Rocky Forge Wind Project

Botetourt County, Virginia WSSI #22766.02

Invasive Plant Species Evaluation

July 18, 2016

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Studies and Solutions, Inc.

Invasive Plant Species Survey Rocky Forge Wind Project WSSI #22766.02

Introduction

Wetland Studies and Solutions, Inc. (WSSI) conducted an invasive plant species survey at the Rocky Forge Wind Project (hereafter referred to as the "Project") to detect the presence and extent of invasive plants within the Project area as required by Virginia Administrative Code Title 9, Agency 15, Chapter 40 Small Renewable Energy Project (Wind) Permit by Rule (PBR) regulation (VDGIF 2012). The Project will be located in Botetourt County, Virginia, approximately 0.5 miles northeast of the intersection of Dagger Springs Road and Blue Grass Trail (Figure 1). The presence of invasive species was evaluated within an approximately 386 acre survey area, which includes the area planned for ground disturbance (i.e., "Disturbance Zone"). Our findings are visually depicted on the Invasive Plant Species Evaluation Map (Appendix A) and are discussed briefly below.

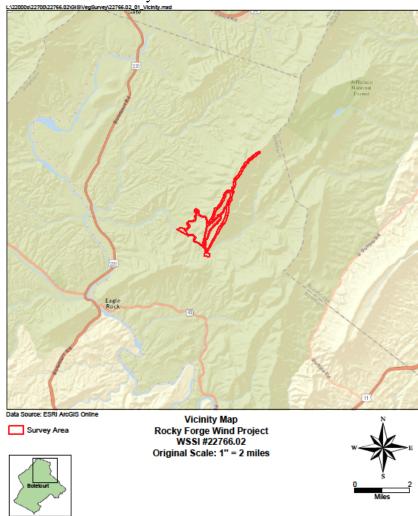


Figure 1. Vicinity Map

Rocky Forge Wind Project - Invasive Plant Species Survey

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Methodology

The invasive plant species survey was completed in accordance with guidance provided by the Virginia Department of Conservation and Recreation (DCR) for the survey area on March 10, 2016 (Appendix B). Invasive plant species evaluation field work was performed by Lauren L. Shaffer, PWD, WPIT, CT¹ and Neil Gutherman, WPIT² on May 2 through 5, 2016, with additional field work performed on July 6, 2016.

Prior to conducting field work, relevant background information was reviewed, including WSSI's February 9, 2016 report titled, "Ecological Community Group – Vegetation Assessment, Rocky Forge Wind Project", site topography, and recent aerial imagery. The survey area consists of several linear corridors on forested ridges and along existing roads; therefore, transects were not established and the survey area was systematically searched for the presence and extent of existing invasive plant species. WSSI staff designated plants as "invasive species" based upon the Virginia Invasive Plant Species List (Appendix C) and a list of potential invasive species for Botetourt County, Virginia, provided by DCR. Per guidance from DCR, areas along access roads and disturbed areas were thoroughly and carefully searched for invasive species. Areas in which invasive plant species were observed were divided into mapping units. With the exception of mapping unit 1, in which no invasive plant species were observed, each mapping unit characterizes a distinct infestation of invasive plant species (Table 1). The percent coverage of each invasive plant species within each mapping unit was approximated for reporting purposes. For each mapping unit, the following information was recorded: the invasive species observed; its associated Virginia Invasiveness Rank; and its relative percent coverage.

Results

Ten (10) mapping units were established to characterize the presence and percent coverage of invasive species within the survey area. Approximately 282 acres (73 percent) of the survey area were determined to be free of invasive species (mapping unit 1), whereas invasive species were observed over approximately 104 acres (27 percent) of the survey area. This information is reported in <u>Table 1</u> and described briefly below. The approximate extent of each infestation is presented on the Invasive Plant Species Survey Map (<u>Appendix A</u>). Plant species designated by DCR as "early detection species", including giant hogweed (*Heracleum mantegazzianum*) and wavyleaf grass (*Oplismenus hirtellus* ssp. *undulatifolius*), were not observed within the survey area.

Overall, the survey area has localized and low-level infestations of invasive plant species. In four (4) mapping units, the relative percent coverage of invasive species within an infestation accounted for greater than 50 percent of vegetative cover. These mapping units are Unit 2 (70 percent coverage by invasives), Unit 3 (75 percent coverage by invasives), Unit 6 (50 percent coverage by invasives), and Unit 9 (72 percent coverage by invasives). These infestations encompass approximately 35 acres (9 percent) of the survey area.

