

DOOMS – BREMO 230-KV TRANSMISSION LINE

Appalachian National Scenic Trail, Virginia
Shenandoah National Park, Virginia

The National Park Service
U.S. Department of the Interior



VEGETATION MANAGEMENT AND RESTORATION PLAN

April 2014

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1 INTRODUCTION

Dominion Virginia Power (Dominion) has an existing transmission line corridor that crosses the Shenandoah National Park and the Appalachian National Scenic Trail (**Figure 1**). The existing transmission line corridor crosses National Park Service (NPS) lands in two places: Skyline Drive and the Appalachian National Scenic Trail (adjacent to Skyline Drive) and across a parcel owned by the Appalachian National Scenic Trail (Tract 444), located east of the Appalachian Trail and Skyline Drive. The transmission corridor across the Appalachian National Scenic Trail and Shenandoah National Park consists of an existing 300-foot-wide and 215-foot-wide corridor (containing three and two transmission lines, respectively). Where the transmission line corridor crosses Skyline Drive and the Appalachian National Scenic Trail footpath, the corridor is 300-feet wide and contains three transmission lines. Where the transmission line corridor crosses Tract 444, an Appalachian National Scenic Trail parcel, the corridor is 215-feet wide and contains two transmission lines. NPS lands crossed by the above described transmission line corridors will be hereinafter referred to as “the corridor.” This document is intended to serve as a vegetation management plan for the Dooms – Breomo corridor as it crosses NPS lands. This plan includes general management guidelines and site-specific prescriptions for treatment and maintenance of vegetation in the corridor.

For the purpose of this vegetation management plan, the corridor is divided into three implementation zones for restoration and vegetation management after construction. These zones include:

1. Implementation Zone 1 - The corridor immediately west of Skyline Drive
2. Implementation Zone 2 - The corridor immediately east of Skyline Drive, with the Appalachian National Scenic Trail crossing
3. Implementation Zone 3 - The Appalachian National Scenic Trail parcel located slightly less than a mile east of Skyline Drive (Tract 444)

Construction activities on NPS property include removing the existing 115-kilovolt (kV) line (five structures on NPS land) and installing a new 230-kV line (four structures on NPS land). Project construction would require clearing vegetation within the limits of disturbance for the construction of access roads and construction pads, and contouring the land (pre- and post-construction). Vegetation management in the corridor would consist of reseeding disturbed areas with the approved NPS seed mix, planting screening areas and vegetation island clusters within the corridor, managing invasive species, and implementing long-term maintenance protocols. Additional vegetation management includes short-term monitoring efforts to ensure the success of the native vegetation plantings in the corridor.

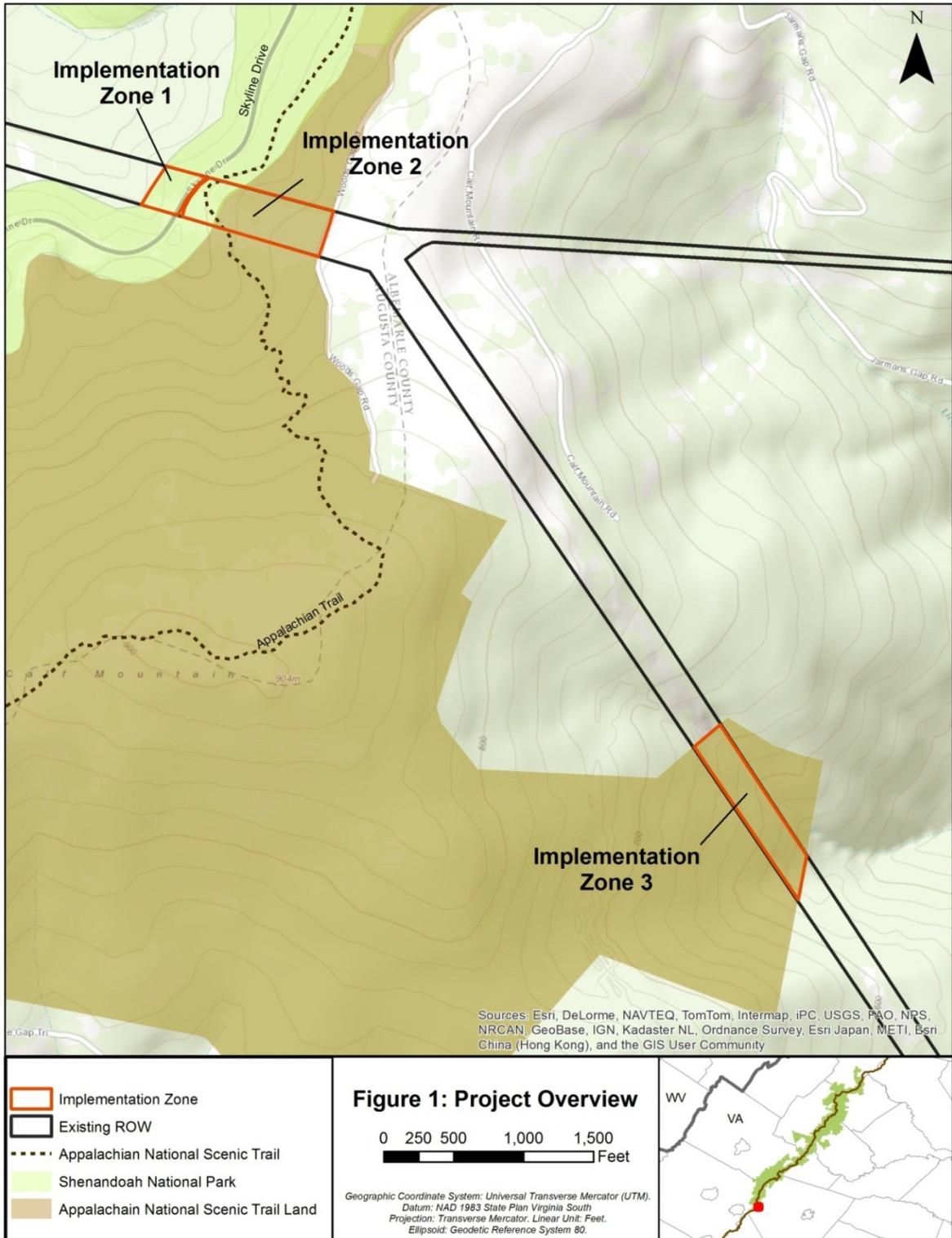


Figure 1: Overview Map of the Project Area

1.1 Objectives

The objective of this vegetation management plan is to create a plan that promotes stable low-growing natural vegetation cover, discourages invasive plant species growth, and minimizes the need for extensive long-term vegetation management activity in the corridor.

Specific objectives are to:

1. Determine protocols for Dominion/NPS communication for any activities on NPS lands.
2. Develop vegetation restoration and maintenance prescriptions for three vegetation zones within the corridor.
3. Develop a plan that encourages a sustainable plant community within the corridor that provides:
 - visual screening of the corridor from the Appalachian National Scenic Trail and Skyline Drive;
 - food and cover for wildlife and bird species;
 - erosion control; and
 - promotion of native over non-native species.
4. Present methods of controlling and managing invasive species.
5. Determine short- and long-term monitoring and maintenance protocols for the corridor.

2 PLAN DEFINITIONS AND TERMINOLOGY

2.1 Terminology

Danger Trees—are defined using Dominion’s standard vegetation management plan. A danger tree is a tree outside the ROW that based on its height and proximity to the line, could, in falling, come within 10 feet of the conductors.

Emergency—a situation that poses immediate threats to life, property, or safety. Examples include: downed power lines, broken poles, and fallen trees. Emergencies do not include cyclic or routine maintenance or trimming.

Hazard Trees — hazard trees are defined by Dominion as “a structurally unsound tree that could strike a target when it falls. As used in this clause the target of concern is electrical supply lines.” In other words, a “hazard tree” is a “danger tree” that exhibits an elevated risk of falling due to one or more physical or physiological defects.

Hydroseeding—typically a mixture of wood fiber, grass seed, and soil stabilizer applied to a disturbed area until permanent vegetation can be established. Hydroseeding minimizes erosion impacts from wind and water by providing adequate dispersal coverage, which traditional hand seeding may not provide.

Nonselective Herbicide—a chemical formulated to kill or significantly retard the growth of all vegetation it contacts.

Non-target Vegetation—native species that occur in the corridor that do not reach a height sufficient to come in contact with utility lines, including the sag of the lines during peak ambient temperatures. Elevation of the utility line above the ground will be taken into consideration when identifying non-target vegetation; i.e., a tree species that would meet target specifications on level ground might be considered non-target where the transmission line crosses a valley or ravine and conductor height is farther from the ground than usual, allowing for the vegetation to grow more than 10 feet tall.

Point of Contact (POC)—a single POC has been assigned for communication between Dominion and the NPS (Karen Beck-Herzog). Several POCs have been assigned for communication between the NPS and Dominion, based on project role or specialty. Dominion’s full POC list is included in **Appendix A**.

Karen Beck-Herzog will be the main POC for the NPS. Any communication between Dominion and the NPS should be directed to Ms. Herzog.

Karen Beck-Herzog, Shenandoah National Park,
Public Affairs Officer, Lands Coordinator, FOIA Officer.
540-999-3500, ext. 3300
karen_beck-herzog@nps.gov.

Dominick Piccolomini is Dominion’s Project Manager, and should be contacted when the NPS is unsure who to contact. A full list of Dominion contacts based on project role or specialty is included in **Appendix A**.

Dominick Piccolomini
Manager Electric Transmission Right-of-Way
701 E Cary St.
Richmond, VA 23219

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Targeted Vegetation/Species—include both native and invasive species. Native woody species present within the corridor that are taller than 10 feet or have the potential to reach a height over 10 feet are considered target vegetation. All invasive species are considered target species, whether or not they have the potential to reach the conductor or extend into the sag zone. Corridors can be vectors for the introduction and spread of invasive species; management of these species is required to prevent further invasion on NPS land. A list of known invasive species currently within the corridor is attached as **Appendix B**. If, during construction or maintenance of the utility line, invasive species are encountered that are not included on this list, Dominion is required to notify the parks of their presence. More information on invasive species can be found in sections 4.1 and 4.10.

Selective Herbicide—a chemical formulated to kill or significantly retard the growth of target vegetation without considerably damaging surrounding vegetation.

