ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket Nos. CP15-554-000 &
CP15-554-001

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT
Docket No. CP15-555-000

Restoration and Rehabilitation Plan

Updated, Rev 6

Prepared by

ERM

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LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
Atlantic	Atlantic Coast Pipeline, LLC
BFM	bonded fiber matrix
BMP	best management practice
DTI	Dominion Transmission, Inc.
EI	Environmental Inspector
FERC	Federal Energy Regulatory Commission
NRCS	Natural Resources Conservation Service
Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
Procedures	Wetland and Waterbody Construction and Mitigation Procedures
Projects	Atlantic Coast Pipeline and Supply Header Projects
RU	revegetation unit
SHP	Supply Header Project
USFS	U.S. Forest Service
WMA	Wildlife Management Area

1.0 INTRODUCTION

Atlantic Coast Pipeline, LLC (Atlantic) – a company formed by four major energy companies – Dominion Resources, Inc.; Duke Energy Corporation; Piedmont Natural Gas Co., Inc.; and AGL Resources, Inc. – proposes to construct and operate approximately 600 miles of natural gas transmission pipelines and associated aboveground facilities in West Virginia, Virginia, and North Carolina. This Project, referred to as the Atlantic Coast Pipeline (ACP), will deliver up to 1.5 million dekatherms per day of natural gas from supply areas in the Appalachian region to demand areas in Virginia and North Carolina. Atlantic has contracted with Dominion Transmission, Inc. (DTI), a subsidiary of Dominion Resources, Inc., to construct and operate the ACP on behalf of Atlantic.

In conjunction with the ACP, DTI proposes to construct and operate approximately 37.5 miles of pipeline loop and modify existing compression facilities in Pennsylvania and West Virginia. This Project, referred to as the Supply Header Project (SHP), will enable DTI to provide firm transportation service to various customers, including Atlantic.

2.0 PURPOSE

This *Restoration and Rehabilitation Plan* was prepared for the ACP and SHP (collectively, the Projects) to address post-construction restoration and rehabilitation activities. The plan will be implemented in conjunction with the 2013 versions of the Federal Energy Regulatory Commission's (FERC) *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) (FERC, 2013a) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) (FERC, 2013b) as well as Atlantic's and DTI's other construction, restoration, and mitigation plans (e.g., *Spill Prevention, Control, and Countermeasures Plan, Invasive Species Management Plan*, and *Winter Construction Plan*). In addition, where state-specific erosion and sediment control requirements are more stringent than the FERC Plan and Procedures, the more stringent requirements will be implemented. The measures described in this plan reflect generally accepted best management practices (BMP) for restoration and rehabilitation of pipeline projects.

Atlantic and DTI have consulted with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and are still in the process of consulting with other Federal, State/Commonwealth, and local agencies, including Federal and State/Commonwealth land managing agencies, to identify appropriate seed mixes for use during restoration. Based on discussions to date with the local NRCS offices, seed mixes have been developed and added to this plan. Seed mixes and how they were developed are described below. A more detailed description of seed mixes by region is presented in Appendix B.

On most pipeline projects, the seed mixes used for rights-of-way restoration generally consist of cool season grass species that grow well in the local area. Cool season grasses typically become established quickly and form a dense mat of grass and roots that is effective in controlling soil erosion in areas that have been disturbed by pipeline construction. These grasses may also provide food and habitat for some wildlife.

Atlantic is planning to incorporate regionally-specific and endemic forb (flowering plant) seeds in its traditionally all-grass seed mix. The incorporation and development of native flowering plants on the pipeline rights-of-way will create, where conditions and land management practices are suitable (i.e., areas with slope less than or equal to about 15 percent), substantial acreages of pollination habitat where this type of habitat is currently non-existent, primarily previously forested areas.

