

BROAD ROCK CREEK PARK INVASIVE PLANT MANAGEMENT PLAN



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PREPARED FOR:

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1. Introduction

Invasive plant species threaten the health of ecosystems and investments in infrastructure. Controlling invasive plant species and restoring native vegetation is essential to sustaining ecosystems and reducing maintenance costs. To that end, this Invasive Plant Management Plan (IPMP) has been prepared to guide successful stewardship of Broad Rock Creek Park in the City of Richmond, Virginia.

The Invasive Plant Management Plan for Broad Rock Creek Park addresses the following project goals:

- **Manage the impact of invasive plant species** to the extent necessary to enable the success of the intended future use of the site as a public park, and reduce risks to natural habitats, ecological diversity, and public health and safety.
- **Revegetate areas where invasives have been removed to stabilize the site soils, reduce erosion, and provide ecological benefits** by using native vegetation.
- **Ensure the long-term health of desirable vegetation and reduce long-term maintenance costs** through a proactive and timely approach to management.

Each of these goals is addressed in methodology described in the sections that follow.

2. Existing Conditions

Location and Project Area

Broad Rock Creek is located in the southern portion of the City of Richmond, Virginia. It is a 26-acre vacant parcel intended for eventual development as a park managed by the City of Richmond.

Topography and Hydrology

Two creeks – Broad Rock Creek and Goode Creek – are present on the site. They drain directly into the James River directly to the east. The topography is gently rolling to flat.

Current Land Use and Existing Vegetation

The site was previously a public housing community that was demolished. Opportunistic early successional and invasive species have colonized the site since then. A number of notable large trees that may have been part of the landscaping of the housing community or predate that development still remain.

Today the site sits between a new affordable housing development to the north, residential area to the west and south, and industrial parcels to the east. In this direction, there are several

vectors for ongoing and new invasive plant species introductions – Interstate I-95 and a railroad line – that should be considered when establishing goals and strategies for invasive plant management.

Pre-Development Plant Community

Prior to development, this site would likely have been a Mesic Mixed Hardwood Forest containing mixtures of American beech, oaks, tulip poplar, and hickories among a wide variety of other hardwoods. Species such as American hornbeam and American holly are common in the understory. Upon removing invasive species, a goal of ongoing management should be to endeavor to reintroduce species from the pre-development plant community as appropriate.

3. Assessment of Current Status

Timmons Group staff visited the site in December 2024 to document invasive species. Numerous species were observed. Locations of invasive vegetation are mapped in Appendix A.

List of Observed Invasives and Relative Abundance

Scientific Name	Common Name	Location and Prevalence
<i>Ailanthus altissima</i>	Tree-of-Heaven	Stand located at the center of the woods with 35% coverage; a second stand at northernmost boundary with 15% coverage
<i>Elaeagnus angustifolia</i>	Russian Olive	Stand located near Colby Lane commingling with privet; 20% coverage
<i>Euonymus fortunei</i>	Wintercreeper	Pervasive throughout site; 20% coverage
<i>Glechoma hederacea</i>	Ground ivy	Small stand in wooded uplands; 45% coverage
<i>Hedera helix</i>	English ivy	Pervasive throughout site; 40% coverage
<i>Lespedeza cuneata</i>	Chinese bush-clover	Two stands on Goode Creek; one 15% coverage and one 40% coverage.
<i>Ligustrum lucidum</i>	Glossy privet	Pervasive throughout wooded uplands where it comingles with <i>L. sinense</i> ; 12% coverage
<i>Ligustrum sinense</i>	Chinese privet	Multiple stands distributed throughout the property, located on the banks of Goode Creek as well as drier upland areas; coverage ranges from 20%-70% in different stands
<i>Lonicera japonica</i>	Japanese honeysuckle	Pervasive throughout site; 35% coverage
<i>Morus alba</i>	White mulberry	Medium sized monoculture stand in wooded uplands near western boundary; 75% coverage
<i>Phyllostachys aurea</i>	Golden bamboo	Monoculture stand entangled with wisteria on banks of Goode Creek; 90%
<i>Pueraria montana</i>	Kudzu	Stand on western border of the middle of the site near new housing community; 60% coverage
<i>Reynoutria japonica</i>	Japanese knotweed	Several stands ranging from 15-60% coverage scattered throughout site