3 REQUIREMENTS AND CONDITIONS

3.1 General Requirements and Conditions

Authorization—Maintenance crews must have a copy of any permits, plans, and mitigations issued as part of the National Environmental Policy Act (NEPA) process with them at all times. When accessing the corridor, vehicles should have company identifying marks and the written approval granted by the NPS (described under *Notification*, below). If a contractor is used to perform the monitoring or maintenance, the contractor will be familiar and compliant with all conditions in the permit and these vegetation management guidelines.

Access—corridor access for regular vegetative monitoring, maintenance, and restoration activities will be through permanent two-track access roads used as part of construction or established roadways, including Skyline Drive. Any other access requires written approval from the NPS.

Chipping—No chipping and/or mulching is permitted without prior written authorization. When removing trees or trimming limbs, the preferred method is to let the branches remain where they lie. Limbs or trees should not be dispersed in the park or under lines. Branches or trees should only be moved if there is a safety concern.

Equipment/Apparel Washdown—Dominion or its authorized contractor will inspect and clean all construction or vegetation maintenance equipment before entering NPS lands to mitigate the spread of invasive species. High-pressure washing is the most effective washdown technique for equipment (NOAA 2013). For this technique, the minimum water pressure for equipment and vehicle cleaning should be at least 90 pounds per square inch (NOAA 2013). All equipment and vehicles accessing NPS land for this project (construction and maintenance) will be thoroughly power-washed or blown clean using an air compressor, adhering to the above specifications. Special attention to the undercarriage and wheel wells should be given during washdown events. This cleaning will remove mud and potential weed seed carrying material. Cleaning of all vehicles will be performed off of NPS lands. In addition to equipment washdown, all boots and clothing must be cleaned of visible soil and plant material prior to entering NPS lands to avoid spread of invasive species and weeds.

Equipment Refueling—Dominion and/or its authorized contractor are not authorized to refuel or store fuel within any NPS lands.

Equipment Storage—to the extent possible, Dominion and/or its authorized contractor will store any equipment or material in an area that will not be visible to Appalachian National Scenic Trail users or Skyline Drive visitors. Dominion and/or its authorized contractor will properly store and remove trash and waste in a timely manner and keep the area free of debris and litter.

Fire Prevention—Dominion and/or its authorized contractor will do everything within its power, both independently and at the request of the park POC, to prevent and suppress fires resulting from Dominion's and/or an authorized contractor's activities on and adjacent to the permitted area.

Noise—Dominion or its authorized contractor will take measures to minimize audible noise during construction. Dominion or its authorized contractor will ensure that all construction equipment is fitted with noise reduction solutions, such as dampening materials, mufflers, and barriers around portable generators. Dominion or its authorized contractor will also ensure that maintenance inspections and repairs on all construction equipment have been completed before the equipment reaches the construction sites.

Notification—Dominion must notify the park POC at least 45 days before any maintenance or restoration activities begin and provide an anticipated work schedule for activities on NPS land. No work on NPS land (e.g., removal of trees, trimming of vegetation, proposed herbicide application, vegetation planting, or vehicular access) is to occur until the park grants written approval (both inside and outside the corridor). Exceptions include emergencies, as defined above. Immediate notice to the park POC is required for any emergency entry onto NPS property that will involve surface-disturbing activities following the period of construction.

Safety—All pruning and cutting will be performed to International Society of Arboriculture and American National Standards Institute standards. Dominion will store equipment or materials in an area away from visitors to ensure visitor safety.

Site Damage—Damage to any boundary trees, signs, survey markers, or boundary monuments will be reported immediately to park POC. Prior to commencing any work, Dominion will ensure that all boundary markers, boundary monuments, and previously documented cultural resources (if applicable) in the corridor are clearly marked and left undisturbed at all times. Any boundary markers or boundary monuments damaged by Dominion and/or its contractors will be repaired, replaced, or otherwise mitigated at Dominion's expense, per NPS specifications.

Spill Prevention—Dominion or its authorized contractor will have spill prevention and containment equipment on site until all work is completed. Dominion and/or its authorized contractor will immediately contain and manage the spill of any hazardous material in accordance with all applicable laws and regulations. The appropriate Dominion POC will immediately notify the park POC of any hazardous material spills on NPS lands.

3.2 Herbicide Usage Requirements and Conditions

Applicator Qualifications—Dominion and/or its authorized contractor must have the appropriate state license to apply herbicides. Dominion and/or its authorized contractor must be able to accurately identify both target and non-target species.

Herbicide Applications—Applications will be basal stem, stem injections, cut stump, and low volume selective foliar spraying (via backpack sprayer). No aerial or broadcast spraying will be allowed.

Herbicide Notification—The park POC must be notified, through submittal of a Pesticide Use Permit, 45 days before any herbicide use occurs. Dominion will identify the herbicide that will be used in the Pesticide Use Permit. A list of 2013 NPS-approved herbicides can be found in **Table 1**. Note, this list may change from year to year and a Pesticide Use Permit is required for any herbicide application on NPS lands. The permit will include the herbicide to be used, target vegetation or species, and the area of application. Following the permit submittal by Dominion, the park POC will then submit the Pesticide Use Permit for regional concurrence and approval.

Material Safety Data Sheets—All material safety data sheets and labels for products used will be available on site and in Dominion and/or authorized contractors' vehicles.

Pesticide Storage, Mixing, and Loading—All mixing will be done outside of NPS boundaries. In addition, herbicides applied on NPS lands will be mixed at the lowest effective concentrations.

Record Keeping—All records will be maintained and the following information will be sent electronically to the park POC within 10 days of an herbicide application: Trade name; EPA number; active ingredient; amount applied; specific targets (especially if the species is invasive); application

method; date applied; area covered; weather, including current air temperature; average wind speed; and time of day. Physical location and Permit Number (e.g., 5:140:1234) must also be included. Additionally, pesticide use logs are required annually.

Spills—A spill plan, which includes both emergency and park personnel notification, will be on hand and available upon request. See *Spill Prevention* above.

4 SITE PREPARATION AND CONDITIONS DURING CONSTRUCTION

As noted in Section 1, the corridor has been divided into three implementation zones for vegetation management. The following section describes aspects of the vegetation management plan that are common to all three implementation zones. Details related to individual implementation zones are presented in sections 5, 6, and 7.

4.1 Target Vegetation and Treatment Methods

4.1.1 Target Vegetation in the Corridor

In general, cleared rights-of-way (ROWs) have a high potential for invasive species growth. Overall, Shenandoah National Park has a low level of invasive species. About 85% of the forested land in the vicinity of the corridor is populated by Central Appalachian Dry-Mesic Chestnut Oak-Northern Red Oak forest. Shenandoah National Park's park-wide monitoring data indicates that 65% of the forest in this vegetation type is free of invasive plant species. The remaining 35% of forest in this vegetation type typically has invasive plant cover ratings of less than 1%, with the exception of an area in the north district of Shenandoah National Park (more than 75 miles north of the corridor) (Cass, pers. comm. 2014).

In 2011, the NPS conducted a forest monitoring survey in the vicinity of the corridor. At the time of the survey, a forest monitoring plot was located approximately 200 meters from the corridor and contained no invasive species. Data from a roadside invasive plant survey, approximately 100 meters from the corridor, show higher levels of three invasive species along on the edge of Skyline Drive. Garlic mustard (*Alliaria petiolata*) had coverage of between 1 and 5%, tree of heaven (*Ailanthus altissima*) had coverage between 5 and 25%, and Japanese stiltgrass (*Microstegium vimineum*) had coverage between 50 and 75%. These numbers are from an opportunistic survey of area observed to have invasive species and do not account for nearby areas that are clear of invasive species (Cass, pers. comm. 2014).

An invasive plant survey was conducted within the corridor at the start of the project and the invasive species level was relatively low; however, some invasive species were found (see maps included in **Appendix B**). No invasive species were found within Implementation Zone 1 (west of Skyline Drive). No invasive species were found immediately adjacent to the Appalachian National Scenic Trail; however, several invasive species were identified within Implementation Zone 2, along the existing access road and east of the Appalachian Trail (NPS 2012). The invasive species found included: oriental bittersweet (*Celastrus orbiculatus*), spotted knapweed (*Centaurea stoebe* sp. *micranthos*), coral berry (*Symphoricarpos orbiculatu*), and Japanese honeysuckle (*Lonicera japonica*). Conversely, several invasive species were identified within Implementation Zone 3 and include: Japanese wineberry (*Rubus phoenicolasius*), Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), spiny plumeless thistle (*Carduus acanthoides*), spotted knapweed (*Centaurea stoebe* ssp. *Micranthos*), Chinese bushclover (*Lespedeza cuneata*), garlic mustard (*Alliaria petiolata*), catnip (*Nepetea cataria*), tree of heaven (*Ailanthus altissima*), coral berry (*Symphoricarpos orbiculatu*), and princess tree (*Paulownia tomentosa*). (NPS 2012). **Appendix B** includes a description of these invasive species and treatment methods, as well as the maps showing the current invasive species locations.

Given the above information, a series of long-term invasive species goals should be implemented and are further described in Section 4.11, *Long-Term Maintenance*.

4.1.2 Herbicides

When used properly, herbicides can be the most effective way to control and minimize growth of target vegetation. A list of the 2013 NPS-approved herbicides is found in **Table 1**. This list will change year to

year as a result of alterations to chemical formulas. Dominion will consult with the park POC each year to obtain an updated list of recommended herbicides, prior to submitting a Pesticide Use Permit application.

Table 1: 2013 Approved Herbicides for Controlling Invasive Species*			
Trade Name	Chemical Name	EPA #	Main pests
Accord [®] Concentrate	Glyphosate isopropylamine	62719-324	exotic plants, weeds
Arsenal [®]	Isopropylamine salt	241-346	corridor weeds
Escort [®]	Metsulfuron Methyl	352-439	corridor weeds
Garlon [®] 3A	Triclopyr TEA salt, Triethylamine, Ethanol	62719-37	woody invasives
Garlon [®] 4	Triclopyr-2-butoxyethyl ester, kerosene	62719-40	woody invasives
Krenite [®] UT and Krenite [®] S	Ammonium salt of fosamine	352-395	corridor weeds
Milestone [®] VM	Aminopyralid tri- isopropanplammonium	62719-537	woody invasives
Plateau [®]	Ammonium salt of fosamine	241-365	exotic plants
Polaris [™]	Isopropylamine salt of imazapyr	228-534	woody invasives
Razor Pro [®]	Isopropylamine salt of glyphosate	228-366	corridor weeds
Rodeo [®]	Glyphosate IPA	62719-324	exotic plants, weeds
Roundup [®] Pro Concentrate	Isopropylamine salt of glyphosate	524-529	exotic plants, weeds
Stalker [®]	Isopropylamine salt of imazapyr	241-398	corridor weeds

*Herbicides listed may change from year to year due to alterations of the chemical formula. It is Dominion's responsibility to contact the NPS staff for an updated herbicide list for the upcoming year. The process for obtaining a Pesticide Use Permit includes identifying the preferred herbicide to be used and the number of acres proposed for application. The Park POC would then submit a Pesticide Use Permit for regional concurrence.