Atlantic has consulted and continues to consult with various county offices of the NRCS, Federal land management resource specialists at the U.S. Forest Service (USFS) and U.S. Fish and Wildlife Service, soil and water conservation districts, the Xerces Society, private groups, and organizations that have specific knowledge of both perennial cover grasses as well as native pollinator forb species seed mixes. Atlantic has obtained recommendations regarding species, seeding rates, mulching during planting, and maintenance mowing. Atlantic has also met and consulted with various national, State/Commonwealth, and local groups and experts on pollinators and pollination species endemic to the region that the pipeline crosses to learn which native forb seed mixes will be complimentary to the various grass seed mixes. These meetings and consultations provided information about the appropriate seeding rates and percentages of each type of seed within a specific seed mix, as well as the location each seed mix is to be used considering the various soil types, elevations, temperatures, and other growing conditions along the rights-of-way.

Through consultations with regional native seed experts, particularly those working with the NRCS and the Xerces Society, Atlantic has determined that native flowering forbs grow best and reproduce most successfully when planted with native warm season grasses. Warm season grasses are slower to establish than cool season grasses, and are bunch grasses instead of mat forming. Warm season grasses and forbs do not provide soil coverage that is as dense or as effective at controlling erosion as cool season grasses. Therefore, Atlantic was advised and has elected to use native warm season grass and forb mixtures only in areas with gradual or low percent slopes. In general, in areas of the rights-of-way with slopes greater than 15 percent Atlantic will use cool season grass mixes without flowering forbs to most effectively control the potential for erosion. These areas are specified in Section 5.7.5 and in Appendix B.

Atlantic is committed to use only forb species that are native to the area or region where they will be planted, to try to source seed from local growers, as available, and to avoid the introduction of non-native and potentially invasive species to the extent practicable.

3.0 TRAINING

Prior to the start of construction, Atlantic and DTI will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC's Plan and Procedures; other construction, restoration, and mitigation plans, including this *Restoration and Rehabilitation Plan*; and applicable permit conditions. In addition, Atlantic and DTI will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

4.0 VEGETATION TYPES IN PROJECT AREA

Atlantic and DTI characterized vegetation types in the ACP Project area and SHP Project area based on review of the U.S. Geological Survey's National Gap Analysis Program Land Cover Data and recent digital aerial photography augmented by field reconnaissance (2014 and 2015). Based on these data, the proposed ACP pipeline facilities cross upland forest/woodland (241.8 miles), cultivated cropland (86.8 miles), wetlands (69.9 miles), pasture land (64.2 miles), tree plantation/harvested forest (59.4 miles), developed land (21.7 miles), open land (17.0 miles), and open water (3.3 miles). The proposed SHP pipeline facilities cross upland forest/woodland (33.0 miles), pasture land (2.2 miles), developed land (1.3 miles), cultivated cropland (0.5 mile), wetlands (0.3 mile), open water (0.2 mile), tree plantation/harvested forest (less than 0.1 mile), and open land (less than 0.1 mile). The types of upland woodland/forest crossed by the Projects include coniferous forests, deciduous forests, mixed forests, deciduous savanna and glades, and floodplain and riparian forests.

5.0 BEST MANAGEMENT PRACTICES

Based on FERC requirements identified in the Plan and Procedures and industry-accepted practices, Atlantic and DTI have identified and developed BMPs for restoration and rehabilitation of areas disturbed by construction. These BMPs have been used to establish Atlantic's and DTI's standards for restoration and revegetation as described below. It is noted that states in which the Projects are located may in some cases have erosion and sediment control requirements that are more stringent than requirements in the FERC Plan and Procedures. Where this occurs, the more stringent requirements will be implemented as depicted on the state-specific erosion and sediment control plans.