Rosa multiflora	Rambler rose	One small but monoculture stand; 80% coverage
Typha latifolia	Broadleaf Cattail	One small stand located within the area of bush-cover on Goode Creek; 30% coverage
Wisteria sinensis	Chinese wisteria	Entangled with the bamboo stand on Goode Creek and spreading beyond it as a monoculture; coverage ranges from 40-95%

Other invasive species are likely present on site but did not meet a prevalence threshold to be reported. Similarly, the species listed above may be present in other areas on site at lower concentrations than the reporting threshold.

3. Invasive Plant Management Plan

Management Goals

Broad Rock Creek is intended to become a public park. The presence of large populations of invasive plants can threaten the intended site use by subtly signaling a lack of maintenance or safety, even to individuals who cannot identify plant species. Removing large areas of invasives is a “cue of care” that indicates a landscape is being intentionally managed, which in turn deters illicit activities, per the principles of Crime Prevention Through Environmental Design (CPTED).

Complete eradication of invasives is a long-term and potentially costly endeavor, and it is financially unfeasible to removal all invasives on a large site. Management goals should strive to efficiently control invasive populations where they are currently causing harm or have the potential to do so in the future.

Suggested management goals include:

- Remove invasive plants that encroach on park programmatic elements or landscaping, obstruct or overtake trails, or obscure sight lines.
- Keep heritage trees free of smothering vines that may endanger their longevity.
- Remove and manage invasives in high visibility “first impression” areas such as at entrances and near major park programmatic elements.
- Remove and manage invasives near unique natural features that are likely to be focal points for visitors, such as along stream banks.
- Prioritize removing populations with the greatest potential for harm to ecological systems, human health, and public safety.
- Monitor for and respond to EDDR designated species, as discussed below.
- Practice integrative vegetation management and adaptive management strategies: record all removal activities, methods, treatments, and outcomes. Review and revise maintenance plans annually based on this data with the goal of improving efficiency and reducing maintenance efforts over time.
- Establish a monitoring plan to track the long-term success of the invasive removal efforts.

Invasive species are likely to continue to be introduced to the site via dispersal mechanisms such as transportation corridors, wind, and water. Early detection rapid response (EDRR) species are designated by Virginia Department of Conservation (DCR) as species that are not

yet widely established in Virginia but are known to have the potential to rapidly spread and become difficult to eradicate once established. A quick response to EDRR species is the most cost-effective strategy for controlling these types of plants.

General Recommendations

Different invasive plant species may require similar control methods, however, the needs and habit of each individual species and/or population should be considered. The method of control, including type, number, and timing of treatments, is dependent on several factors such as the size and age of the population(s), species morphology, and life cycle. Site dependent factors such as topography, nearby non-target species, and sensitive areas like waterbodies or rare habitats are taken into consideration.

A specific plan was developed for the treatment of each species (Appendix B). An integrated approach considers several management options (i.e. natural, cultural, mechanical, chemical controls) with the goal of reducing treatments over time. The application of herbicides is often the treatment method of choice for large invasive populations which have created localized monocultures and no native vegetation remains to be preserved.

Control efforts aim to inhibit current growth and/or prevent regeneration and reemergence of target species. Eradication is commonly an end goal when managing a site for invasive species, but eradication is difficult and often impossible given nearby re-introduction sources. In some cases, when invasive species are present, but populations are so small that they do not pose a threat of becoming a monotypic community or reducing overall habitat quality, no treatment may be proposed to prevent affecting non-target species.

Large areas of bare ground following treatment applications can create ideal conditions for the re-establishment of invasives and should be promptly reseeded with vegetation before new invasive populations establish.

General recommendations include the following:

- If a weed or invasive plant is providing a functional value such as slope stabilization, replace it with a plant that will provide functional value equal to or greater than that of the existing plant.
- Use the proper equipment for the type of control measure. These include but are not limited to:
 - Tractor mounted bush hog for heavy mowing (minimum plant height equal to or greater than three (3) to four (4) inches) and high mowing (minimum plant height equal to or greater six (6) to eight (8) inches).
 - Tractor-mounted, truck-mounted, trailer-counted, or ATV-mounted sprayer for broadcast applications.
 - Backpack style sprayer or other device for spot spraying, appropriate to the class of herbicide.

