>Pueraria montana</i>	kudzu
<i>Rubus phoenicolasius</i>	wine raspberry
<i>Vincetoxicum</i> spp.	swallow-worts
<i>Wisteria floribunda</i>	Japanese wisteria
<i>Wisteria sinensis</i>	Chinese wisteria

Strategically Manage PETE's Special Places

Managing invasive plant species can seem like an endless and insurmountable challenge, so focusing limited time and resources where they can be most effective is key to successfully

tackling the invasives problem. By strategically focusing treatments on their special places, parks can efficiently treat invasive plants in areas that are most important to preserve.

This management plan provides that strategic focus by identifying the places and invasive species within PETE that are highest priority for invasive species treatment. This plan was created using the Invasive Plant Species and Habitat Management Planning Process developed by Art Gover at Penn State's Wildland Weed Management Unit (Gover 2016). This planning process is based on several important principles:

- Parks have finite resources that can only be directed to a small portion of potential natural resource needs.
- We can use park-specific data to make informed strategic decisions with limited resources. Strategic management is effective by protecting natural resources without wasted effort.
- Protecting the best sites within a park maximizes the benefit to park natural resources per person-hour expended on invasive species management.

While there has been considerable effort at PETE to manage invasive plant species, not all areas of the park have received the same level of attention and inaction can have negative impacts. This process considered all areas of the park, including levels of infestation and importance of the resource to the park, to prioritize the most important areas and species for management.

The Invasive Plant Species and Habitat Management Planning Process involves three steps: 1) defining habitat management zones, 2) prioritization, and 3) prescription.

Define Habitat Management Zones

To determine which areas of the park are more important to preserve, we assembled a team knowledgeable about PETE's invasive species, including one park natural resources staff, the regional Invasive Plant Management Team (IPMT) Lead, and two vegetation monitoring specialists from NCRN. This group met virtually to delineate Habitat Management Zones within PETE (Figure 1). Habitat management zones are discrete areas of the park that are ecologically or culturally valuable and where invasive species management is operationally feasible.

The Habitat Management Zones were delineated based on three criteria:

- 1) Areas containing high priority invasive species, Japanese stiltgrass (*Microstegium vimineum*), privet (*Ligustrum* spp.), tree of heaven (*Ailanthus altissima*), Japanese honeysuckle (*Lonicera japonica*), etc.
- 2) Wetlands and riparian areas
- 3) Archaeological and/or culturally significant areas.

We identified 29 habitat management zones, ranging in size from 1-16 acres, and then assigned a Stewardship Index based on the ecological and cultural value of the zone's resources, and an Outreach Index that captured the value of the zone to the park's interpretation and outreach goals (for further details see Gover 2016).

Prioritization

We then used a prioritization tool (Gover 2016) housed in a Microsoft Excel workbook to prioritize which Habitat Management Zones and which invasive species should be managed to maximize the benefit to park natural resources. First, data on invasive species were collected from:

- Long-term forest health monitoring data collected from 2020 through 2023 as part of MIDN Forest Vegetation Monitoring (Comiskey et al., 2009)
- Mid-Atlantic IPMT treatment and survey data from 2020 through 2023
- Publicly available invasive occurrence data from iNaturalist (2013 – 2023) and EDDMaps (2012 – 2022)