5.1 EROSION CONTROL

Atlantic and DTI anticipate that construction activities requiring the installation of temporary erosion control devices will begin with access road preparation and timber clearing in 2017, and continue through the completion of construction in late 2019. Construction of the pipelines will be followed by restoration of the rights-of-way, stabilization of the soil, and seeding (where needed). Atlantic and DTI will complete final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench (10 days in residential areas), seasonal or other weather conditions permitting. For construction activities occurring in Winter, conditions such as frozen soils or snow cover could delay successful soil compaction mitigation or seeding activities. In these conditions, Atlantic and DTI will resume clean-up and restoration efforts the following Spring. Atlantic and DTI will monitor and maintain temporary erosion controls (e.g., temporary slope breakers, sediment barriers, or mulch) until conditions allow for completion of cleanup and installation of permanent erosion control structures.

Temporary erosion control measures and permanent erosion control devices to be employed during and after construction are described below. Atlantic and DTI will continue to consult with the applicable land managing agencies to identify other site-specific measures which may be required on Federal or State/Commonwealth lands.

- Slope Breakers – Temporary and permanent slope breakers will be installed, where required, to slow runoff velocity and direct water off the rights-of-way. Temporary slope breakers, such as earthen berms, will be installed prior to the start of construction activities. Permanent slope breakers will be installed during final grading.

- Temporary Sediment Barriers – Temporary sediment barriers, such as belted silt retention fence, compost filter sock or a combination of barriers, will be installed at the base of slopes adjacent to road, wetland, and waterbody crossings, and in other areas where required to prevent the transport of sediment off the construction rights-of-way.

- Permanent Trench Breakers – Sacks of subsoil or sand, polyurethane foam, or bentonite clay bags installed around the pipe will remain in the trench to prevent subsurface channeling of water along the trench.

- Mulch – Straw (weed free), hay (weed free), erosion-control fabric, or other equivalent material will be placed on the rights-of-way, where required, to protect the soil surface from water and wind erosion and to optimize the soil moisture regime necessary for successful revegetation, especially on dry, sandy sites.

During construction, the effectiveness of temporary erosion control devices will be monitored by Atlantic's and DTI's Environmental Inspectors (EI). Where appropriate for local resource needs, the role of the EI may be filled by agricultural or horticultural monitors. The effectiveness of revegetation and permanent erosion control devices will be monitored for the life of the project by Atlantic and DTI operating personnel during the long-term operation and maintenance of the pipeline systems.

5.2 SOIL RESTORATION

Successful revegetation is dependent on appropriate soil conditions and can be influenced by several factors, including soil texture, drainage class, salinity, and acidity. Soil characteristics along the pipeline routes and access roads and at contractor yards and aboveground facility sites are identified in Resource Report 7. Unless otherwise approved by a land managing agency or landowner, soil restoration will include:

- removal of excavated rock that is not returned to the trench and is considered construction debris;

- distribution of rock on the work area that is of similar size and density to adjacent areas not disturbed by construction;

- grading of the rights-of-way to restore preconstruction contours to the extent practicable; and

- preparation of the soil for revegetation.

5.3 SOIL COMPACTION

Soil compaction resulting from construction activities may reduce the potential for successful revegetation. Fine-textured soils with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction and rutting. Atlantic and DTI will minimize impacts by implementing the mitigation measures for compaction and rutting as described in the Plan and Procedures. Atlantic and DTI will test for soil compaction:

- in residential and agricultural areas (e.g., active croplands, pastures, nurseries, and orchards);

- in other areas requested by the land managing agency or landowner;

- in undisturbed areas adjacent to the construction workspace with the same soil type under similar moisture conditions to approximate preconstruction conditions; and

- in areas identified by the EIs, who will be responsible for conducting subsoil and topsoil compaction testing and determining the need for corrective measures.

Compaction impacts will be mitigated through the use of tillage equipment during restoration activities such as a paraplow or similar implement. In areas where topsoil segregation occurs, plowing with a paraplow or other deep tillage implement to alleviate subsoil compaction will be conducted before replacement of the topsoil. In rocky or heavily rooted soils, compaction may be impossible to measure and rectify without additional damage. If compaction testing is impeded by rock or roots, Atlantic and DTI may conclude that there is a suitable amount of large material in the soil to rectify potential compaction. Soil compaction will be remediated prior to re-spreading of salvaged topsoil.