- Areas within the driplines of trees to be saved may require use of hand-held equipment.
- Mechanical methods:
 - Mowing and mechanical means should be used as the primary method of managing vegetation growth during long-term management. Hand removal and seasonal cutbacks are the preferred methods for controlling problematic species. The specific means of removing (e.g. pulling, cutting) must factor in what is most effective but also least disruptive to the site, particularly when the location is on a slope.
 - The use of a pull-behind brush hog or hand-held string trimmer can be used for high-mowing of grasses and forbs at 6 to 8 inches height to effectively control weeds without negatively impacting the growth of the native plants.
 - Shrubs and woody vines should be removed by their root systems where possible.
 - Grazing by ruminants (usually goats or sheep) where practical and appropriate to plant species present.
- Chemical methods:
 - Herbicides are recommended in this plan especially during the Initial Control Period before the desired landscape is planted. During long-term management, herbicides should be used only to target specific problematic species or stands as needed. Herbicides must be used in accordance with their approved label, and the quantity of herbicide applications should decrease annually over time.
 - The class of herbicide to be used will depend on problematic species in question.
 - Herbicide must not be applied when rainfall is expected within 48 hours or wind speeds exceed 10 mph.
 - Restrictions regarding the use of herbicides adjacent to and within wetlands and watercourses are to be obeyed. For invasive control in these areas or anywhere spray drift may come into contact with water, select products labeled for use near water.
 - VDACS Certified Commercial Pesticide Applicators or Registered Technicians working under direct supervision of a Commercial Applicator should apply chemical control treatments. In addition, unpaid volunteers may utilize nonrestricted herbicides, *while under the supervision of a licensed commercial applicator*, on properties owned by local political subdivisions, under legislation passed by the State of Virginia in 2024.

If assistance is needed in making a determination about a problematic species and the appropriate solution, consult a Virginia Certified Horticulturalist, ISA Certified Arborist, or the local office of the Virginia Cooperative Extension. Consult the latest USDA recommendations and resources for control measures, including the National Invasive Species Information Center (NISIC) and “A Management Guide for Invasive Plants in Southern Forests” from the U.S. Forest Service.

- Waste management:
 - Many invasives can readily resprout or self-propagate from fragments of roots and other plant parts. Ensure that all plant debris is removed from site and disposed of at a landfill.
 - Do not compost or woodchip invasive plant species, or dispose of at municipal yard waste collection sites.

Prioritized Species for Removal

The following species are prioritized for removal:

Pueraria montana (Kudzu) is an extremely aggressive vine that outcompetes all other vegetation. Blue Ridge PRISM writes, “It cannot be overemphasized that nothing short of total eradication prevents kudzu from taking over again once it has invaded a location.” This patch is likely over ten years old, possessing large underground tubers that will permit the plants to resprout even after several years of management. Disturbing and removing stands of invasives next to it, such as the bamboo, will provide an opportunity for kudzu to expand its spread. Thus, aggressive efforts to monitor and control this patch are of the highest priority to this plan. Failure to control the kudzu now will result in costlier management efforts in the future if it is allowed to continue to spread.

Phyllostachys aurea (Golden Bamboo) forms dense monoculture stands that will prohibit the growth of other species. Uncontrolled, its rhizomes will continue to spread. Bamboo is difficult to control or eliminate. Small pieces of bamboo can readily self-propagate if not properly disposed. Goode Creek is likely to be a focal point for visitors, and the final alignment of the trail network may make removing the bamboo a necessity. Removing the bamboo will also remove a large population of **Wisteria sinensis** (Chinese Wisteria) that relies on the bamboo for support.

Wisteria sinensis (Chinese Wisteria) smothers and kills trees. Protecting the mature tree canopy on site to the greatest extent possible is essential for the comfort of park visitors and to mitigate the urban heat island effect.