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Rocky Forge Wind Project – Invasive Plant Species Survey

Table 1. Inavsive species and their percent coverage on the Rocky Forge Wind Project					
Unit	Area (acres)	Scientific name	Common name	Virginia Invasiveness Rank	Percent coverage
1	281.6	N/A	N/A	N/A	N/A
2	4.4	Dipsacus fullonum	Wild teasel	Medium	10
4	4.4	Microstegium vimineum	Japanese stiltgrass	High	60
3	1.8	Paulownia tomentosa	Royal Paulownia	Medium	75
		Dipsacus fullonum	Wild teasel	Medium	5
4	18.8	Pyrus calleryana	Callery pear	Medium	1
4		Rubus phoenicolasius	Wineberry	High	1
		Securigera varia	Crown-vetch	Low	15
_	1.0	Paulownia tomentosa	Royal Paulownia	Medium	5
5	1.0	Rubus phoenicolasius	Wineberry	High	15
		Rubus phoenicolasius	Wineberry	High	2
		Cirsium arvense	Canada thistle	High	5
		Microstegium vimineum	Japanese stiltgrass	High	15
6	8.3	Lonicera japonica	Japanese honeysuckle	High	25
		Rosa multiflora	Multiflora rose	High	1
		Celastrus orbiculatus	Oriental bittersweet	High	1
		Rumex crispus	Curly dock	Low	1
		Cirsium arvense	Canada thistle	High	1
	43.2	Cirsium vulgare	Bull thistle	Medium	1
7		Elaeagnus umbellata	Autumn olive	High	5
′		Lespedeza cuneata	Chinese lespedeza	High	1
		Microstegium vimineum	Japanese stiltgrass	High	5
		Paulownia tomentosa	Royal Paulownia	Medium	10
	3.9	Lespedeza cuneata	Chinese lespedeza	High	1
8		Microstegium vimineum	Japanese stiltgrass	High	15
		Rosa multiflora	Multiflora rose	High	1
		Rubus phoenicolasius	Wineberry	High	5
	20.3	Lespedeza cuneata	Chinese lespedeza	High	10
		Lonicera japonica	Japanese honeysuckle	High	25
9		Lonicera maackii	Amur Honeysuckle	High	15
		Microstegium vimineum	Japanese stiltgrass	High	20
		Pyrus calleryana	Callery pear	Medium	1
		Rosa multiflora	Multiflora rose	High	1
	2.9	Cirsium arvense	Canada thistle	High	5
10		Elaeagnus umbellata	Autumn olive	High	10
10		Lespedeza cuneata	Chinese lespedeza	High	5
		Securigera varia	Crown-vetch	Low	10

Rocky Forge Wind Project – Invasive Plant Species Survey

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Limitations

This study is based on the examination of the vegetation, site characteristics, and available reference documents. Our review and report have been prepared in accordance with the guidelines listed in the DCR Invasive Species Action and Recommendations, developed specifically for the Project. We make no other warranties, either expressed or implied, and our report is not a recommendation to buy, sell, or develop the property.

WETLAND STUDIES AND SOLUTIONS, INC.

Neil Gutherman, WPIT Environmental Scientist

Benjamin N. Rosner, PWS, PWD, CT, CE³ Manager – Environmental Science

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Rocky Forge Wind Project – Invasive Plant Species Survey

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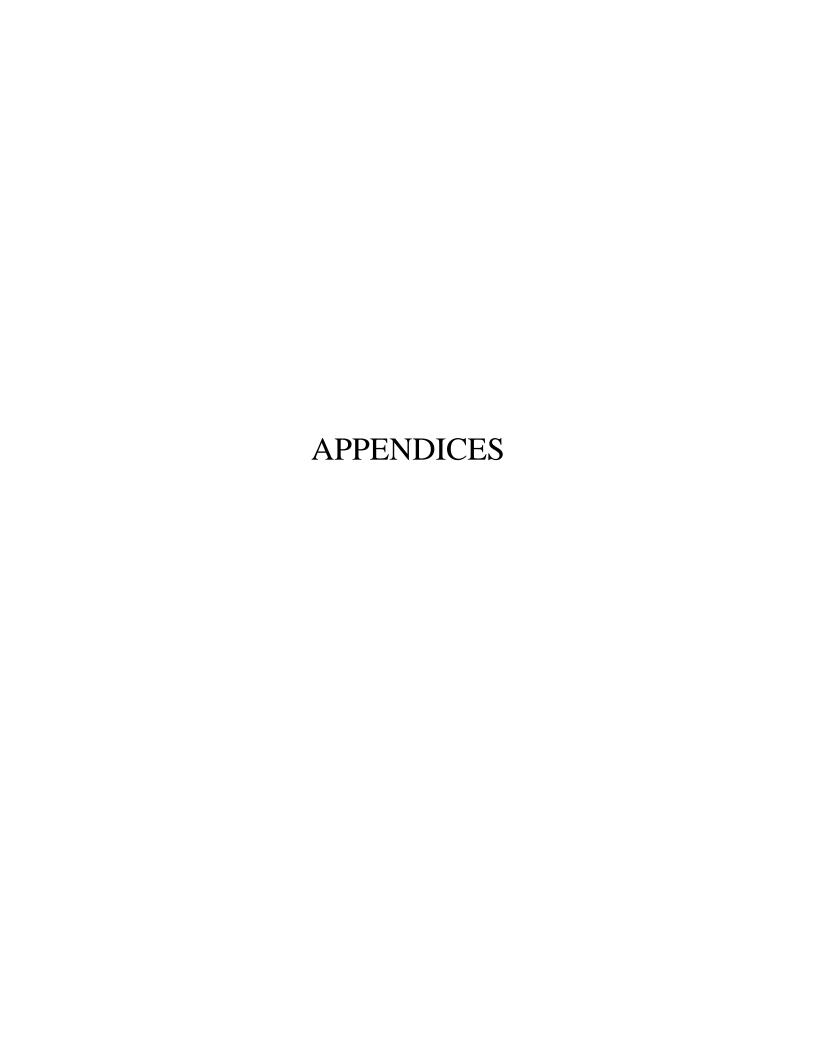
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Virginia Certified Professional Wetland Delineator #3402-000155; Wetland Professional in Training, Society of Wetland Scientists Certification Program, Inc.; Certified Level 1 Taxonomist: All Phyla, Society for Freshwater Science (SFS).