4.1.3 Best Management Practices and Treatment Methods

Best management practices and herbicide use restrictions include:

- Only NPS pre-approved herbicides, and associated application rates, can be used (**Table 1**, subject to change each year).
- No broadcast or aerial applications of herbicides are permitted.

- No water sources in the parks are permitted for mixing herbicides or cleaning equipment of any kind; avoid all water when using herbicides.
- No herbicides will be used within 10 feet of any surface water (i.e., streams, springs, seeps, wetlands). Within 10 to 50 feet of surface waters, only NPS pre-approved herbicides labeled for wetland use are permitted.

On NPS lands, Dominion can use three methods of herbicide application and/or one mechanical method for vegetation control. Herbicide application methods include foliar spraying (via backpack sprayer), basal stem (including stem injections), and cut-stump treatments. Mechanical treatments include hand cutting (described further below). Aerial or broadcast spraying methods cannot be used to treat target vegetation on NPS lands. When herbicide and mechanical treatments are used in combination, these methods can effectively control target vegetation.

Foliar Spraying—Foliar spraying via a backpack sprayer is the application of herbicides to fully developed leaves, stems, or blades of targeted vegetation. Dominion will apply the herbicide per label directions and spray with a low-volume applicator to establish a uniform application over the entire foliage of the plant. Dominion will not use foliar spraying of herbicides on plants taller than 5 feet due to the potential for wind dispersal to other non-target species. Foliar spraying will be applied on post-emergent vegetation in low volumes and low pressure methods through backpack sprayers. When foliar spraying, Dominion should consider the effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness. In the field, Dominion should limit applications to calm, dry periods to minimize runoff and drift. Dominion staff or authorized contractors will not foliar spray if winds exceed 10 miles per hour or if rainfall is imminent. If heavy rainfall is expected, Dominion will minimize treatment applications on steep slopes to reduce runoff (Bureau of Land Management 2013).

Basal Stem Treatment—Basal stem treatment is a technique that includes stem injection or banding to deliver an herbicide application at low pressure to the base or stem of targeted vegetation. Basal stem treatment is most effective when applied to fresh live stems or new growth vegetation. Basal stem application is done only to targeted vegetation and minimizes herbicide application to non-target vegetation.

Cut-Stump Treatment—Cut stump treatment is a technique that combines hand cutting and basal stem treatment methods. Cut stump treatments deliver an herbicide application at a low pressure to the freshly cut stump of target vegetation. To be most effective, herbicide treatment is applied immediately after cutting stumps.

Hand Cutting—Hand cutting consists of the removal of target vegetation using hand tools. Target vegetation is cut as close to the ground as possible, and stumps are no taller than 3 inches. Hand cutting is the most effective on single target vegetation and within areas restricted by terrain, site size, and sensitivity.

4.2 Vegetation Removal, Stockpiling, and Mulch

Given that the corridor is an existing cleared ROW, limited vegetation clearing will be required for the construction of this project. It is not anticipated that any large trees will be removed for the construction of the project within the corridor. Any vegetative debris that has to be removed from the limits of disturbance will be dispersed throughout the ROW. If chipping or mulching is necessary, the NPS must authorize the action and determine if the mulch should be stockpiled or dispersed throughout the corridor.

NPS management policies state that to prevent the spread of invasive exotic plant species, certified weed-seed free materials should be used. Mulch may be necessary for the plantings described under each implementation zone. If mulch is obtained from outside sources for any aspect of restoration, it must be obtained from an NPS-approved vendor. Only straw may be used on NPS lands, never hay, to reduce exposure of open areas in the corridor to unwanted seeds. Pre-approved mulch vendors include:

- Royal Oak Farm, LLC (<http://www.royaloakfarmllc.com/v.php?pg=5>)
- JK Enterprise Landscape Supply (<http://www.lumberjake.com/category/products/mulches/>)

4.3 Fertilizers and Soil Amendments

Soil amendments and fertilizers are materials added to soil to increase physical properties, such as water retention, infiltration, and drainage. Generally, this vegetation management plan does not recommend soil amendments and fertilizers, because they are not likely to meet the goals of establishing a self-sustaining habitat. If vegetation cannot be established without the aid of fertilizers, it may be less likely to survive long term, once supplementation fertilizers are no longer added (Downing, pers. comm. 2013).

Instances where fertilizers are recommended for this plan are for establishing grasses and herbaceous vegetation for erosion and sediment (E&S) control purposes. In such cases, an organic-low nitrogen amendment such as Biosol[®] or Sustane[®] can be used to provide low levels of slow release nutrients and some organic matter when establishing E&S controls. Dominion should use NPS-approved fertilizers and soil amendments only to meet the minimum standards for E&S controls. Fertilizers will not be used within sensitive sites unless given prior NPS approval.

4.4 Topsoil Salvaging

It is important to preserve as much of the existing topsoil as possible for use during restoration. Topsoil is an important source of native seed and soil microbes that enhance re-vegetation efforts. A preliminary soil boring near the location of the project site and field investigations indicates that the topsoil was approximately 0.5 to 1 inch deep. Below the topsoil, there were shallow subsurface soils (6 to 12 inches) with low moisture through the entire depth for all implementation zones, with Implementation Zone 3 having slightly higher moisture levels. Subsurface soil depth increases slightly (12 to 18 inches) east of the Appalachian Trail near the access road.

NPS management policies state, “Wherever practicable, soils and plants affected by construction will be salvaged for use in site restoration.” As mentioned previously, topsoil was approximately 0.5 to 1 inch deep, with shallow underlying soils that were high in gravel and nutrient poor. Efforts should be made to salvage the topsoil that is present; however, it may not be possible at this site given the shallow soils and level of GPS accuracy equipment required to remove the thin layer topsoil with a bulldozer. Both NPS and Dominion agree that topsoil salvaging is a preferred option for restoration efforts. When possible, Dominion will salvage and stockpile the top 6 inches of topsoil within the corridor. If topsoil is salvaged, it will likely contain subsurface soil and could include gravel/cobble stones.

Prior to topsoil salvaging, the Dominion test the soil in multiple areas in the corridor to identify:

- Soil classification and characteristics
- If soil has the necessary physical and chemical characteristics needed for restoration efforts (such as texture, type, pH, and organic matter)
- If salvageable soil provides a suitable amount of coverage within the corridor

Once the topsoil has been determined salvageable and salvaged, Dominion would minimize the amount of handling of the stockpiled soil, maintain specified stockpile locations (shown in **Figure 2**), preserve the original soil characteristics, and protect stockpiles from erosion due to rainfall and runoff. Stockpiled topsoil should be stored in wide, shallow piles no more than 9 feet deep, and the slopes should be generally kept shallower than 3:1 (Horizontal :Vertical) (CDM Smith 2012). Stockpiling soils for an extended period of time could result in the loss of soil microbes, bacteria, and native seeds that are typically found in soils. To reduce the loss of the above-listed items and protect soils from erosion, stockpiles should be placed in an area that minimizes wind exposure (at the edge of the corridor) and/or by seeding the soil with the seed used for E&S control measures (described below in Section 4.5) (Montana State University 2004). It is important not to disturb soil once it has been stockpiled, until it is used for restoration.

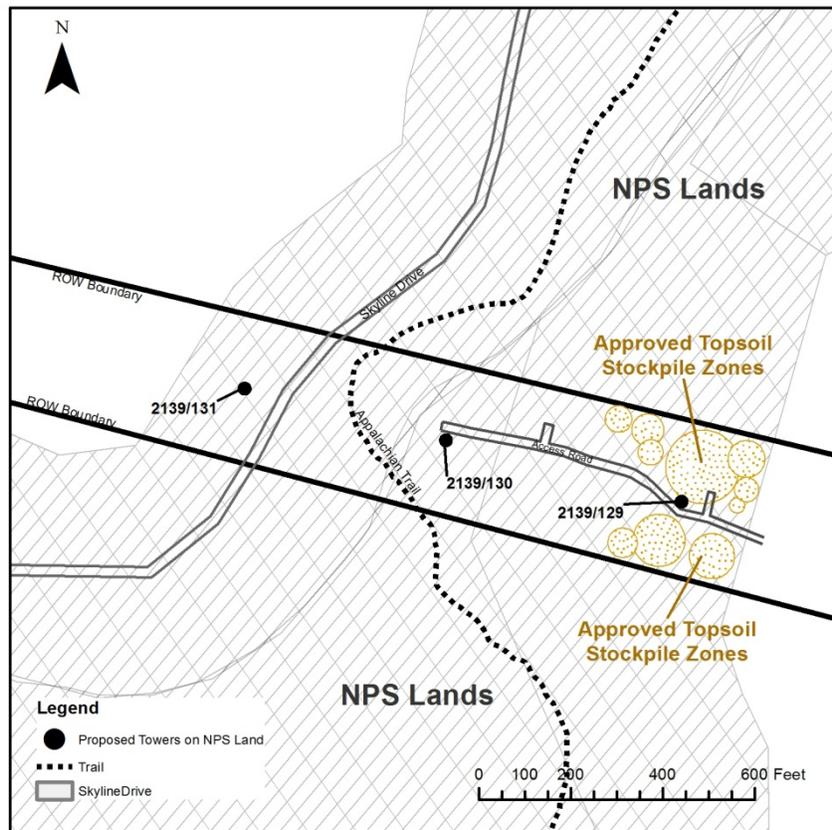


Figure 2: Approved Topsoil Stockpile Location

Soil salvaging may not be feasible or produce the amount of soil that may be needed for restoration. NPS management policies state that “if additional soil and plants are needed to restore disturbed sites, they may be obtained from other sites in the park if it is determined that the use of an in-park source will not significantly affect cultural or natural resources or ecological processes. Imported soils must (1) be compatible with existing soils, (2) be free of undesired seeds and organisms, and (3) fulfill the horticultural requirements of plants used for restoration” (NPS 2006). Dominion will work with the NPS to determine the best second option to soil salvaging. Three potential options include:

1. Salvage soils from other portions of the parks for use during restoration. Prior to use, in-park resources should be determined to not significantly affect cultural or natural resources.
2. Adding soil amendments to the subsurface soils and creating new topsoil. New topsoil is achieved by blending organic material, and/or compost with the subsurface soil. Compost should meet the California Compost Quality Council's definition (2001) of mature, specifically: cured compost with limited odor production, limited toxicity potential, and minimal impacts on soil nitrogen. Mature compost is used for general field use and row crops and is a substitute for low analysis organic fertilizers in some cases. Approximately 6 inches of organic material, and/or compost would be blended with the top 8 inches of the subsurface soils to create new topsoil. Any additional organic material and/or compost used during restoration will need to be approved by the NPS at the same time the plant species are approved (6 months prior to use).
3. Import new topsoil to the site for use during restoration. Topsoil must be approved by the NPS and be free of undesired seeds and organisms. Any additional topsoil used during restoration will need to be approved by the NPS at the same time the plant species are approved (6 months prior to use).