Ailanthus altissima (Tree of Heaven) can tolerate a wide variety of soil and site conditions and outcompetes native vegetation through both resprouting and prolific seed production. Toxic compounds in its leaf litter exhibit allelopathic effects that hinder the growth of native plants. It is the preferred host plant of the spotted lanternfly, which was first spotted in Virginia in 2018 and has spread throughout the Shenandoah Valley and Northern Virginia. The spotted lanternfly is a significant threat to native trees as well as numerous fruit crops. As the spotted lanternfly is just beginning to be observed in the Richmond, early action to remove tree of heaven within the park will protect new native plantings by removing a source of host trees for the lanternflies.

The prioritized species above are not an all-inclusive list of actions or species to target. Many of the other invasive species observed on site are pervasive and widespread, intermingling with other vegetation rather than forming monotypic stands. Defer to the management goals above

to identify the locations to prioritize for managing these species. A generalized approach, such as goat grazing, may be the most cost-effective option for tackling these areas, particularly under mature canopy trees. Though goat grazing reduces the need for herbicides and manual labor, goats will also eat desirable vegetation, so grazing locations must be carefully chosen.

A comprehensive list of species-specific control measures is covered in Appendix B.

5. Project Schedule

The project schedule should be approached from the perspective of both long-term management covering the life of the project as well as ongoing seasonal maintenance activities. This section sorts the management of the project into phases— Initial Control Measures and Vegetation Management, Initial Maintenance, and Ongoing Maintenance. Particular attention is needed to the Initial Maintenance Period over the first three years following initial control and planting. The more intensive maintenance procedures during this time will reduce long-term maintenance requirements.

Initial Control Measures and Vegetation Establishment

Initial control measures must be conducted prior to the establishment of desired vegetation. Remove and eradicate these species to the greatest extents possible prior to seeding or planting anything on site.

- Conduct initial mechanical removal of bamboo, wisteria, kudzu, and tree of heaven. Stabilize slopes and riverbank edges with seeding, live staking, and/or geotextile.
- Remove smothering vines from otherwise healthy, large diameter canopy trees. Sever all vines and paint with appropriate herbicide. Do not pull vines from trees; it will damage the tree further. Let them fall on their own; do not allow public into areas where there is a risk of falling vegetation.
- Following initial removal, grazing by goats for several years can be a cost-effective method of managing resprouts. Grazing can be employed as a primary strategy but only in areas where the vegetation is not so dense that it hinders goats' movements. Goats will also eat any new plantings or vegetation that they find palatable, so only deploy goats where planting new vegetation is not immediately planned.
- In following years, spot-treat recurrent problem areas with herbicides. Many species will likely need retreated as they will regenerate from any roots that are not removed or from the seedbank.
- Invasive removal may endanger existing desired trees and vegetation. When in doubt, consult with an arborist to discuss the appropriate means of removal that will be effective while minimizing harm to existing trees.

Native Plant Establishment

The contractor will be responsible for ensuring the survival of plant material through the warranty period. Plant material will be replaced as necessary. Additional information on planting is included in the landscape specifications and notes and details in the project construction documents.

General Notes and Sequencing:

- Following initial invasive control measures, prepare site soil conditions for seeding.
- Apply soil amendments as recommended by soil analysis.
- Seed disturbed areas with a temporary mixture as needed to meet state regulations for erosion and sediment control (see C6.8 for recommended seed mixes). Seed promptly following removal of invasive species. The seed mixture shall adhere to the acceptable mixtures specified in Table 3.31-b of the Virginia Erosion and Sediment Control Handbook.
- During the next suitable seeding period (spring or fall), sow permanent groundcover. Optimal seed germination occurs by seeding after October 15 and before April 15. If seeding is conducted outside of optimal seed germination period, pair a seasonally appropriate temporary cover crop with the seeding to support erosion and sediment control, soil stabilization, and weed suppression during seed establishment.
- If planting trees and shrubs in areas where there is no existing canopy, plant densely to shade out invasive seedlings.
- Protect new plantings with deer exclusion fencing or protective tubes.
- If planting under existing canopy, vegetation may be difficult to establish. Plant the smallest plant sizes available (plugs, containers, bare-roots) to minimize damage to existing tree roots.
- Alternatively, areas under existing tree canopy can be fenced to exclude deer. A mix of native and invasive species will reemerge. Control emergent invasives by hand pulling or spot treatment to allow natives to reestablish.