Wetland Professional in Training, Society of Wetland Scientists Certification Program, Inc.

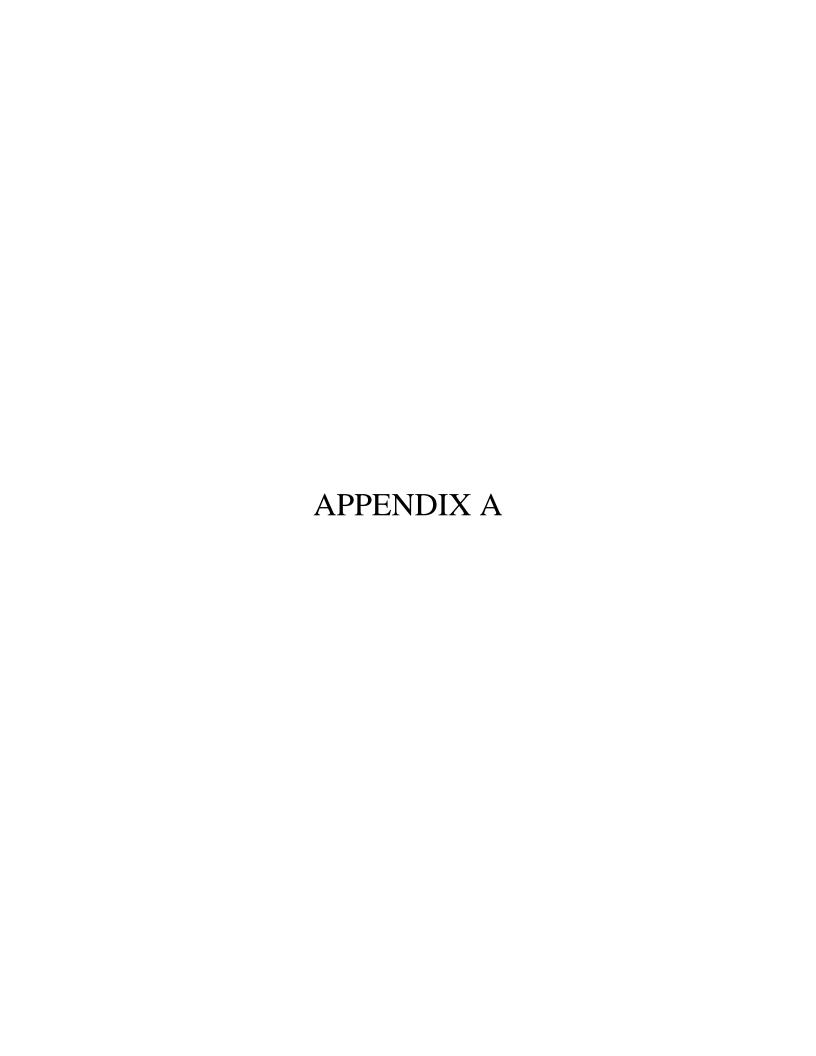
Professional Wetland Scientist #1766, Society of Wetland Scientists Certification Program, Inc.; Virginia Certified Professional Wetland Delineator #3402-000080; Certified Level 1 Taxonomist: All Phyla, Society for Freshwater Science (SFS); Certified Ecologist, Ecological Society of America.