4.5 Seeding

Intermediate seeding events will occur throughout active construction to promote soil stabilization in disturbed areas. During these intermediate seeding events, the seed mix Regreen™ (*Triticum aestivum*) should be used to address temporary stabilization issues and adhere to E&S control measures. Any other temporary seeding types, brands, or methods must be approved by the NPS. Approved fertilizers can be used for E&S controls (see in Section 4.3).

Once construction is complete and contours are restored, the corridor will be seeded with the NPS-approved seed mix shown in **Table 2**. This seed mix is most suitable for a sunny corridor environment. Seed mix distributions are based on water availability and total amount of sunlight within the corridor. The seed mix contains two winter species, broomsedge (*Andropogon virginicus*) and beaked panic grass (*Panicum anceps*), which allow vegetation to become established in the colder months. Approved vendors for seed purchase include:

- ERNST Conservation Seeds (<http://www.ernstseed.com/>)
- Prairie Moon Nursery (<http://www.prairiemoon.com/home.php>)

Table 2: NPS Approved Seed Mix		
Habitat	Sunny, dry	
Seeding Rate	20 pounds/acre	7.3 ounces per 1,000 square feet
Species	%	
<i>Andropogon virginicus</i> (broomsedge)	5	
<i>Panicum anceps</i> (beaked panic grass)	15	
<i>Tridens flavus</i> (purpletop)	20	
<i>Schizachyrium scoparium</i> (little bluestem)	60	

4.6 Plants for Use in Restoration

NPS management policies state that, “wherever practicable, soils and plants affected by construction will be salvaged for use in site restoration” (NPS 2006). While plant salvaging is preferred for restoration activities within the corridor, it is not practical or possible for this project. Quantities of sufficient and suitable species are not currently growing, and therefore salvageable, within the corridor; as such, plant salvaging will not be used for this project.

Plants used in restoration will be purchased from a nursery. Purchased vegetation must be identified as locally harvested and grown. A list of native species to be used in the landscape plantings is shown in **Table 3**. Prior to purchasing, the NPS must approve the species for purchase. As such, Dominion must talk with the NPS at least 3 months prior to ordering any species, so that the NPS may talk with the nursery to ensure that all plants are from native propagates. Plants purchased from nurseries will be container species, preferably no bigger than 1 gallon in size.

Timing for planting is critical. Every effort should be made to get the plants in the ground quickly and during optimal times for planting. Optimal times are mid-spring (before budding) or mid-fall (after leaf fall) to maximize survival rate (Bassuk 2000). Bareroot plants are not preferred because the survivability of bareroot plants decreases the longer they remain unplanted; however, if container species are not available, bareroot plants can be purchased.

Seedling/shrub availability may change from year to year, and nurseries should be contacted early. Suggested nurseries for plant purchase include:

- Nature By Design: 300 Calvert Avenue Alexandria, VA 22301; (703) 683-GROW (4769) (www.nature-by-design.com)
- Wild Plant Nursery of Earth Sangha: 10123 Commonwealth Blvd. Fairfax, VA 22032. (703) 764-4830 (www.earthsangha.org)
- Blue Ridge Wildflower Society Plant Sale, Virginia Native Plant Society. (www.brwfs.org)
- Waynesboro Nurseries, Inc. (www.waynesboronurseries.com)

Other suitable vendors can be found on the Virginia Native Plant Society website (<http://vnps.org/wp/vnps-native-plant-nurseries-and-plant-sales/>). All vendors must be approved by the NPS prior to use.

4.7 Plant Protection Measures

The Rutgers New Jersey Agricultural Experiment Station provides a deer aversion ranking for the species shown in **Table 3**. Using input from nursery and landscape professionals, cooperative extension personnel, and master gardeners in northern New Jersey, staff from the Agricultural Experiment Station compiled a list of landscape plants and associated deer aversion rankings. This list was referenced and used to rank deer aversion for the species to be included in the suggested species list. The ranking uses the key shown at the bottom of **Table 3**. Plants with a ranking of A or B should be used to the maximum extent possible to reduce impacts from deer browsing.

Deer populations typically graze in utility corridors and can seriously impact newly planted vegetation by eating leafy vegetation. In addition to using plants less palatable to deer, plant protection methods can be implemented to further reduce impacts from deer browsing. A combination of individual tree/shrub cages and enclosures would be most effective for plant protection on the Dooms – Bremo project. These types

of cages and fences are recommended because they are largely maintenance-free once installed and they dramatically reduce the potential for wildlife entanglement.

Table 2: Suggested Native Species for Use in the Project Corridor

Species ¹	Sun/Shade Species ²	Size, Mature (feet)	Drought Tolerance	Moisture Use	Root Depth (inches)	Growth Rate	Lifespan	Deer Aversion ³	Recommended Spacing (feet)
<i>Corylus americana</i> (American hazelnut)	Part shade	10	Medium	Medium	20	Moderate	Short	B	6
<i>Rhus aromatic</i> (fragrant sumac)	Varied	6	High	Low	24	Slow	Long	A	6
<i>Spirea alba v. latifolia</i> (meadow sweet)	Varied	3-6	Low	Medium	12	Moderate	Moderate	C	10
<i>Viburnum acerifolium</i> (mapleleaf viburnum)	Varied	6	High	Medium	14	Slow	Long	B	5 feet for island clusters; 6 feet for screening buffers
<i>Viburnum dentatum</i> (arrowwood viburnum)	Varied	8	Low	-	-	Moderate	Short	A	6
<i>Corylus cornuta</i> (beaked hazelnut)	Varied	15	Medium	Medium	16	Moderate	Long	B	6
<i>Aronia arbutifolia</i> (red chokeberry)	Full Sun	5	Low	High	20	Moderate	Moderate	B	4
<i>Ilex verticillata</i> (winterberry)	Varied	10	Low	High	16	Moderate	Moderate	B	6

2 ¹ Information on each species was obtained from the U.S. Department of Agriculture (USDA) Plants website (<http://plants.usda.gov/java/>).

3 ² Varied – Species that are adapted to grow from full sun to part shade.

4 ³ A = Rarely Damaged; B = Seldom Severely Damaged; C = Occasionally Severely Damaged; D = Frequently Severely Damaged.

Deer netting is effective in restricting deer movement and minimizing browsing to larger areas of growing vegetation. Deer exclosures should be placed around each planting area in Implementation Zones 1 and 2. Generally, multiple smaller exclosures will work better for keeping deer out than several large exclosures. One exclosure should be used for each island cluster. For the screening plantings, several smaller exclosures would be most effective and manageable for installation and repair. Each exclosure should be made out of 7 or 8 foot tall polypropylene fencing with wooden 4by 4 inch posts, at least 10 feet long with 2 feet sunk into the ground. An example is shown in **Figure 3**; however, for this project no metal should be used. Plastic fencing can be purchased from a company called Deer Busters (<http://www.deerbusters.com/poly-deer-fence/poly-deer-fence/better-heavy-duty-deer-fence/7-5-x-330-heavy-duty-deer-fence/>). A NPS wildlife biologist must approve materials for fencing, prior to purchase, in order to ensure there is no wildlife entanglement hazard.



Figure 3: Example of Deer Exclosure

Plastic fences and exclosures will be left in place for 2 years to allow enough time for new vegetation to establish and protect it from deer grazing during the critical first 2 years of growth. Depending on deer population and the browsing pressure of deer in the corridor, Dominion may need to replace fencing within the 3-year short-term monitoring period.

Chemical deer repellents are not recommended for use in this vegetation management plan because they must be reapplied after each rain event to ensure maximum efficiency, which would not be practical for this project.

4.8 Time of Year Restrictions

No vegetation management within existing cleared corridor areas will occur from April 1st to August 1st each year. Many ground-nesting species reside in the corridor between late April and early June. To ensure protection to these species, no vegetation maintenance is allowed between April 1st and August 1st. The only exception to this rule is during the short-term monitoring events (described in the following section). Dominion agrees to contact the park POC at least 45 days before any maintenance or restoration activities begin.

4.9 Short-term Monitoring

After restoration, short-term monitoring will be required for each implementation zone. Short-term monitoring will be completed by Dominion for 3 years after restoration. Monitoring events will occur

four times each year (April, June, August, and October), typically in the middle of the month (weather-dependent). At each short-term monitoring event, Dominion will observe the plantings and seed growth to ensure all plantings are healthy and no plants have died. Specifically, during each monitoring event Dominion crews will complete the following for each implementation zone:

- weeding – Manual/herbicide application;
- mulching – shredding hardwood mulch (with approval from the NPS);
- watering – will carry water and only use supplementary if needed;
- pruning – damaged parts removed; and
- monitoring – for disease, insect, and pest (including deer) concerns.

Use of mulching around plantings should help reduce the need for supplemental watering; however, if there are no rain events of more than an inch for 2 to 3 weeks, or if no rain occurs for several months, then additional watering is recommended at monitoring events (Downing, pers. comm. 2013). Watering the plants must be slow and long to achieve proper water uptake.

