

Invasive Plant Species and Habitat Management Plan for Booker T. Washington National Monument

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Executive Summary

This management plan:

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

Invasive Plant Species and Habitat Management Plan for Booker T. Washington National Monument

Invasive plants threaten the natural and cultural resources of Booker T. Washington National Monument (BOWA). 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 (2007-2018, Miller et al. 2021) in BOWA showed low invasive abundance throughout the years. However, Japanese stiltgrass (*Microstegium vimineum*) significantly increased in plot frequency over time and Japanese honeysuckle (*Lonicera japonica*) 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.

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

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 BOWA, contact Kate Miller, Quantitative Ecologist, NETN (kathryn_miller@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 BOWA, there are several promising biocontrols for several species of concern in the mid-Atlantic region, and that could become more established in BOWA. For example, psyllid insects are currently being released as a biocontrol for Japanese knotweed. 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. Working early detection and rapid response (EDRR) species list for Booker T. Washington National Monument.

Early Detection and Rapid Response Species List for BOWA	
Scientific Name	Common Name
<i>Ampelopsis brevipedunculata</i>	porcelainberry
<i>Celastrus orbiculatus</i>	oriental bittersweet
<i>Dioscorea oppositifolia</i>	Chinese yam
<i>Elaeagnus angustifolia</i>	Russian olive
<i>Hedera helix</i>	English ivy
<i>Heracleum mantegazzianum</i>	giant hogweed
<i>Morus alba</i>	white mulberry
<i>Oplismenus hirtellus ssp. undulatifolius</i>	wavyleaf basketgrass
<i>Persicaria perfoliata</i>	mile-a-minute weed
<i>Wisteria floribunda</i>	Japanese wisteria
<i>Wisteria sinensis</i>	Chinese wisteria

Strategically Manage BOWA'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 BOWA 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 BOWA 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 BOWA's invasive species, including one park natural resources staff, the regional Invasive Plant Management Team (IPMT) Lead, two vegetation monitoring specialists from NETN and invasive species specialist from the Schoodic Institute. This team met virtually to delineate Habitat Management Zones within BOWA (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*), Johnsongrass (*Sorghum halapense*), Japanese honeysuckle (*Lonicera japonica*), etc.;
- 2) Wetlands and riparian areas;
- 3) Archaeological and/or culturally significant areas.

We identified 14 habitat management zones, ranging in size from 3 to 13 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:

- Vegetation classification plots (2002) and accuracy assessment points (2005) collected for the park's vegetation classification and mapping project (Patterson, 2008)
- Long-term forest health monitoring data collected in 2016 and 2019 as part of MIDN Forest Health Monitoring (Comiskey et al., 2009.)
- Mid-Atlantic EPMT treatment and survey data from 2017 and 2019
- Oral communication with the park's Chief of Interpretation and Natural Resources, Timbo Sims (2022)
- Publicly available data from iNaturalist (2019 – 2021) and EDDMapS (2014 – 2019)