INVASIVE PLANT SPECIES SURVEY ROCKY FORGE WIND PROJECT

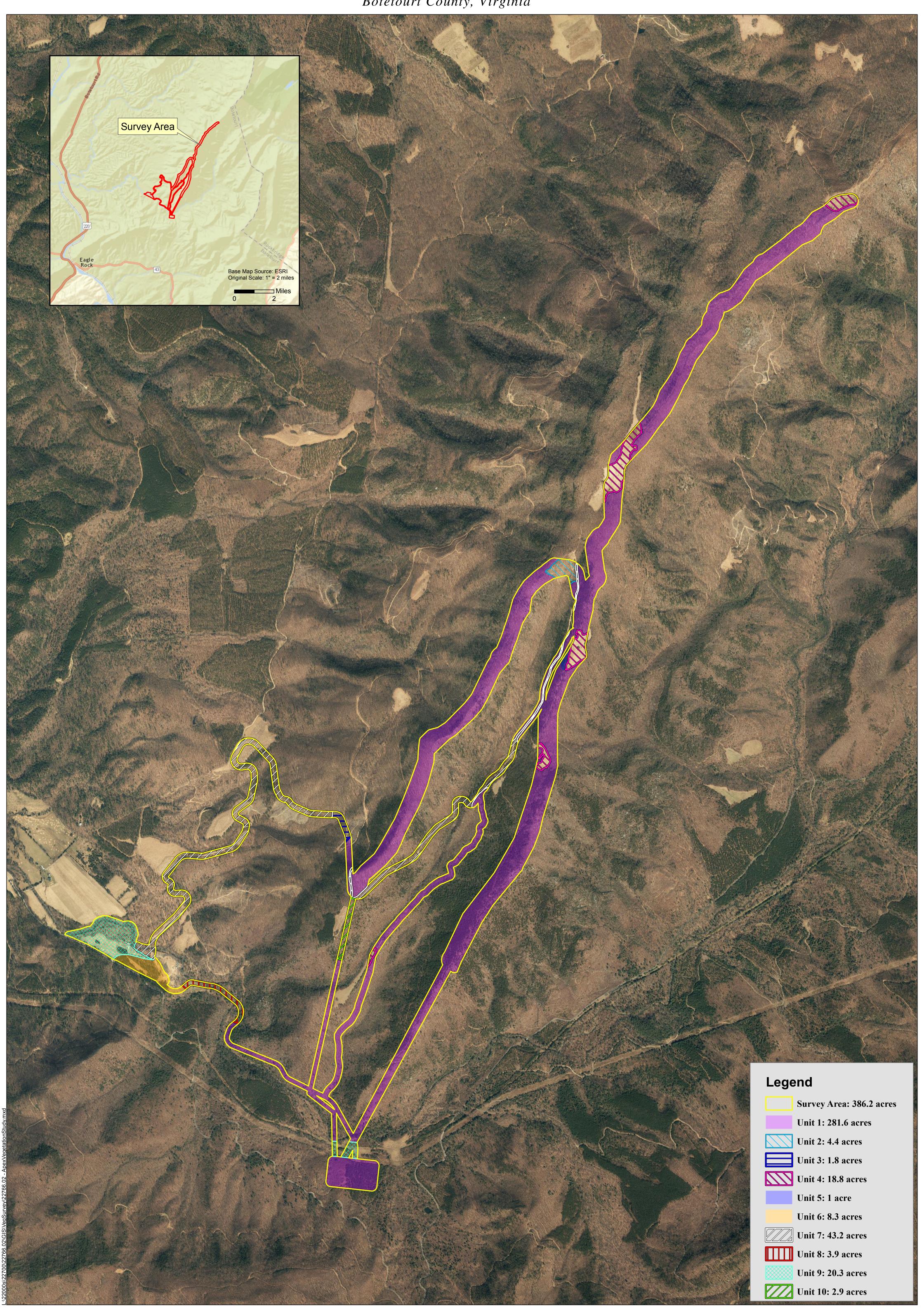
APPENDICES

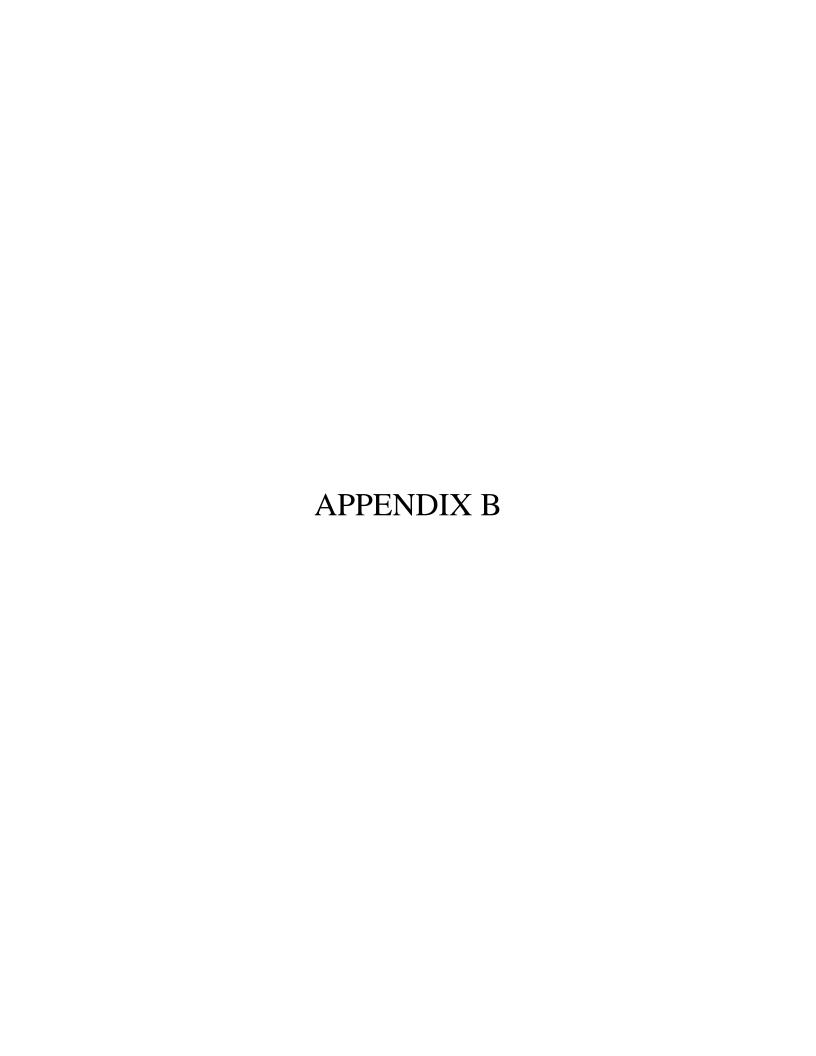
- A. INVASIVE PLANT SPECIES EVALUATION MAP
- B. WIND ENERGY PERMIT BY RULE REGULATION, DCR INVASIVE SPECIES ACTION AND RECOMMENDATIONS
- C. VIRGINIA INVASIVE PLANT SPECIES LIST