If monitoring shows that a plant has died, Dominion will maintain a list of plants to be replaced. Any plants that need to be replaced will be planted at the October monitoring event each year. The monitor will try to determine the cause of death and identify if a new area should be selected or a new species should be planted in place of the original. If plant deaths occur after the third year, natural succession will allow for another species to grow in its place, which will promote the goal of a natural setting and vegetative mosaic.

Dominion will check plant protection fencing at each monitoring event to make sure it is functioning and to ensure that it has not been compromised by weather events (i.e., wind, ice, or snow damage) or deer. Any failed protection measures will be replaced or repaired as soon as possible. All deer protection measures and fencing will be removed at the last short-term monitoring event or if the plantings have outgrown the enclosure.

During all short-term monitoring events, work crews will also identify if any target invasive vegetation has populated the restored areas. Crews will treat identified target species using one or more of the four treatment methods (Section 4.1, *Target Vegetation Treatment Methods*) as appropriate. At the end of the 3-year short-term monitoring period, it is expected that invasive species conditions would be as described under Section 4.10, *Long-Term Maintenance*, and will be controlled to remain at the described level.

At the end of each monitoring event, Dominion will provide a summary of activities to the NPS and notify the NPS of any vegetation death discovered during a monitoring event. At the end of the 3-year short-term monitoring period, the success rate for plantings should be at least 80%. If success is not at least 80%, Dominion will replace plants to meet the 80% criteria. Additionally, A member of the Shenandoah National Park Natural and Cultural Resource Division will meet Dominion on-site, a minimum of once per year for a field review

4.10 Long-term Maintenance

The long-term goal of this plan is to create a natural and self-sustaining vegetation cover within the corridor that requires little maintenance and trimming. Over time, natural succession should allow for the natural blending of the island clusters, vegetation screening areas, and the other parts of the corridor that will be seeded. At year four, the vegetation should be well-established and require little maintenance to

maintain a low growth habitat suitable for many species. Through natural succession, seedlings from the adjacent forested area may establish along the edges or within the corridor. Dominion conducts yearly inspections of all its transmission lines, either by air or on the ground to identify any potential danger trees, ROW encroachments, or immediate reliability concerns. For the purposes of long-term vegetation management, Dominion maintenance crews will remove seedlings and saplings that may have established in the corridor every 3 to 5 years. At the last short-term monitoring event and the first long-term maintenance event, all plantings will be inspected to ensure an 80% survival rate.

A series of long-term maintenance goals have been developed to keep invasive species at a controllable and acceptable level. A summary of invasive species currently found in the project vicinity and the corridor is included in Section 4.2. At each long-term maintenance event (every 3 to 5 years), invasive species will be treated to maintain the following desired cover ratios.

Areas in the corridor more than 20 meters from Skyline Drive should have:

- Zero percent (0%) cover of any invasive species new to Shenandoah National Park or new to the site as defined by the Shenandoah National Park 2014 species list¹ and the invasive vegetation survey performed in the corridor.
- No more than 5% total cover of invasive species.
- A minimum of 80% total cover of planted or seeded native species, or native volunteer species.

Areas in the corridor and within 20 meters of Skyline drive should have:

- Zero percent (0%) cover of any invasive species new to Shenandoah National Park or new to the site as defined by the Shenandoah National Park 2014 species list¹ and the invasive vegetation survey performed in the corridor.
- No more than 10% total cover of invasive species.
- A minimum of 75% total cover of planted or seeded native species, or native volunteer species.

4.11 Erosion Control

Dominion will implement E&S control measures as specified in its Erosion and Sediment Control Plan and included in the Dooms – Brems Construction Plan (Dominion 2013). The preferred method of E&S control on NPS lands is hydroseeding with a product called RegreenTM (*Triticum aestivum*), as mentioned in Section 4.5, *Seeding*. The following additional E&S control measures that have been agreed on by the NPS and Dominion through the NEPA process will be implemented on NPS property:

1. No access roads or construction equipment will cross Sawmill Run.
2. Dominion will use RegreenTM, or a NPS approved equivalent, for any temporary seeding.
3. Dominion will ensure that its equipment will be well cleaned of soil before entering NPS land.

¹ The Shenandoah vascular plant checklist organized by plant family:

<https://irma.nps.gov/NPSpecies/Reports/SpeciesList/Species%20Checklist/SHEN/11/false>

The Shenandoah vascular plant checklist organized alphabetically by genus:

<https://irma.nps.gov/NPSpecies/Reports/SpeciesList/Species%20Checklist/SHEN/11/false>

4. When permanent or temporary soil stabilization is required, the rolled erosion control product should meet the specifications used in other park projects. Acceptable materials include the following:
 - a. Short-term netless erosion control blanket. Furnish an erosion control blanket composed of processed biodegradable natural fibers mechanically interlocked or chemically adhered together to form a continuous matrix with 12-month typical functional longevity designed for use on geotechnically stable slopes with gradients flatter than 1 Vertical:4 Height and channels with shear stress up to 0.5 pound per square foot.
 - b. Short-term single-net erosion control blanket. Furnish an erosion control blanket composed of 100% biodegradable natural fibers, and stitched with biodegradable jute netting with a nonfixed and loose netting joint to form a continuous matrix with 12-month typical functional longevity designed for use on geotechnically stable slopes with gradients between 1V:4H and 1V:2H and channels with shear stress up to 1.75 pounds per square foot. Products include Curlex® I FiberNet from the American Excelsior Co. or an approved equivalent.
 - c. Short-term double-net erosion control blanket. Furnish an erosion control blanket composed of 100% biodegradable natural fibers, stitched with biodegradable jute netting with nonfixed and loose netting joints to form a continuous matrix with 12-month typical functional longevity designed for use on geotechnically stable slopes with gradients between 1V:2H and 1V:1.5 H and channels with shear stress up to 2.25 pounds per square foot. Products include Curlex® II FibreNet from the American Excelsior Co. or an approved equivalent.
 - d. The rolled erosion control product should not contain any form of plastic netting or thread, even biodegradable plastic. Also, the stakes used to secure the rolled erosion control product should be metal or wood, and not plastic of any type.
5. A 100-foot no-construction buffer will be maintained along Sawmill Run where it crosses the ROW.
6. No work should occur in any watercourses.

4.12 Danger and Hazard Tree Plan

Dominion conducts yearly inspections of all its transmission lines, either by air or on the ground to identify any potential danger trees, hazard trees, ROW encroachments, or immediate reliability concerns. Danger trees and hazard trees (defined in Section 2.1, *Terminology*) will be determined using Dominion’s company standards, which are compliant with NERC standards. Dominion defines a “danger tree” as a tree outside a ROW that based on its height and proximity to a transmission line, could, in falling, come within 10 feet of the conductors. During construction Dominion will cut danger trees; however, during maintenance Dominion will routinely cut “hazard trees”. A Hazard tree is defined as “a structurally unsound tree that could strike a target when it falls. As used in this clause, the target of concern is electrical supply lines.” In other words, a “hazard tree” is a “danger tree” that exhibits an elevated risk of falling due to one or more physical or physiological defects. Defects include dead, leaning, decay, weak crotches, co-dominance, disease, etc. Neither danger trees nor hazard trees exist inside a ROW by Dominion’s definition. Trees that even have the potential to reach danger tree height and are within a ROW fall under the definitions of either “undesirable vegetation” or “incompatible vegetation”. Those definitions are:

- *Incompatible vegetation*—Vegetation with growth potential that could threaten to encroach Clearance 2 distances by the next Maintenance Tree Work cycle, if not properly addressed
- *Undesirable vegetation*—Vegetation requiring on-going maintenance activity

Dominion's definition of a hazard tree and danger tree will be adopted for this project. Each year a Work Plan should be submitted to the NPS that addresses hazard trees outside of the corridor that are anticipated to be removed.

The following hazard/danger tree plan is in effect for the corridor.

- **Danger Trees outside of the Corridor.** At the start of construction, Dominion will cut any danger trees (currently none expected for this project) from outside of the corridor.
- **Hazard Trees outside of the Corridor.** Each year a Work Plan will be presented to the NPS and will address what trees, how many trees, the proposed schedule for the removal, and the method of removal that year. Dominion must request permission from the NPS to enter the property owned by the federal government and acquire the written concurrence from the superintendent(s) on which trees have been identified for removal.
- **NEPA Compliance.** The Work Plan will be submitted so that the NPS can fulfill the environmental compliance needs that are a requirement of NEPA. The NPS will prepare a NEPA compliance document to address routine vegetation management. A separate compliance action will be required to address danger trees outside of the corridor.
- **Construction Permit.** Once compliance is complete, a special use permit will be issued with terms and conditions to allow construction activities outside of the corridor.
- **Emergency Removal of Hazard Trees.** Natural disasters such as earthquakes, fires, tornados, hurricanes, landslides, wind shear, fresh gale, major storms, ice storms, and floods do occur. Should such events occur, Dominion is required by the Federal Energy Regulatory Commission and enforced by NERC to immediately remove any hazard that is affecting the reliability of the electric grid. Dominion will make every effort to inform the Superintendent(s) that it is entering the corridor or is outside of the corridor to address the hazard causing the outage.

5 IMPLEMENTATION ZONE 1: WEST OF SKYLINE DRIVE

5.1 Existing Conditions

The area along Skyline Drive contains mostly native grass species, trees, shrubs, and wildflowers and is exposed to constant sunlight. Soil samples at the site indicate shallow subsurface soils near Skyline Drive (6 to 12 inches) with low moisture through the entire depth. Various tree, shrub, and grass species are present within the corridor. West of Skyline Drive is a very steep hillside containing many tree and shrub species, including: black cherry (*Prunus serotina*), red maple (*Acer rubrum*), sumac (*Rhus* sp.), and oak (*Quercus* sp.). Some of these trees and shrubs are up to 4 feet tall as measured during the July 2012 survey. No invasive plant species were identified west of Skyline Drive.

5.2 Plantings

Once Implementation Zone 1 has been seeded with the NPS-approved mix (**Table 2**), individual plant species listed in **Table 3** will be planted in island clusters or as screening within the corridor and west of Skyline Drive (**Figure 4**).