Initial Maintenance – 1 to 3 years

This period is crucial to the long-term success of the new planting and invasive control measures, and will require the most active management. Particular attention to the site during this phase of management will provide for successful implementation of the landscaping plan and generally reduces requirements for intervention over time.

Key maintenance tasks include the following:

General

- Complete tasks as described in the “Annual Maintenance Schedule” section.
- Continue seasonal watering for the first year and as needed during periods of drought.
- Hand-weed regularly to remove competition to native plantings.
- Resprouts of treated invasives are likely to occur as well as new seedlings emerging from the seedbank. Spot treat, hand pull, mow, graze, or solarize small areas with plastic sheeting. Refer to Appendix B for recommended followup methods. Select an efficient method appropriate for the size and site context of infestation being treated, aiming to use herbicides only as necessary. Select a targeted herbicide that will treat the invasive species in question with the least risk to desired vegetation.

Woody Vegetation

- Monitor trees support systems (staking) monthly to ensure correct placement to ensure proper tree growth. As trees mature and outgrow the staking, remove it. Remove any remaining tags and labels from plants within one year.
- Mulch seasonally or as needed in landscape beds (mulching is unnecessary in natural areas).
- Remove deer exclusion measures once native vegetation has become established.

Groundcover and Meadow Plantings

- Monitor seeded areas to ensure that they are filling in over time. Seed, propagate or add additional plantings as needed to fill in patches without plants to avoid invasives filling the voids.
- Mowing and Spraying:
 - Monitor newly established mowed turf areas for the emergence of invasives. Spot treat areas where invasives are becoming dominant despite mowing.
 - In meadow areas, do not mow, prune, or deadhead except as described in the mowing schedule below and in the “Annual Maintenance Schedule” section. It is best to avoid mowing in typical nesting periods for any wildlife present on site (typically between April and September).
 - Meadow mowing is recommended when vegetation has reached 2 to 2.5 feet tall. Mow using a tractor-pulled or push-behind brush hog. A second mowing can be done later in the growing season when temperatures cool down and before cool season invasive and weed species can produce seed. Spot spray any patches of invasives.

Long-term Management – 3 years onward

Continue ongoing maintenance and management, including the tasks described in the “Annual Maintenance Schedule” section. For the long-term, meadows and restoration plantings should be allowed to naturalize with minimal to no management.

Key maintenance tasks include the following:

- Evaluate plant survival on an annual basis.
- Monitor the overall composition of the plantings as they naturalize to ensure that they represent the general species composition originally intended. Manage, remove, and replace vegetation as needed to sustain reforestation efforts and new groundcover layer.
- Mow meadows once annually in late winter or early spring or late fall after vegetation has gone dormant following the same protocol as during the Establishment Period. The annual mowing should be effective at preventing the emergence of shrubby growth, but monitor for areas requiring additional treatment.
- Prune only as needed to mitigate hazards to people or infrastructure.
- This plan is suitable for the lifespan of the project with reasonable modifications as needed based on ongoing management activities and changes that occur on site, incorporating integrated vegetation management and adaptive management principles.

Annual Maintenance Schedule

Maintenance tasks have been listed here by season given the optimal times for invasive control, planting, pruning, and other activities. Note: While Appendix B gives treatment options for different times of the year, it is not necessary to conduct control efforts for each species in every season. Follow-up efforts should only be pursued when new growth is observed. Create a maintenance calendar so work is distributed evenly across the year and aligned with staffing, funding and resources.

Winter

Key maintenance tasks include the following:

- Review and revise management plans for the upcoming year based on observations from the prior year.
- Prune hazards as necessary and seasonally appropriate.
- Per Appendix B, conduct any required removal treatments that are appropriate for winter. The dieback of deciduous plant material and perennials allows for easier access into areas of the site; however, plant identification may be more challenging, and some chemical treatments are not effective when plants are dormant or the ground is frozen. Winter is an excellent time for treating evergreen invasives, as damage to desirable plants is reduced. Hand pulling species will be easier when the ground is moist.