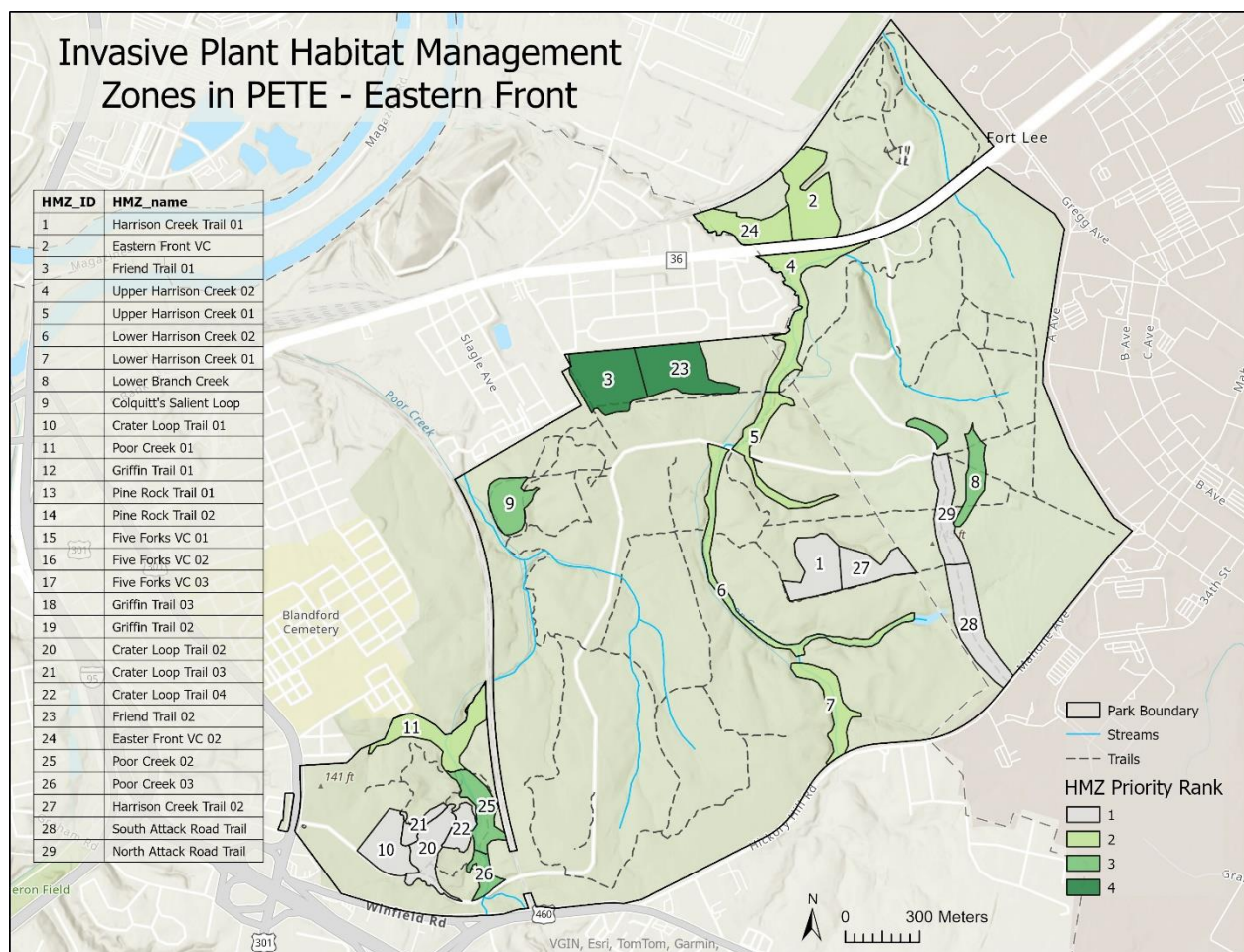


Figure 1. Habitat Management Zones for the treatment of invasive species in the Eastern Front of Petersburg National Battlefield.