Vegetation island clusters are areas where woody vegetation is planted in groupings within the corridor. Island clusters are on average 25 feet by 25 feet and about 50 feet apart. Vegetation will be planted in a mosaic pattern to create a natural-looking environment and offer protection and habitat to certain species. Three vegetation island clusters are recommended and shown in **Figure 4**. Island clusters will contain species from **Table 3** and consist of low shrubby and sun-tolerant vegetation. Planting the individual species too close together can limit growth rates and affect vegetation height, width, and leaf density; therefore, species will be planted at least 4 to 6 feet apart, as specified in **Table 3**. Each island cluster would contain between 20 and 25 plants. Species included in the clusters are American hazelnut (*Corylus Americana*), beaked hazelnut (*Corylus cornuta*), winterberry (*Ilex verticillata*), fragrant sumac (*Rhus aromatic*), mapleleaf viburnum (*Viburnum acerifolium*), and arrowwood (*Viburnum dentatum*). These species will be planted at the edges and throughout the island clusters. Shade-tolerant vegetation including American hazelnut (*Corylus americana*) will be placed near the center of the island clusters, with the intention that the sun-tolerant species will eventually provide some shading to this species.

A visual screening area will be established along Skyline Drive. The shoulder of the road is currently maintained as manicured grass and will continue after construction. A 25- to 30-foot planting zone will be established at the edge of the manicured area and run perpendicular across the corridor. The screening area will extend from the northern edge of the corridor to the edge of the historic rock wall (approximately 200 feet). The screening area will include all of the native low-growing woody species listed in **Table 3**. Plants should be placed between 4 and 6 feet apart in a mosaic pattern and quantities (**Figure 4**).

The island clusters and screening area will include approximately 280 plants; exact numbers are shown in **Figure 4**.

5.3 Plant Protection Measures

Deer exclosures should be installed around each of the island clusters and screening area, as described in Section 4.7, *Plant Protection Measures*.

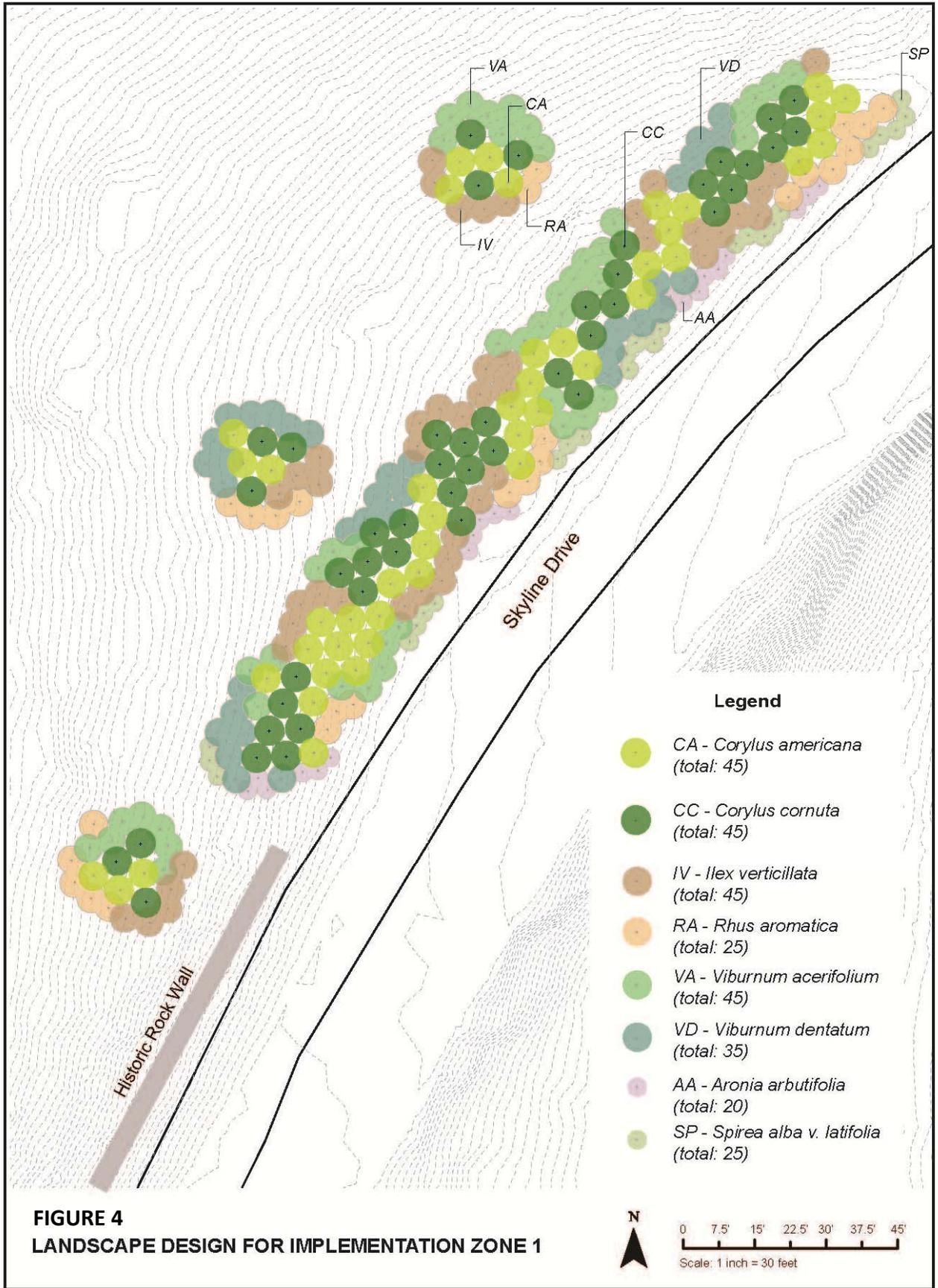
5.4 Plant Establishment/Restoration

5.4.1 Short-term Monitoring

Short-term monitoring will occur as described under Section 4.9, *Short-term Monitoring*.

5.4.2 Long-term Maintenance

Long-term monitoring will occur as described under Section 4.10, *Long-term Maintenance*.



6 IMPLEMENTATION ZONE 2: EAST OF SKYLINE DRIVE

6.1 General

The area along the Appalachian National Scenic Trail contains mostly native grass species. Samples at the site indicate shallow subsurface soils (6 to 12 inches) with low moisture through the entire depth. Soil depth increases (12 to 18 inches) east of the Appalachian Trail near the access road. There is a steep hillside on the east side of Skyline Drive, which is not anticipated to be cleared of vegetation. The hillside contains various tree and shrub species, including sumac (*Rhus* sp.), sassafras (*Sassafras albidum*), American witch-hazel (*Hamamelis virginiana*), black cherry (*Prunus serotina*), maple (*Acer* sp.), ash (*Fraxinus* sp.), and oak (*Quercus* sp.) saplings.

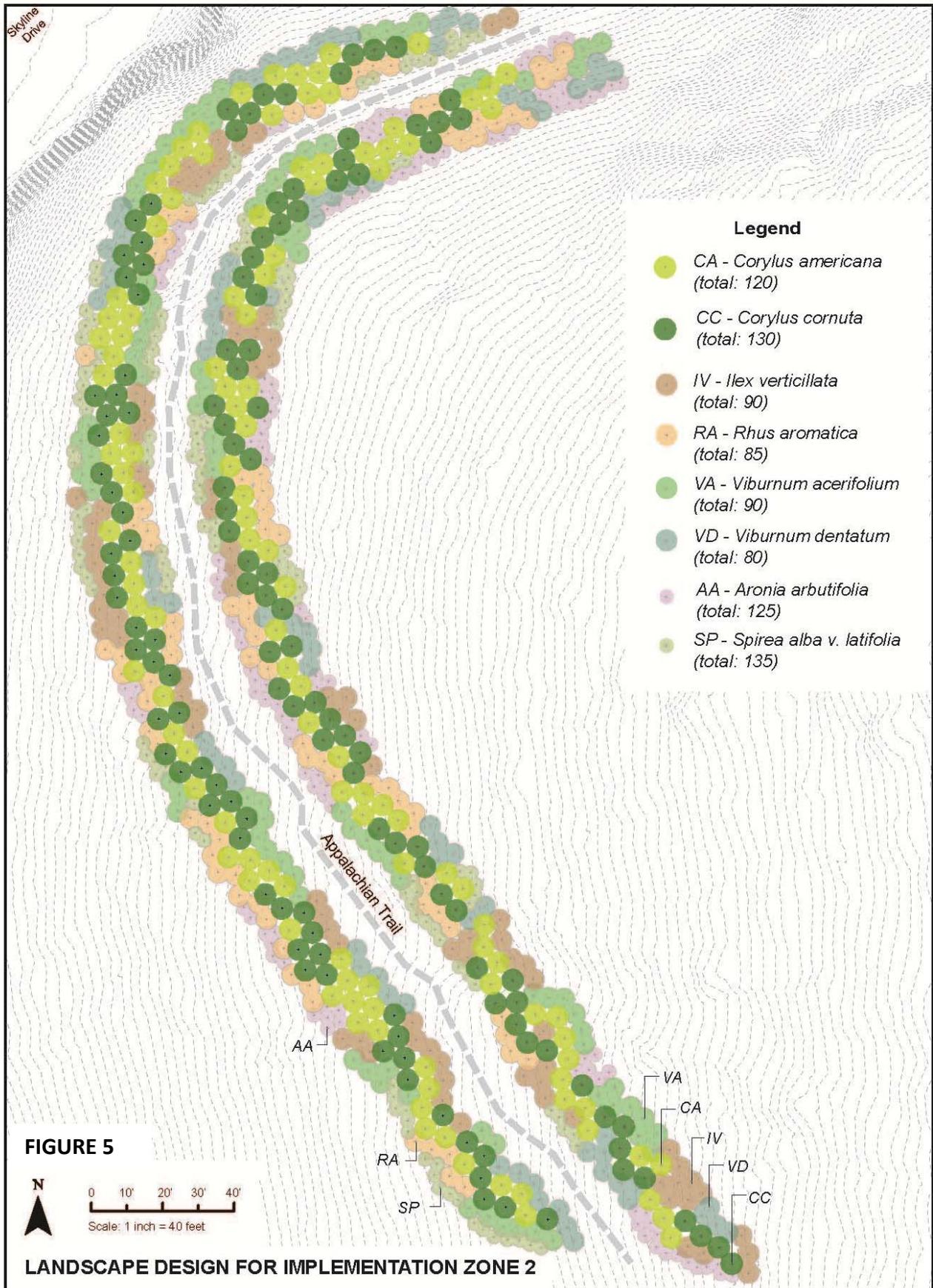
The area surrounding the Appalachian National Scenic Trail and to the east is exposed to long periods of direct sunlight. At the time of the site visit, vegetation had recently been cut; therefore, wide views of the existing corridor and structures were available from Appalachian National Scenic Trail when accessing from either side of the corridor. The corridor around the Appalachian Trail contained mainly grassy vegetation with a few woody species, specifically, sassafras and sumac, located near the edge of the corridor.