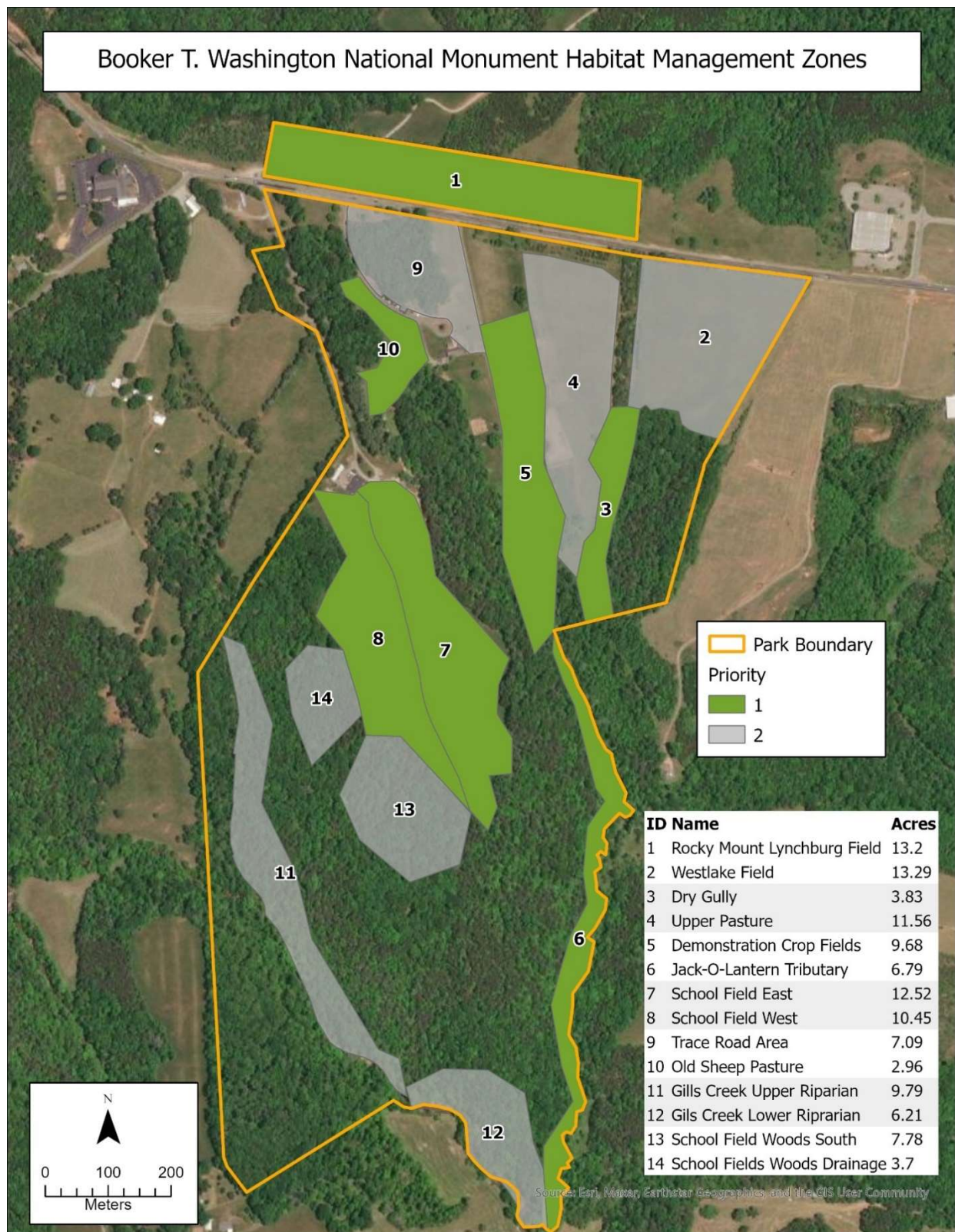


Figure 1. Habitat Management Zones for the treatment of invasive plants at Booker T. Washington National Monument.

The full list of invasive plant species occurring in BOWA can be found in Appendix A. From those data, we identified the invasive species known to occur within 50 m of the 14 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 to 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. Of the 14 habitat management zones, 7 zones were identified as being operationally manageable in a 5-year timeframe.

Rocky Mount Lynchburg Turnpike Field, Dry Gully, Demonstration Crop Fields, Jack-O- Lantern Tributary, School Field East, School Field West and Old Sheep Pasture were the highest priority zones for invasive species management, specifically the species highlighted in red, orange, and yellow in Table 2. The remaining 7 zones: Westlake Field, Upper Pasture, Trace Road Area, Gills Creek Upper Riparian, Gills Creek Lower Riparian, School Field Woods South, and School Field Woods Drainage were the lowest priority and were not included in the prescription phase of the planning tool. However, 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 the three highest priorities 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 (e.g., 4, 5, 6) 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. Priority habitat management zones (darker green indicates higher priority) and priority invasive species (high number indicates higher priority) for Booker T. Washington National Monument.