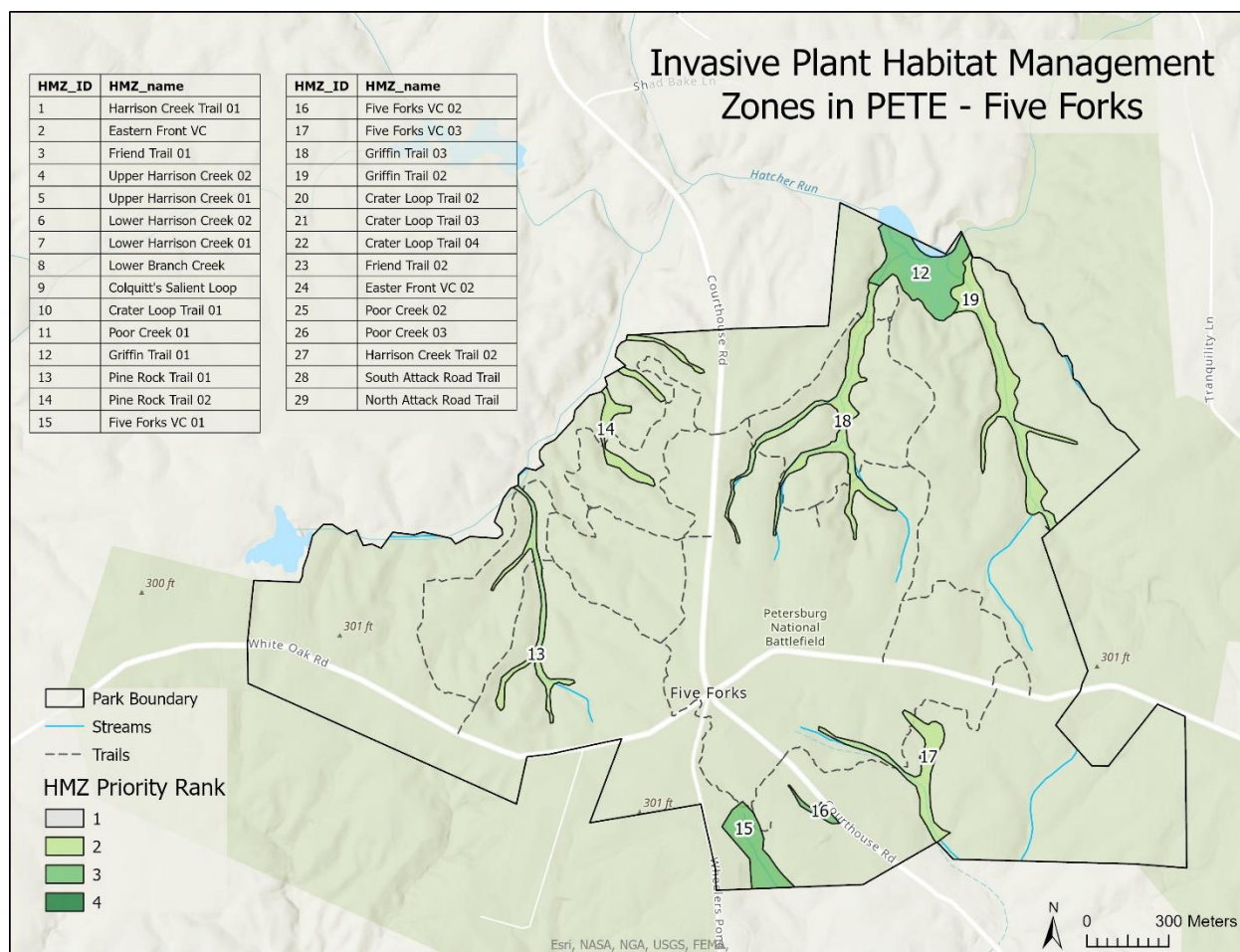


Figure 2. Habitat Management Zones for the treatment of invasive species in Five Forks for Petersburg National Battlefield.

The full list of invasive plant species considered in this treatment plan for PETE can be found in Appendix A. From those collected data, we identified the invasive species known to occur within the 29 habitat management zones, and then categorized the species into three groups:

1. Weedy non-native species that can act invasively (e.g., ground-ivy (*Glechoma hederacea*), hairy bittercress (*Cardamine hirsuta*) but do not cause as much ecological harm, relative to other invasive species which are known be problematic in the park. These species were excluded from the prioritization tool.
2. “Super Bad” invasive species that cause significantly greater negative impact to park resources (e.g., Japanese stiltgrass (*Microstegium vimineum*), kudzu (*Pueraria lobata*), Johnsongrass (*Sorghum halapense*), and others). These species were given higher priority by the tool.
3. The remaining invasive species known to occur in the habitat management zones were included in the prioritization tool as “regular” invasive species (see Gover 2016 for more details).

Next, we quantified the level of infestation of each invasive plant species per zone, the potential impacts of those invasive species on the habitats, the difficulty of managing those invasives, and the restoration effort required in each habitat. The prioritization tool ranks and weights all these inputs and creates a prioritization matrix (Table 2) that provides strategic direction for managers to protect the best sites within the park.

Friend Trail 1 and 2, Lower Branch Creek, Colquitt's Salient Loop, Griffin Trail 1, Five Forks VC 1 and 2, and Poor Creek 1 and 2 were the highest priority zones for invasive species management, specifically the species highlighted in red, orange, and yellow in Table 2. The prescription tables for the species in these zones are included in the tables in Appendix B. Please note that only the zones with highlighted species (high priority species) are represented in the prescription. The HMZs without significant invasive species cover such as Friend Trail 1 and 2 do not have prescription tables. However, these zones should be monitored carefully as they are such high priority, and IPMT should be contacted if invasive species are detected within them.

The remaining 20 zones are considered lower priority and they are not included in the prescription tables in Appendix B. Please refer to the PDF documents with the prescriptions table and the calendar to see prescriptions for these other HMZs. Additionally, the species found in these lower priority habitat zones are also present in at least one of the higher priority habitat zones, and their prescriptions can be easily applied to lower priority zones.