No invasive species were found immediately adjacent to the Appalachian National Scenic Trail; however, limited numbers of invasive species were identified along the access road and east of the Appalachian Trail during the July 2012 invasive species survey (NPS 2012). The invasive species found included: oriental bittersweet (*Celastrus orbiculatus*), spotted knapweed (*Centaurea stoebe* sp. *micranthos*), coralberry (*Symphoricarpus orbiculatu*), and Japanese honeysuckle (*Lonicera japonica*) (shown in **Appendix B**). Specific treatment methods and goals for invasive species management can be found in sections 4.2 and 4.11.

6.2 Plantings

Once the grass seed mixes are spread throughout the disturbed areas within Implementation Zone 2, shrub and species from **Table 3** will be planted along the Appalachian National Scenic Trail to provide visual screening to hikers using the Appalachian Trail.

A vegetation visual screening area will be established on either side of the Appalachian Trail for the width of the corridor (300 feet). This visual screening zone will be about 15 to 20 feet wide and establish a structural mosaic of native habitat to buffer views the transmission lines. The screening area will include approximately 850 plants planted along the Appalachian Trail; exact numbers are shown in **Figure 5**. Plants should be placed between 4 and 6 feet apart (**Table 3**) in a mosaic pattern and using quantities as shown in **Figure 5**.



6.3 Plant Protection Measures

Deer exclosures should be installed around each of the island clusters and screening area, as described in Section 4.7, *Plant Protection Measures*.

6.4 Plant Establishment/ Restoration

6.4.1 Short-term Monitoring

Short-term monitoring will occur as described under Section 4.9, *Short-term Monitoring*.

6.4.2 Long-term Maintenance

Long-term monitoring will occur as described under Section 4.10, *Long-term Maintenance*.

7 IMPLEMENTATION ZONE 3: APPALACHIAN NATIONAL SCENIC TRAIL PARCEL

7.1 General

Implementation Zone 3 is located approximately 0.86 mile east of Implementation Zone 2 and currently contains mostly native grasses, trees, and shrub species. Samples at the site indicate a shallow subsurface soil depth (6 to 12 inches) near tower 39/324, with moisture levels higher than the other two implementation zones. Implementation Zone 3 is located on a fairly steep hillside and generally slopes north. One small wetland was found on an existing access road within the zone. Implementation Zone 3 contains many overgrown tree and shrub species, including: sassafras (*Sassafras albidum*) and oak (*Quercus sp.*) and maple (*Acer sp.*) saplings. Several invasive species were identified within Implementation Zone 3 during the July 2012 site survey (NPS 2012) and include Japanese wineberry (*Rubus phoenicolasius*), Japanese honeysuckle (*Lonicera japonica*), multiflora rose (*Rosa multiflora*), spiny plumeless thistle (*Carduus acanthoides*), spotted knapweed (*Centaurea stoebe ssp. Micranthos*), Chinese bushclover (*Lespedeza cuneata*), garlic mustard (*Alliaria petiolata*), catnip (*Nepetea cataria*), tree of heaven (*Ailanthus altissima*), coral berry (*Symphoricarpos orbiculatu*), and princess tree (*Paulownia tomentosa*). Specific treatment methods and goals for invasive species management can be found in sections 4.2 and 4.11.

7.2 Plantings

Restoration in Implementation Zone 3 will only include seeding of the area as described in Section 4.5, *Seeding*, and no woody species will be planted. There is no need for visual screening in this section of the corridor because there is no visitor traffic. Limited clearing will occur in the corridor for the enhancement of access roads and construction pads, and most native woody and shrub species currently present will remain in place. Natural succession is recommended as a treatment in this area.

7.3 Plant Protection Measures

No plant protection measures are needed for Implementation Zone 3.

7.4 Plant Establishment/Restoration

7.4.1 Short-term Monitoring

No woody species will be planted; however, the area should be checked during the monitoring efforts described under Section 4.9, *Short-term Monitoring*, to ensure that the grasses are establishing successfully.

7.4.2 Long-term Maintenance

Long-term monitoring will occur as described under Section 4.10, *Long-term Maintenance*.

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**APPENDIX A: DOMINION VIRGINIA POWER POINT OF CONTACT
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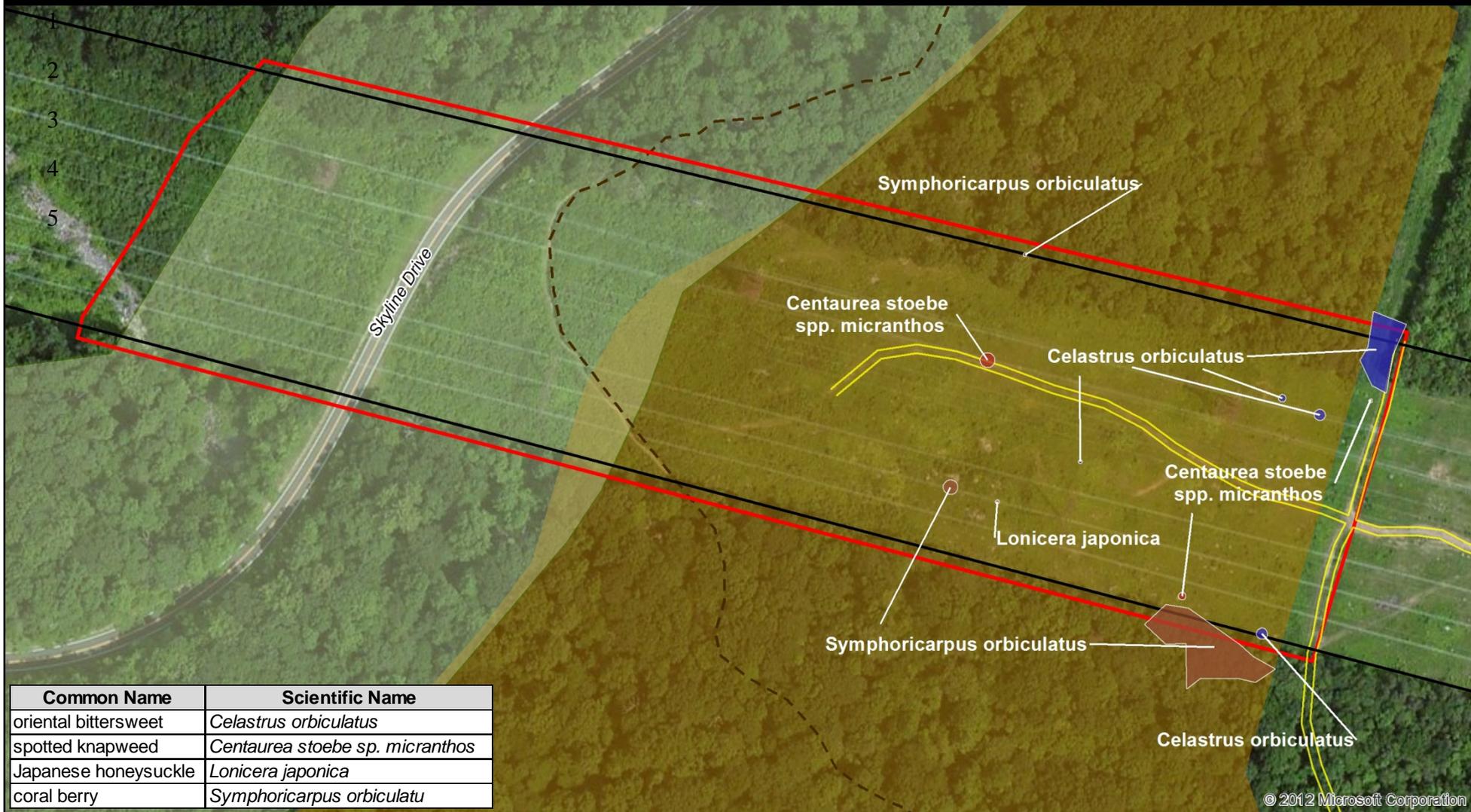
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List provided February 2014

**APPENDIX B. DOOMS – BREMO 230 kV INVASIVE EXOTIC PLANTS
INFORMATION**

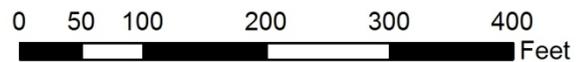
Maps of Existing Invasive Species Locations



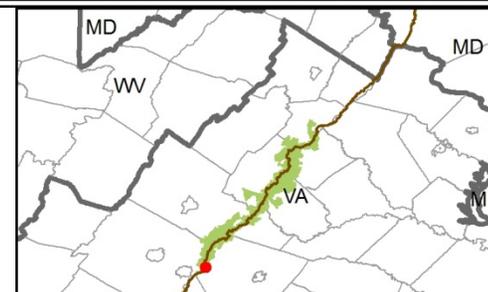
Common Name	Scientific Name
oriental bittersweet	<i>Celastrus orbiculatus</i>
spotted knapweed	<i>Centaurea stoebe sp. micranthos</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
coral berry	<i>Symphoricarpus orbiculatu</i>

- Proposed Access Road
- Existing ROW
- Survey Area A
- Appalachian National Scenic Trail
- Shenandoah National Park
- Appalachain National Scenic Trail Land