Invasive Plant Species Evaluation Map Rocky Forge Wind Project

Botetourt County, Virginia





Wind Energy Permit by Rule Regulation DCR Invasive Species Action and Recommendations

for the Rocky Forge Wind Energy Project, Botetourt County, Virginia

The following is provided by the Department of Conservation and Recreation-Division of Natural Heritage, to serve as Guidance per Regulation C-Other Natural Resources, as described in the Methodology section of the Virginia Department of Environmental Quality, Wind Permit by Rule GUIDANCE (November 2013). These required and recommended actions were developed specifically for the Rocky Forge Wind Energy Project in Botetourt County, Virginia.

1. Required Action

The Disturbance Zone (DZ) should be surveyed to detect presence and extent of invasive plants. A map product will be prepared depicting the DZ and locations of invasive plants found. DZ edges and areas adjacent to access roads are especially susceptible to invasive plant colonization and spread, and should be inspected carefully. Invasive plant occurrences should be mapped using global positioning system (GPS) devices. Small patches (<0.125 ac) can be mapped as point features, while larger patches are best mapped as polygons. Infestations occurring as linear patches along roads or trails can be mapped as line features. Each line feature should include an estimate of average patch width, allowing for area calculations. For all features, within-patch visual estimates of percent cover should be made. Invasive plant site survey results and map data will be shared with DCR Natural Heritage.

Table 1 indicates *potential* invasive plant species of concern at the <u>Botetourt County, Virginia</u> project site. Species are grouped by shade tolerance class; and, soil moisture affinities are given. Two species, giant hogweed (*Heracleum mantegazzianum*) and wavyleaf grass (*Oplismenus hirtellus* ssp. *undulatifolius*), are "early detection species", for which prevention of establishment and spread is a statewide high priority. Any occurrences of these plants should be reported to DCR as soon after detection as possible.

GPS guidelines: Point/polygon coordinates should be determined using a GPS device. UTM zone, datum, GPS file name, estimated horizontal accuracy, number of positions averaged and receiver status should be recorded. As a backup, coordinates (for point features only) should be written down in the field in the event GPS files are lost.