	HMZ Name	Rocky Mount Lynchburg Turnpike Field	Dry Gully	Demonstration Crop Fields	Jack-O-Lantern Tributary	School Field East	School Field West	Old Sheep Pasture	Westlake Field	Upper Pasture	Trace Road Area	Gills Creek Upper Riparian	Gills Creek Lower Riparian	School Field Woods South	School Field Woods Drainage
	Stewardship Index	2	2	2	2	2	2	2	1	1	1	2	2	2	2
	Outreach Index	2	2	2	2	2	2	2	1	2	1	1	1	1	0
Scientific Name	Common Name														
<i>Ailanthus altissima</i>	tree-of-heaven	0	0	0	9	7	0	9	0	0	0	6	6	6	0
<i>Alliaria petiolata</i>	garlic mustard	0	0	7	0	0	0	0	0	5	0	0	0	0	0
<i>Berberis julianae</i>	wintergreen barberry	0	0	8	0	0	0	10	0	7	0	0	0	0	0
<i>Elaeagnus umbellata</i>	autumn olive	0	0	0	0	10	0	0	0	0	0	0	0	0	0
<i>Cardamine hirsuta</i>	hairy bittercress	0	0	6	0	0	0	0	0	6	0	0	0	0	0
<i>Ligustrum</i> spp.	privet	0	0	0	0	10	0	0	0	0	0	0	0	0	0
<i>Lonicera japonica</i>	Japanese honeysuckle	0	0	6	7	7	0	0	0	0	0	6	6	0	0
<i>Microstegium vimineum</i>	Japanese stiltgrass	6	7	6	7	6	6	6	4	5	4	4	4	6	4
<i>Pueraria lobata</i>	kudzu	0	0	0	0	0	0	8	0	0	0	6	6	0	0
<i>Rosa multiflora</i>	multiflora rose	0	0	0	0	8	10	0	0	0	0	7	7	0	0
<i>Rubus phoenicolasius</i>	wineberry	0	0	0	0	0	0	10	0	0	0	0	0	0	0
<i>Securigera varia</i>	crownvetch	0	7	0	0	0	0	0	0	6	0	0	0	0	0
<i>Sorghum halepense</i>	Johnsongrass	0	9	0	0	9	9	0	0	8	0	0	0	0	0
<i>Vinca minor</i>	lesser periwinkle	0	0	0	0	0	0	8	0	0	4	0	0	0	0
<i>Persicaria longiseta</i>	creeping smartweed	0	0	0	6	0	0	0	0	0	0	5	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 BOWA. 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 BOWA 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 the Booker T. Washington National Monument'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

Invasive Species Present at Booker T. Washington National Monument

Common Name	Scientific Name
tree-of-heaven	<i>Ailanthus altissima</i>
garlic mustard	<i>Alliaria petiolata</i>
Wintergreen barberry	<i>Berberis julianae</i>
Hairy bittercress	<i>Cardamine hirsuta</i>
autumn olive	<i>Elaeagnus umbellata</i>
privet	<i>Ligustrum spp.</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Japanese stiltgrass	<i>Microstegium vimineum</i>
creeping smartweed	<i>Persicaria longiseta</i>
kudzu	<i>Pueraria lobata</i>
multiflora rose	<i>Rosa multiflora</i>
wineberry	<i>Rubus phoenicolasius</i>
crownvetch	<i>Securigera varia</i>
Johnsongrass	<i>Sorghum halepense</i>
lesser periwinkle	<i>Vinca minor</i>

APPENDIX B

Treatment Prescription Key (Adapted from Gover 2016)

Action	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, NPS Invasive Plant Management Team member or contractor who holds a Pesticide Applicator License. A Registered Technician may apply autonomously and may also supervise other non-credentialed applicators as long they are on-site.
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.
PRE	A preemergent herbicide can be applied to prevent annual species, such as Japanese stiltgrass or mile-a-minute, from germinating.

Treatment Prescriptions for Rocky Mount Lynchburg Turnpike Field

[illegible]

Treatment Prescriptions for Dry Gully

[illegible]

Treatment Prescriptions for Demonstration Crop Fields

[illegible]

Treatment Prescriptions for School Field East

[illegible]

Treatment Prescriptions for School Field West

[illegible]