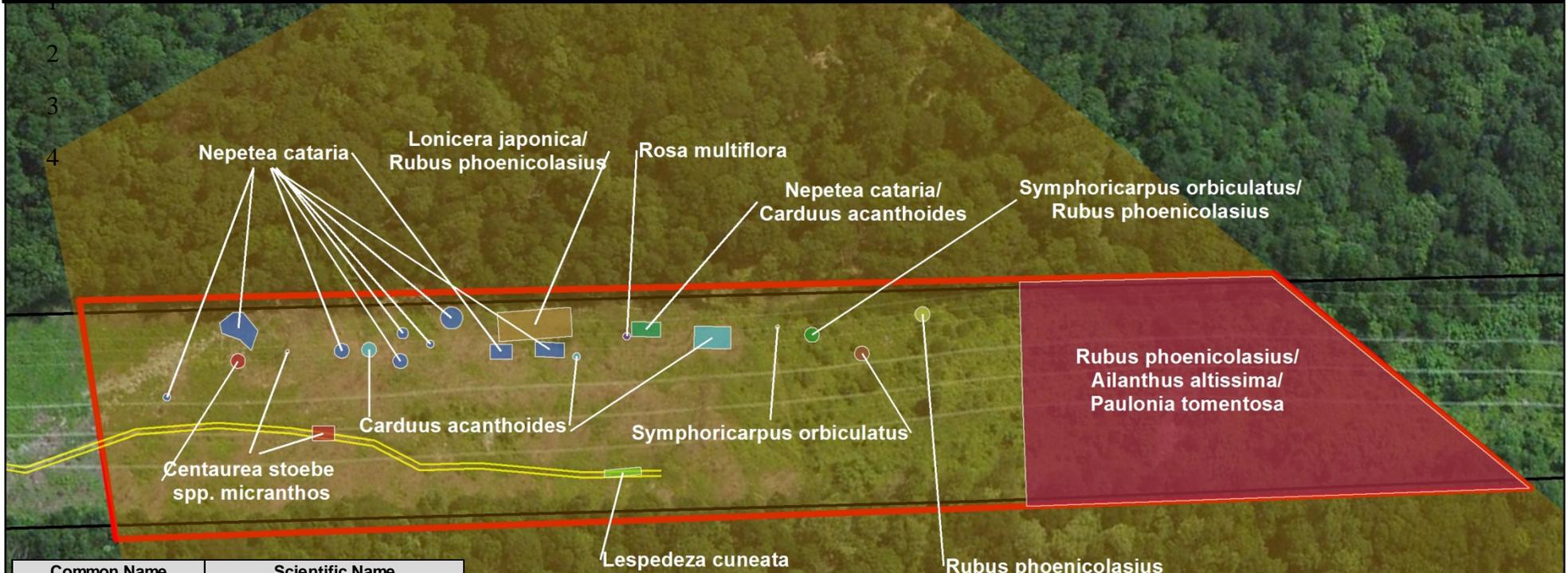
Invasive Species
Implementation Zones 1 and 2



Geographic Coordinate System: Universal Transverse Mercator (UTM).
 Datum: North American Datum of 1983 (NAD83). Zone: 17N.
 Projection: Transverse Mercator. Linear Unit: Meter.
 Ellipsoid: Geodetic Reference System 80.



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Common Name	Scientific Name
Japanese wineberry	<i>Rubus phoenicolasius</i>
spotted knapweed	<i>Centaurea stoebe</i> sp. <i>micranthos</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
coral berry	<i>Symphoricarpus orbiculatu</i>
multiflora rose	<i>Rosa multiflora</i>
spiny plumeless thistle	<i>Carduus acanthoides</i>
Chinese bushclover	<i>Lespedeza cuneata</i>
garlic mustard	<i>Alliaria petiolata</i>
catnip	<i>Nepetea cataria</i>
tree of heaven	<i>ailanthus altissima</i>
princess tree	<i>Paulownia tomentosa</i>

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— Proposed Access Roads

Existing ROW

Survey Area B

Appalachain National Scenic Trail Land

Invasive Species Implementation Zone 3

0 50 100 200 300 400 500 Feet

Geographic Coordinate System: Universal Transverse Mercator (UTM).
 Datum: North American Datum of 1983 (NAD83). Zone: 17N.
 Projection: Transverse Mercator. Linear Unit: Meter.
 Ellipsoid: Geodetic Reference System 80.

Treatment Methods for Invasive Species

Spiny plumeless thistle (*Carduus acanthoides*) is a biennial forb in the aster family (Asteraceae) growing 1 to 4 feet tall. Flowers occur at the ends of the branches and bloom from July to October in the second year. Each plant is capable of producing up to 100,000 seeds dispersed by the wind. Manual and chemical control methods should focus on elimination prior to seed production. Manual cutting or hand removal should be done twice per growing season just before flowering. Chemical herbicides are not recommended in high quality natural areas. If used, herbicides are the most effective in the rosette stage and least effective in the flowering stage. The use of spot sprayers is preferred (USDA Forest Service 2007).

Spotted knapweed (*Centaurea stoebe* ssp. *micranthos*) is a biennial plant that forms a rosette of leaves in the first year and develops into a bush-like plant in its second year. Manual, mechanical, and chemical methods should focus on elimination prior to seed production. Hand removal can be difficult since it must be performed more than once a growing season. Roundup® is recommended to treat rosettes during the second year just prior to flowering (The Nature Conservancy 2005).

Princess tree (*Paulownia tomentosa*) is a small- to medium-sized deciduous tree up to 50 feet tall. Seed capsules, 1 to 2 inches long, appear from June to April and release tiny winged seeds in winter. Young seedlings can be pulled by hand, although the entire root must be removed because fragments may resprout. Larger trees should be cut down and the stumps treated with glyphosate concentrate. If seed capsules are present on cut limbs, these pieces should be collected and bagged so they are not spread through relocating or mulching.

Japanese honeysuckle (*Lonicera japonica*) is a semi-evergreen vine that blooms from late April through July. Hand removal is not recommended because the entire root must be removed to prevent resprouting. Roundup® is recommended for treatment in combination with hand removal and stem cutting. A 1.5 to 2 % solution or 3 to 5 % solution of Triclopyr should be applied directly to the leaves or to the cut stems immediately following cutting.

Tree-of-heaven (*Ailanthus altissima*) is a deciduous tree that may reach 80 feet tall and 6 feet wide. Small saplings can be removed by hand as long as the entire root is removed to prevent resprouting. Trees should be cut down and the outer 2 inches of the surface of the stump treated with Roundup®. If seed capsules are present on cut limbs, these pieces should be collected and bagged so they are not spread through relocating or mulching.

Oriental bittersweet (*Celastrus orbiculatus*) is a deciduous vine that may grow up to 66 feet long using surrounding trees for support. Plants can produce up to 370 fruits that ripen in the fall. Hand removal of small populations is effective but requires frequent cutting throughout the year. Roundup® or triclopyr should be applied directly to the cut stems following cutting (NPS 2005b).

Wineberry (*Rubus phoenicolasius*) is a spiny shrub creating thick dense mats and fruiting throughout the summer months. Hand removal of small populations is effective but requires frequent cutting throughout the year. Cutting close to the ground is effective in combination with herbicide. Roundup® or triclopyr is recommended and should be applied directly to the cut stems following cutting (NPS 2005c; Pennsylvania Department of Conservation and Natural Resources 2013).

Multiflora rose (*Rosa multiflora*) is a medium height, thorny, bushy shrub that spreads more than producing leaves. Height can reach up to 15 feet with small red fruits that can remain attached well into winter. Pulling, grubbing, or removing individual plants from the soil can only be effective when all roots are removed. Three to six cuttings per growing season for more than 1 year can achieve high plant

mortality. Such treatment may need to be repeated for 2 to 4 years. Cutting close to the ground is effective in combination with herbicide. Triclopyr is recommended and should be applied directly to the cut stems following cutting (Missouri Department of Conservation 2013a).

Sericea lespedeza (*Lespedeza cuneata*) is a perennial legume that grows 3 to 6 feet tall. Flowers are in clusters of mostly two to three in upper leaf axils. Its myriads of fruits are oval, and up to 1/8 inch wide. The preferred method to control lespedeza is controlled burning, but other methods can also be effective. Mechanical removal of the flower bud stage for 2 to 3 consecutive years should reduce the vigor of the plant. Spot treatments using backpacks of Triclopyr has been shown to be the most effective during flowering or prior to branching (Missouri Department of Conservation 2013b).

Common burdock (*Arctium minus*) is a biennial weed that can reach 3 to 4 feet tall. The flowers form clusters at the top of the stem that produce prickly burrs. These burrs can attach to clothing or animal fur increasing the spread of seeds. Cutting twice a year is the preferred control method. Backpack treatment using Roundup® is also an effective control method (USDA Forest Service 2005b).

Japanese barberry (*Berberis thunbergii*) is a compact, spiny, deciduous shrub that grows 2 to 3 feet tall. Bright red fruits mature in mid-summer and remain on the bush until winter. The berries are eaten by wildlife and the seeds are dispersed through waste. Hand cutting is recommended in early spring because it is the first shrub to produce leaves, making identification easier. In combination with cutting, triclopyr treatment is effective when applied directly to stems following cutting. Roundup® is also effective but not preferred (USDA Forest Service 2005a).

Common mullein (*Verbascum thapsus*) is a biennial plant that grows 5 to 10 feet tall during its second year. The tiny seeds are pitted and rough with wavy ridges and deep grooves. The seeds can germinate after lying dormant in the soil for several decades. It is estimated that a single plant can produce more than 100,000 seeds. The seeds are dispersed close to the parent plant during the autumn and winter. Pulling or cutting below root crown is highly effective prior to seed production. A 3% application of Roundup® has been effective in treating mullein.

Black locust (*Robinia pseudoacacia*) is a fast-growing tree that can reach heights of 100 feet. Seed pods develop up to 4 inches long and contain four to eight seeds. Multiple cuttings during the growing season is an effective control method, but this may take several consecutive years to achieve adequate control. The most effective treatment method is from basal bark application of triclopyr herbicide. This should be done when the trees are small and the bark is still thin. Applications should be applied between mid-July and the end of December. This method does not work on larger trees with the diameter at breast height greater than 6 inches. For larger trees, Krenite® (a formulation of fosamine ammonium) is a non-volatile contact brush herbicide that is applied to leaves between July and August. Garlon® 3A (formulation of triclopyr) is effective when applied to recently cut surfaces and Garlon® 4 is effective as a basal bark treatment (Illinois Natural History Survey 2013a, Missouri Department of Conservation 2013c).

Garlic mustard (*Alliaria petiolata*) is small fragrant plant that grows 2 to 48 inches tall. Black seeds are produced in 1 to 4.7-inch-long, narrow, linear capsules called siliques. Hand cutting is an effective control method. In combination with cutting, spot application of 2% Roundup® to the foliage of garlic mustard is most effective during spring and fall (Illinois Natural History Survey 2013b).