2. Recommended Actions

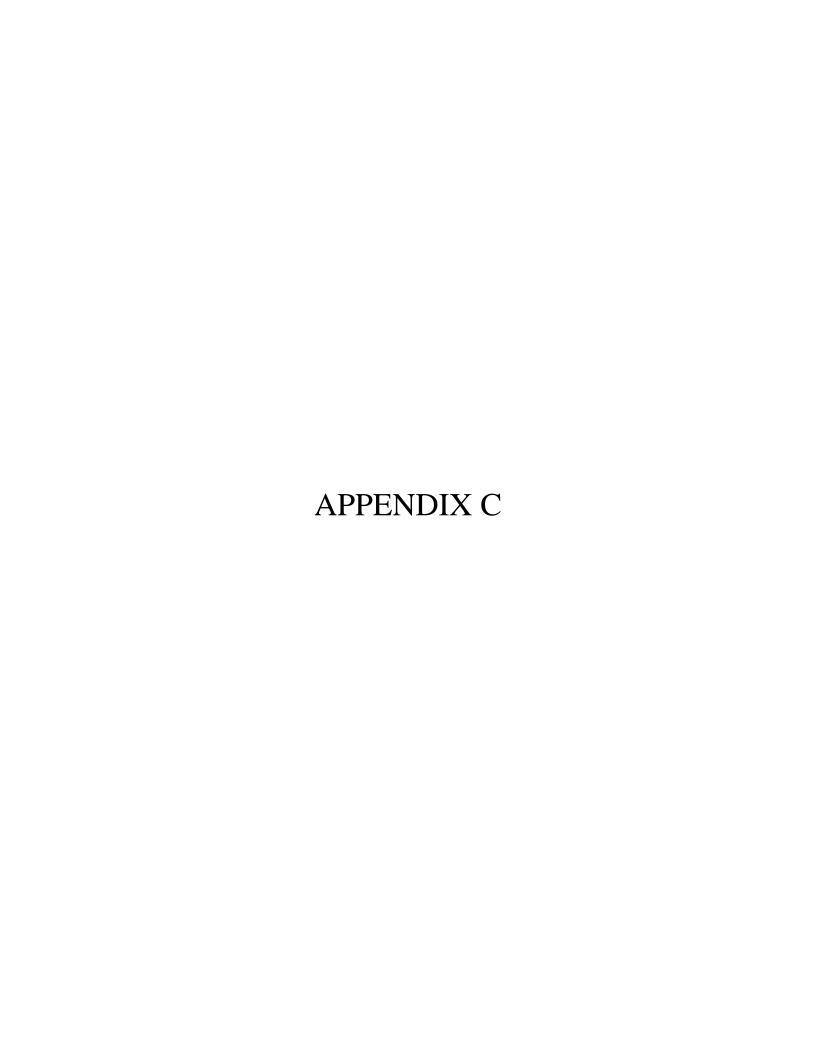
- **a)** DCR recommends annual monitoring for presence and abundance of invasive plant species for up to five (5) years following disturbance, or commensurate with other vegetation monitoring activities being conducted within the DZ following project completion.
- **b)** For erosion and sediment control and post-construction site restoration, it is recommended that plants listed as invasive by DCR NOT be used. Chinese ("sericea") lespedeza (*Lespedeza cuneata*) is especially problematic and should be avoided.

- **c)** It is recommended that only plants native to Virginia and adapted to the local site conditions be used for site restoration, including warm season grasses. For a list of recommended species, you may use our Native Plant Finder, at http://www.dcr.virginia.gov/natural-heritage/np.
- **d)** New invasive plant populations can become established from seed or plant fragments accidentally transported to a site via construction equipment. Such introductions can be prevented by pressure washing of mechanized equipment, vehicles, worker's boots, etc. before arrival at the construction site.

Table 1. Invasive plants, grouped by shade tolerance class, potentially occurring within natural and man-made forest openings on mountain ridges and adjacent slopes in Botetourt County, Virginia.

Highly Shade Intolerant						
Scientific Name	Common Name	Soil Moisture Preference				
Ailanthus altissima	Tree-of-heaven	Mesic				
Allaria petiolata	Garlic mustard	Mesic				
Celastrus orbiculatus	Oriental bittersweet	Mesic				
Centaurea stroebe ssp. micranthos	Spotted knapweed	Xeric				
Cirsium arvense	Canada thistle	Mesic				
Elaeagnus umbellata	Autumn olive	Mesic				
Heracleum mantegazzianum*	Giant hogweed	Mesic, Hydric				
Lespedeza cuneata	Sericea, Chinese lespedeza	Mesic				
Lonicera japonica	Japanese honeysuckle	Mesic				
Lonicera morrowii	Morrow's honeysuckle	Mesic				
Microstegium vimineum	Japanese stiltgrass	Mesic				
Persicaria perfoliata	Mile-a-minute	Mesic				
Pueraria montana var. lobata	Kudzu	Mesic				
Reynoutria japonica	Japanese knotweed	Mesic				
Rosa multiflora	Multiflora rose	Mesic				
Sorghum halepense	Johnson grass	Mesic				
-	Moderately Shade Tolerant					
Ailanthus altissima	Tree-of-heaven	Mesic				
Allaria petiolata	Garlic mustard	Mesic				
Celastrus orbiculatus	Oriental bittersweet	Mesic				
Centarea stroebe ssp. micranthos	Spotted knapweed	Xeric				
Dioscorea polystachya	Cinnamon vine	Mesic				
Elaeagnus umbellata	Autumn olive	Mesic				
Euonymus alatus	Winged euonymus	Mesic				
Heracleum mantegazzianum*	Giant hogweed	Mesic, Hydric				
Ligustrum sinense	Chinese privet	Mesic, Hydric				
Lonicera japonica	Japanese honeysuckle	Mesic				
Lonicera maackii	Amur honeysuckle	Mesic				
Lonicera morrowii	Morrow's honeysuckle	Mesic				
Microstegium vimineum	Japanese stiltgrass	Mesic				
Persicaria perfoliata	Mile-a-minute	Mesic				
Pueraria montana var. lobata	Kudzu	Mesic				
Reynoutria japonica	Japanese knotweed	Mesic				
Rosa multiflora	Multiflora rose	Mesic				
Rubus phoenicolasius	Wineberry	Mesic				
Sorghum halepense	Johnson grass	Mesic				