Prescription

Last, we described how strategic invasive species management will be implemented in the park. The prescription specifies: who will be doing the work, how the invasives will be managed, and when the management should be conducted for only the habitat management zones that were identified as high priority and for only those invasive species that were identified as priorities in Table 2.

Other invasive species not specified by this plan may be treated while crews are in the habitat management zones targeting priority species. Thus, species with lower ranks of 2 in Table 2 can also be treated when operationally efficient. For example, all invasive shrubs should be treated at the same time within a priority zone, even if the various shrub species received different priority rankings.

Table 2. Habitat management zones (HMZs) ranked by priority and priority invasive species (high number indicates higher priority) for Petersburg National Battlefield.

	HMZ Name	Friend Trail 01	Friend Trail 02	Lower Branch Creek	Colquitt's Salient Loop	Griffin Trail 01	Five Forks VC 01	Five Forks VC 02	Poor Creek 02	Poor Creek 03	Eastern Front VC	Upper Harrison Creek 02	Upper Harrison Creek 01	Lower Harrison Creek 02	Lower Harrison Creek 01	Poor Creek 01	Pine Rock Trail 01	Pine Rock Trail 02	Five Forks VC 03	Griffin Trail 03	Griffin Trail 02	Easter Front VC 02	Harrison Creek Trail 01	Crater Loop Trail 01	Crater Loop Trail 02	Crater Loop Trail 03	Crater Loop Trail 04	Harrison Creek Trail 02	South Attack Road Trail	North Attack Road Trail
	Habitat Type	WL	WL	WL	MF	WL	WL	WL	WL	WL	WL	WL	WL	WL	WL	WL	WL	WL	WL	WL	WL	WL	MF	ME	ME	ME	ME	MF	MF	MF
	Stewardship Index	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	0	0	0	0	1	1	1	
	Outreach Index	2	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0
Scientific Name	Common Name																													
<i>Ailanthus altissima</i>	tree-of-heaven	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Berberis thunbergii</i>	Japanese barberry	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Celastrus orbiculatus</i>	Oriental bittersweet	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Elaeagnus umbellata</i>	autumn olive	0	0	0	0	0	0	0	0	6	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Hedera helix</i>	English ivy	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Lespedeza cuneata</i>	sericea lespedeza	0	0	5	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
<i>Ligustrum spp.</i>	privet	0	0	0	0	0	0	0	6	6	0	5	0	0	0	5	0	0	0	0	0	0	0	4	0	0	0	0	0	0
<i>Lonicera japonica</i>	Japanese honeysuckle	0	0	0	0	5	0	0	5	5	4	4	0	4	0	4	0	0	0	4	4	4	3	3	0	0	0	3	3	3
<i>Microstegium vimineum</i>	Japanese stiltgrass	0	0	4	4	0	0	0	3	3	3	3	3	3	2	3	0	3	3	0	0	3	2	2	2	2	2	2	2	2
<i>Rosa multiflora</i>	multiflora rose	0	0	0	0	0	0	0	0	6	0	0	0	5	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
<i>Rubus phoenicolasius</i>	wineberry	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Wisteria sinensis</i>	Chinese wisteria	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
<i>Youngia japonica</i>	Oriental false hawksbea	0	0	0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Persicaria longiseta</i>	Oriental lady's thumb	0	0	0	0	0	0	0	0	6	0	5	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Commelina communis</i>	Asiatic dayflower	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0

Appendix B contains the invasive species management prescriptions for the high priority zones and species. There are many opportunities for volunteers and park partners to play an important role in invasive species management in PETE. Also, many invasive management prescriptions require a Registered Technician, someone who has completed the required trainings and obtained certification to use herbicides. In addition to conducting the treatments themselves, Registered Technicians can supervise non-credentialed applicators if they are in direct contact at the work site. Registered Technicians can be park staff, NPS Invasive Plant Team members, or contractors.

Restoration

Planting native plants in areas where invasive species have been removed will help restore habitats dominated by native species. The Local Information sections for each vegetation Association detected during the PETE vegetation inventory are a useful reference for native species that are common components of a given habitat and that are likely to do well in that environment if introduced (see Appendix H in Patterson 2008).

Strategic Management Protects Park Resources

Continued invasive species management is crucial to protecting PETE's important natural and cultural resources. Inaction will result in declines in the park's forests, biodiversity, and the integrity of key cultural resources. The strategic prescriptions presented in this report direct scarce resources to the areas of the park where invasive species management will most benefit the park's cultural and natural resources.