Spring

Key maintenance tasks include the following:

- Per Appendix B, conduct any required removal treatments that are appropriate for spring. It will be easier to access treatment areas before new deciduous vegetative growth becomes dense. For many species, foliar sprays are more effective when they target young, newly emerged leaves. Hand pulling species will be easier when the ground is moist.
- Water new plantings as needed, especially during periods of drought.
- Remove and dispose of diseased and damaged plant material.

Summer

Key maintenance tasks include the following:

- Per Appendix B, conduct any required removal treatments that are appropriate for summer. Aim to complete treatments before plants produce seed.
- Water as needed, especially during periods of drought.
- Remove and dispose of diseased and damaged plant material, particularly those that contain or could contain pests.

Fall

Key maintenance tasks include the following:

- Per Appendix B, conduct any required removal treatments that are appropriate for summer. Complete treatments before plants produce seed.
- Remove and dispose of diseased and damaged plant material, particularly those that contain or could contain pests.
- Leave groundcover alone for the purposes of creating seasonal interest in the landscape and winter habitat and food sources for wildlife. Do not dead-head or cut down standing native vegetation, including grasses and forbs. If a decision is made to cut down any native vegetation, lay the clippings on the ground to serve as mulch.
- Identify problem areas and challenges from the prior growing season to incorporate into maintenance and management plans for the upcoming season. Plan out and schedule specific maintenance tasks.

These seasons overlap as far as timing for different maintenance tasks. The timing for various tasks differs between plant species based on their individual phenology—when they bud, flower, leaf out, and so on. The following calendar shows when these seasonal tasks should generally take place, but attention should be paid to the best time to complete specific tasks, such as pruning, for individual species.

General Seasonal Maintenance Calendar

Month	Season			
	Winter	Spring	Summer	Fall
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				

4. Monitoring

Monitoring procedures should be implemented to sustain and modify maintenance and management practices over time. Consider setting up monitoring plots that are photographed on an annual or seasonal basis to track changes in vegetation.

At a minimum, the following monitoring practices must be implemented on an annual basis:

- An inventory of health of planted areas
- An inventory and mapping of invasive plants and noxious weeds

- A site assessment of current conditions and a report on appropriate action needed to address any issues affecting the health of the plantings and modifications needed to maintenance activities and management practices.
- Submission of the assessment and report to City of Richmond Parks, Recreation, and Community Facilities (PRCF). This will include an updated inventory of invasive plants and noxious weeds.

Monitoring should be conducted over the lifetime of the project to effectively manage the control of invasive plant and noxious weed species.

Re-Vegetation Protocol

The best time to reseed and replant is generally in the fall and spring per the planting periods included in the planting specifications for the project. Replacement planting should match the original plantings or be approved by the project designers and consultants. If all of one species dies, consider an alternate plant selection, taking into consideration what plants have done well.

6. Resources

Websites

USDA National Invasive Species Information Center (NISIC).

<https://www.invasivespeciesinfo.gov/>

Virginia Invasive Plant List. <https://www.dcr.virginia.gov/natural-heritage/invspdpdflist>

Virginia Noxious Weed List.

<https://law.lis.virginia.gov/admincode/title2/agency5/chapter317/section20/>

Invasive Plant Fact Sheets. Blue Ridge PRISM, 2025. <https://blueridgeprism.org/factsheets>

Publications

A Management Guide for Invasive Plants in Southern Forests. U.S. Forest Service, 2015.

https://www.srs.fs.fed.us/pubs/gtr/gtr_srs131.pdf

USDA-NRCS Conservation Practice Standard: Herbaceous Weed Treatment. USDA Natural resources Conservation Service, 2020. https://www.nrcs.usda.gov/sites/default/files/2022-09/Herbaceous_Weed_Treatment_315_CPS_10_2020.pdf

Non-native Invasive Plant Species Control Treatments. Virginia Department of Forestry, 2018.

https://dof.virginia.gov/wp-content/uploads/FT0031-Nonnative-Invasive-Plant-Species-Control-Treatments_pub.pdf

Appendix A: Invasive Areas Map (See attached)

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