Urtica dioica	European stinging nettle	Mesic		
Shade Tolerant				
Allaria petiolata	Garlic mustard	Mesic		
Celastrus orbiculatus	Oriental bittersweet	Mesic		
Dioscorea polystachya	Cinnamon vine	Mesic		
Euonymus alatus	Winged euonymus	Mesic		
Ligustrum sinense	Chinese privet	Mesic, Hydric		
Lonicera japonica	Japanese honeysuckle	Mesic		
Lonicera morrowii	Morrow's honeysuckle	Mesic		
Microstegium vimineum	Japanese stiltgrass	Mesic		
Oplismenus hirtellus ssp. undulatifolius	Wavyleaf grass	Mesic		
Persicaria perfoliata	Mile-a-minute	Mesic		
Pueraria montana var. lobata	Kudzu	Mesic		
Rosa multiflora	Multiflora rose	Mesic		
Rubus phoenicolasius	Wineberry	Mesic		
Sorghum halepense	Johnson grass	Mesic		
Urtica dioica	European stinging nettle	Mesic		



Virginia Invasive Plant Species List







The Virginia Invasive Plant Species List comprises species that are established — or may become established — in Virginia, cause economic and ecological harm, and present ongoing management issues.

The list is for educational purposes only and has no regulatory authority.

To be included on the list, there must be demonstrable evidence that a species poses a threat to Virginia's forests, native grasslands, wetlands or waterways.

The Virginia Department of Conservation and Recreation's Invasive Species
Assessment Protocol, approved by the Virginia Invasive Species Working Group, May 2015, was used to conduct a risk assessment for each listed species.
Species were ranked as exhibiting high, medium or low levels of invasiveness based on their threat to natural communities and native species.

			R	EGIO	N
			ä	ont	=
		Virginia Invasiveness	Mountain	Piedmont	Coastal
Scientific Name	Common Name	Rank	Σ	_	Ö
Ailanthus altissima	Tree-of-heaven	High	•	•	•
Alliaria petiolata	Garlic Mustard	High	•	•	•
Alternanthera philoxeroides	Alligator-weed	High			•
Ampelopsis brevipedunculata	Porcelain-berry	High		•	•
Carex kobomugi	Japanese Sand Sedge	High			
Celastrus orbiculatus	Oriental Bittersweet	High	•	•	
Centaurea stoebe ssp. micranthos	Spotted Knapweed	High	•	•	•
Cirsium arvense	Canada Thistle	High	•	•	
Dioscorea polystachya	Cinnamon Vine	High	•	•	
Elaeagnus umbellata	Autumn Olive	High		•	
Euonymus alatus	Winged Euonymus Lesser Celandine	High		•	
Ficaria verna		High	•	•	
Hydrilla verticillata	Hydrilla Valley Flor	High			
Iris pseudacorus	Yellow Flag Chinese Lespedeza	High			
Lespedeza cuneata	Chinese Lespedeza Chinese Privet	High			
Ligustrum sinense		High			
Lonicera japonica Lonicera maackii	Japanese Honeysuckle Amur Honeysuckle	High High			
Lonicera maackii Lonicera morrowii	Morrow's Honeysuckle	High			
Lythrum salicaria	Purple Loosestrife	High			
Microstegium vimineum	Japanese Stiltgrass	High			
Murdannia keisak	Marsh Dewflower	High			
Myriophyllum aquaticum	Parrot Feather	High			
Myriophyllum spicatum	Eurasian Water-milfoil	High			
Persicaria perfoliata	Mile-a-minute	High			•
Phragmites australis ssp. australis	Common Reed	High	•	•	•
Pueraria montana var. lobata	Kudzu	High	•	•	•
Reynoutria japonica	Japanese Knotweed	High	•	•	•
Rosa multiflora	Multiflora Rose	High	•	•	•
Rubus phoenicolasius	Wineberry	High	•	•	•
Sorghum halepense	Johnson Grass	High	•	•	•
Urtica dioica	European Stinging Nettle	High	•	•	•
Acer platanoides	Norway Maple	Medium	•	•	•
Agrostis capillaris	Colonial Bent-grass	Medium	•	•	•
Akebia quinata	Five-leaf Akebia	Medium		•	•
Albizia julibrissin	Mimosa	Medium	•	•	•
Arthraxon hispidus var. hispidus	Joint Head Grass	Medium	•	•	•
Berberis thunbergii	Japanese Barberry	Medium	•	•	•
Cirsium vulgare	Bull Thistle	Medium	•	•	•
Dipsacus fullonum	Wild Teasel	Medium	•	•	•
Egeria densa	Brazilian Waterweed	Medium	•	•	•
Euonymus fortunei	Winter Creeper	Medium	•	•	•
Glechoma hederacea	Gill-over-the-ground	Medium	•	•	•
Hedera helix	English Ivy	Medium		•	•

Invasiveness rank is higher for species that:

- Alter ecosystem processes, such as succession, hydrology or fire regime.
- Are capable of invading undisturbed natural communities.
- Cause substantial impacts on rare or vulnerable species or natural communities or high-quality examples of more common communities.
- Are found widely distributed and generally abundant where present.
- Disperse readily to new areas.
- · Are difficult to control.