This plan can be updated every 4 – 5 years, to determine progress on containing priority species in habitat management zones and re-evaluate park priorities considering staffing and funding levels. The latest monitoring data and new observations from the Invasive Species Early Detection / Rapid Response Program will be incorporated into the updated plan. However, the Microsoft Excel workbook prioritization tool can be updated at any time (e.g., new invasive species found, land parcel newly acquired by the park, etc.), to evaluate evolving management priorities.

Literature Cited

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APPENDIX A

Table 3. Invasive species considered for the PETE's Invasive Management Plan.

Scientific Name	Common Name
<i>Ailanthus altissima</i>	tree-of-heaven
<i>Berberis thunbergii</i>	Japanese barberry
<i>Broussonetia papyrifera</i>	Paper mulberry
<i>Celastrus orbiculatus</i>	Oriental bittersweet
<i>Clematis terniflora</i>	autumn clematis
<i>Commelina communis</i>	Asiatic dayflower
<i>Duchesnea indica</i>	Indian strawberry
<i>Elaeagnus umbellata</i>	autumn olive
<i>Geranium molle</i>	Dove's-foot crane's-bill
<i>Hedera helix</i>	English ivy
<i>Hemerocallis fulva</i>	orange day-lily
<i>Lespedeza cuneata</i>	sericea lespedeza
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Ligustrum</i> spp.	privet
<i>Lonicera japonica</i>	Japanese honeysuckle
<i>Lonicera maackii</i>	Amur honeysuckle
<i>Melia azedarach</i>	Chinaberry
<i>Microstegium vimineum</i>	Japanese stiltgrass
<i>Morus nigra</i>	black mulberry
<i>Ornithogalum umbellatum</i>	common star-of-Bethlehem
<i>Persicaria longiseta</i>	Oriental lady's thumb
<i>Populus alba</i>	white poplar
<i>Rosa multiflora</i>	multiflora rose
<i>Rubus phoenicolasius</i>	wineberry
<i>Verbascum thapsus</i>	common mullein
<i>Vicia grandiflora</i>	large yellow vetch
<i>Vinca major</i>	greater periwinkle
<i>Wisteria sinensis</i>	Chinese wisteria
<i>Xanthium strumarium</i>	rough cocklebur
<i>Youngia japonica</i>	Oriental false hawksbeard

APPENDIX B

Treatment Prescription Key (Adapted from Gover 2016)

	Description
Lead Worker	
Volunteer	As a <i>lead</i> worker, volunteers are limited to manual methods, and whatever equipment they are qualified/permitted to use. Volunteers may not apply pesticides unless a Certified Applicator is present.
Registered Technician	This is a park employee who has completed the required annual training sanctioned by the PA Department of Agriculture (PDA). A Registered Technician can apply pesticides autonomously, in operations in which they have been trained, but they may not supervise non-credentialed applicators.
Management Method	
Pull	Remove plant from soil by pulling or digging it from the soil using manual equipment.
Cut	Remove top growth using hand-held or motorized tools. Typically directed towards woody plants, including vines.
Foliar-Broadleaf	An herbicide application to target plant foliage. 'Broadleaf' is a label for <i>triclopyr</i> plus 2,4-D is a selective mixture to control broadleaved weeds without injuring grasses.
Foliar-Specialized	An herbicide application to target plant foliage. 'Specialized' refers to any herbicide or mixture that is not 'AirStrike' or 'Broadleaf', and is used for a specific target species. Examples include <i>quizalofop-P</i> to treat Japanese stiltgrass, or <i>aminopyralid</i> or <i>aminocyclopyrachlor</i> to treat Canada thistle.
Stem-hack	Woody species can be stem-treated. Hack and squirt is a concentrated mixture applied to fresh, spaced cuts made in the bark.
Stem-basal	Woody species can be stem-treated. Basal bark is an oil-based mixture applied to the lower portion of intact stems.
Stump-aqueous	Non-suckering woody plants can be cut and stump-treated to prevent regrowth. Water-based mixtures can be applied to freshly-cut stumps.
Stump-oil	Non-suckering woody plants can be cut and stump-treated to prevent regrowth. Oil-based mixtures can also be applied to previously cut stumps by treating the remaining bark as well
PRE	A preemergent herbicide can be applied to prevent annual species, such as Japanese stiltgrass or mile-a-minute, from germinating.