5.4 TOPSOIL SEGREGATION, REPLACEMENT, AND SOIL CONDITIONING

The potential mixing of topsoil or surface soil with the subsoil from construction activities could result in a loss of soil fertility. To prevent mixing of the soil horizons or incorporation of additional rock into the topsoil, topsoil segregation will be:

- performed in the trenchline within non-saturated wetlands, croplands, pastures, hayfields, residential areas, and in other areas requested by the land managing agency or landowner;

- conducted as described in the Plan and Procedures;

- stockpiled on the rights-of-way; and

- excluded from materials used for padding the pipe.

Topsoil will be layered above subsoil where seeds stored in the soil will be encouraged to grow. Topsoil segregation will generally not occur in forested areas. Most forested areas are not conducive to topsoil segregation due to the amount of root materials present and the wider construction rights-of-way that would be required to store segregated topsoil. Topsoil segregation may be required on certain public lands as identified by land managing agencies; these will be identified and addressed through ongoing consultations with the land managing agencies (see Sections 5.0 and 6.0).

5.5 RE-CONTOURING

Grading will be conducted prior to construction where necessary to provide a reasonably level work surface. Upon completion of construction, Atlantic and DTI will:

- restore the ground surface as closely as practicable to original contours to restore natural overland water flow patterns, aquifer recharge, and drainage patterns;
- re-contour disturbed areas in a fashion designed to stabilize slopes, remove ruts and scars, and support successful revegetation; and
- restore, to original or better condition, drainage ditches, and culverts that are diverted or damaged during construction.

5.6 STEEP SLOPE AREAS

Areas with steep slopes along the pipeline routes may make the establishment of vegetation more difficult due to the increased potential for stormwater runoff and erosion by water. In areas with slopes greater than 15 percent, Atlantic and DTI are planning to use seed mix prescriptions that utilize appropriate cool season grass species to quickly stabilize the disturbed areas and minimize erosion and sedimentation. Table 5.6-1 in Appendix A quantifies by county the major soil drainage and slope classes crossed by the Projects. Soil drainage classes were used to determine some of the grass seed types utilized in specific mixes (see Section 5.7.5).

The use of fast-growing cool season grasses will help to ensure faster soil stabilization in steeper terrain because of the faster development of stable root systems, which hold the soil in place. Additionally, in areas with slopes greater than 35 percent, the rights-of-way will be restored to natural contours to the extent practicable or in accordance with requests from land managing agencies or landowners. These steep slope areas are mostly located along the route in the Appalachian region of West Virginia and western Virginia but occasionally in other areas along the entire rights-of-way. Restoration of steep terrain may include:

- grading to the natural conditions;
- installation of permanent erosion control devices (i.e., slope breakers) designed to reduce runoff velocity, divert water from the surface of the rights-of-way, and encourage retention of soils; and

- the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil.

In addition to these general measures, Atlantic and DTI will develop and implement other additional site-specific measures, where warranted, to address land movement, surface erosion, backfill erosion, general soil stability when backfilling the trench, and restoring of the rights-of-way in steep slope areas. Specifically, as discussed in Resource Report 6, Atlantic and DTI are committed to employing best in class measures to protect the environment in steep slope areas. Best in class is defined as the most efficient and/or protective design or configuration with the least environmental impact providing reliable construction and operations.

Also as discussed in Resource Report 6, Atlantic and DTI will implement the Slip Avoidance, Identification, Prevention, and Remediation – Policy and Procedure, and are conducting geotechnical studies along the proposed pipeline routes in Pennsylvania, West Virginia, and western Virginia in steep terrain areas to assess the potential for landslides and landslips to occur during construction and operation of the Projects.