Early detection species

The list includes a subcategory of invasive plants that are considered early detection species. These are species not yet established or, if established, are not yet widespread in Virginia but known to be highly invasive in habitats similar to those found here. If discovered in Virginia, these species need to be quickly mapped, photographed and reported to DCR. The management goal for early detection species is eradication, as preventing the establishment and spread of newly arrived species will save valuable natural and economic resources.

INFORMATION

For more information, or to report early detection species, contact Stewardship Biologist Kevin Heffernan with the Virginia Department of Conservation and Recreation at 804-786-9112 or kevin.heffernan@dcr.virginia.gov

Photo credits:

Tree-of-heaven, Chuck Bargeron, University of Georgia, Bugwood.org. Phragmites, Jil M. Swearingen, USDI National Park Service, Bugwood.org. Wavyleaf grass, Kerrie L. Kyde, Maryland Department of Natural Resources, Bugwood.org.

Citation:

Heffernan, K., E. Engle, C. Richardson. 2014. Virginia Invasive Plant Species List. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Natural Heritage Technical Document 14-11. Richmond.



			REGION		
		Virginia Invasiveness	Mountain	Piedmont	Coastal
Scientific Name	Common Name	Rank	Σ	<u>~</u>	Ŭ
Holcus lanatus	Common Velvet Grass	Medium	•	•	•
Humulus japonicus	Japanese Hops	Medium	•	•	•
Ligustrum obtusifolium var. obtusifolium	Border Privet	Medium	•	•	•
Lonicera tatarica	Tartarian Honeysuckle	Medium	•	•	
Lysimachia nummularia	Moneywort	Medium	•	•	•
Miscanthus sinensis	Chinese Silvergrass	Medium	•	•	•
Najas minor	Brittle Naiad	Medium	•	•	•
Paulownia tomentosa	Royal Paulowina	Medium	•	•	•
Persicaria longiseta	Long-bristled Smartweed	Medium	•	•	•
Phyllostachys aurea	Golden Bamboo	Medium	•	•	•
Poa compressa	Flat-stemmed Bluegrass	Medium	•	•	•
Poa trivialis	Rough Bluegrass	Medium	•	•	•
Pyrus calleryana	Callery Pear	Medium	•	•	•
Rhodotypos scandens	Jetbead	Medium	•	•	•
Rumex acetosella	Sheep sorrel	Medium	•	•	•
Spiraea japonica	Japanese Spiraea	Medium	•	•	
Stellaria media	Common Chickweed	Medium	•	•	•
Veronica hederifolia	Ivy-leaved Speedwell	Medium	•	•	•
Viburnum dilatatum	Linden arrow-wood	Medium		•	
Wisteria sinensis	Chinese Wisteria	Medium	•	•	•
Commelina communis	Asiatic Dayflower	Low	•	•	•
Elaeagnus pungens	Thorny Olive	Low	•	•	•
Lespedeza bicolor	Shrubby Bushclover	Low	•	•	•
Lonicera fragrantissima	Winter Honeysuckle	Low	•	•	•
Melia azedarach	Chinaberry	Low		•	•
Morus alba	White Mulberry	Low	•	•	•
Perilla frutescens	Reefsteak Plant	Low	•	•	•
Phleum pratense	Timothy	Low	•	•	•
Populus alba	Silver Poplar	Low			•
Rumex crispus ssp. crispus	Curly Dock	Low			
Securigera varia	Crown-vetch	Low			
-		Low			
Trapa natans	European Water Chestnut Siberian Elm				
Ulmus pumila		Low			
Vinca major	Greater Periwinkle	Low			_
Vinca minor	Periwinkle	Low	•	•	•
Wisteria floribunda	Japanese Wisteria	Low		•	•
	ECIES - not yet widely e		in VII	rginia	
Aldrovanda vesiculosa	Waterwheel	High			
Eichhornia crassipes	Water Hyacinth	High			
Imperata cylindrica	Cogon Grass	High			
Ludwigia grandiflora ssp. hexapetala	Large Flower Primrose Willow	High	•	•	•
Oplismenus hirtellus ssp. undulatifolius	Wavyleaf Grass	High	•	•	
Vitex rotundifolia	Beach Vitex	High			•
Heracleum mantegazzianum	Giant Hogweed	Medium	•	•	
Ipomoea aquatica	Water Spinach	Medium	•	•	•
Salvinia molesta	Giant Salvinia	Medium	•	•	•
Solanum viarum	Tropical Soda Apple	Medium		•	•