Treatment Prescriptions for Lower Branch Creek

Priority Rank	Habitat Management Zone	Species	Lead Worker	Method	Comments	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	Lower Branch Creek	sericea lespedeza	Registered Tech	Foliar-Broadleaf	3% glyphosate or triclopyr												
4	Lower Branch Creek	Japanese stiltgrass	Registered Tech	Foliar-Specialized	0.25-0.50% glyphosate												
4	Lower Branch Creek	Japanese stiltgrass	Registered Tech	PRE	7 oz/ac indaziflam												

Treatment Prescriptions for Colquitt's Salient Loop

Priority Rank	Habitat Management Zone	Species	Lead Worker	Method	Comments	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
4	Colquitt's Salient Loop	Japanese stiltgrass	Registered Tech	Foliar-Specialized	0.25-0.50% glyphosate												
4	Colquitt's Salient Loop	Japanese stiltgrass	Registered Tech	PRE	7 oz/ac indaziflam												

Treatment Prescriptions for Griffin Trail 01

Priority Rank	Habitat Management Zone	Species	Lead Worker	Method	Comments	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
5	Griffin Trail 01	Japanese honeysuckle	Registered Tech	Foliar-Broadleaf	3% glyphosate or triclopyr												

Treatment Prescriptions for Poor Creek 02

Priority Rank	Habitat Management Zone	Species	Lead Worker	Method	Comments	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
6	Poor Creek 02	privet	Registered Tech	Stump-aqueous	50% glyphosate												
6	Poor Creek 02	privet	Registered Tech	Foliar-Broadleaf	3% glyphosate or triclopyr												
5	Poor Creek 02	Japanese honeysuckle	Registered Tech	Foliar-Broadleaf	3% glyphosate or triclopyr												
5	Poor Creek 02	Japanese honeysuckle	Registered Tech	Stump-oil	50% glyphosate												
5	Poor Creek 02	Japanese honeysuckle	Volunteer	Cut													
3	Poor Creek 02	Japanese stiltgrass	Registered Tech	Foliar-Specialized	0.25-0.50% glyphosate												
3	Poor Creek 02	Japanese stiltgrass	Registered Tech	PRE	7 oz/ac indaziflam												

Treatment Prescriptions for Poor Creek 03

Priority Rank	Habitat Management Zone	Species	Lead Worker	Method	Comments	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
6	Poor Creek 03	autumn olive	Registered Tech	Stump-aqueous	50% glyphosate												
6	Poor Creek 03	autumn olive	Registered Tech	Foliar-Broadleaf	3% glyphosate or triclopyr												
6	Poor Creek 03	English ivy	Registered Tech	Foliar-Broadleaf	5% glyphosate or triclopyr												
6	Poor Creek 03	English ivy	Registered Tech	Stump-oil	50% glyphosate												
6	Poor Creek 03	English ivy	Volunteer	Cut													
6	Poor Creek 03	privet	Registered Tech	Stump-aqueous	50% glyphosate												
6	Poor Creek 03	privet	Registered Tech	Foliar-Broadleaf	3% glyphosate or triclopyr												
6	Poor Creek 03	multiflora rose	Registered Tech	Foliar-Broadleaf	3% glyphosate or triclopyr												
6	Poor Creek 03	multiflora rose	Registered Tech	Stump-aqueous	50% glyphosate												
6	Poor Creek 03	Oriental lady's thumb	Registered Tech	Foliar-Broadleaf	1% glyphosate or triclopyr												
5	Poor Creek 03	Japanese honeysuckle	Registered Tech	Foliar-Broadleaf	3% glyphosate or triclopyr												
5	Poor Creek 03	Japanese honeysuckle	Registered Tech	Stump-oil	50% glyphosate												
5	Poor Creek 03	Japanese honeysuckle	Volunteer	Cut													
5	Poor Creek 03	Chinese wisteria	Registered Tech	Foliar-Broadleaf	1% clopyralid												
5	Poor Creek 03	Chinese wisteria	Registered Tech	Stump-oil	50% glyphosate												
5	Poor Creek 03	Chinese wisteria	Volunteer	Cut													
3	Poor Creek 03	Japanese stiltgrass	Registered Tech	Foliar-Specialized	0.25-0.50% glyphosate												
3	Poor Creek 03	Japanese stiltgrass	Registered Tech	PRE	7 oz/ac indaziflam												