The following lists some of the design and construction mitigation measures that will be implemented during construction in steep slope areas:

- targeted management and diversion of surface water around landslide sites, including the use of ditches, berms, slope breakers, and/or grading;
- mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
- targeted management of water sources along the trench, including the use of trench breakers and/or added drainage piping in the trench;
- targeted mitigation of seeps, springs, or other subsurface water encountered along the rights-of-way using subsurface drains or other special drainage measures;
- engineering of the backfill around or within steep slope areas to dry the backfill, add compaction, improve backfill soil strength, and reduce saturation;
- installation of targeted structures to stabilize backfill using engineered fill, retaining walls, sack-crete placements, key trenches, and/or shear trenches; and
- reduction in surcharge on steep slope areas by reducing excess or saturated backfill.

5.7 SITE PREPARATION AND SEEDING

Atlantic and DTI will complete final grading and permanent erosion control measures within 20 days after backfilling of the trench (10 days in residential areas), seasonal or other weather conditions permitting. In the event that these timeframes cannot be met or construction or restoration activities are interrupted for an extended period, mulch will be spread prior to

seeding. In these cases, all slopes within 100 feet of wetlands or waterbodies will be mulched at a rate of 3 tons per acre.

5.7.1 Seedbed Preparation

Proper preparation of the soil surface and seedbed is essential for rapid and healthy revegetation (Virginia Department of Environmental Quality, 1992). Successful germination of seed is enhanced by a well-prepared seedbed, the suitability of which decreases rapidly after rainfall.

Seedbed preparation starts immediately after soil has been replaced on the rights-of-way and final grading, contouring, and de-compaction activities are complete. Seedbed preparation will be conducted immediately prior to seeding to prepare a firm seedbed conducive to proper seed placement. Seedbed preparation will also be performed to break up surface crusts and to reduce weeds that develop between the initial ground clearing and final seeding.

Unless otherwise specified by land managing agencies or landowners or as needed to support the establishment of pollinator habitat, the seedbed will be prepared in disturbed areas to a depth of 3 to 4 inches using appropriate equipment (e.g., cultipacker roller) to provide a seedbed that is firm, yet rough. Atlantic and DTI will imprint exposed soils with a sheepsfoot, landfill compactor, tractor with studded tires, or land imprinter equipment. Soil imprinting, or tracking, leaves divots on the ground surface that trap moisture and seeds, creating catchments for native plant material to be spread across the seeded area (West Virginia Department of Environmental Protection, 2012). In addition, a seedbed with a rough surface is conducive to the capturing or lodging of seed when broadcasted or hydroseeded, and can reduce runoff and erosion potential. The rough seedbed surface will also retain soil moisture for seedling germination and promote faster establishment of vegetation.

In compacted areas, additional measures such as chisel plowing or disking may be necessary to improve water infiltration and soil aeration, which are needed to prepare an adequate seedbed. When hydroseeding, Atlantic and DTI will scarify the soil surface prior to seeding to anchor the seed to the soil surface and encourage germination. Where residential lawns or landscaped areas are disturbed or as needed to support the establishment of pollinator habitat, more intensive ground and seedbed preparations may be required, including rock collection, grading, and soil preparation/amending.

5.7.2 Seeding

Seeding will not be conducted in actively cultivated croplands unless requested by the landowner. In residential areas, lawns will be restored on a schedule established during easement negotiations with the landowner. On all other lands, Atlantic and DTI will perform seeding of permanent vegetation during the Fall of the year construction is completed, within the recommended seeding dates, and within six working days of final grading, weather and soil conditions permitting. Atlantic and DTI will prioritize seeding and other restoration work in high-elevation areas, in an attempt to avoid restoration delays due to Winter-related weather and field conditions. If seeding cannot be done within recommended Fall timeframes, appropriate temporary erosion control measures will be installed and temporary grass cover will be seeded.

If temporary grass cover is used, seeding of permanent vegetation will occur at the beginning of the next recommended seeding season.

In addition, as part of the restoration and rehabilitation plan to revegetate disturbed areas along the pipeline routes, Atlantic and DTI will use cool season grasses to revegetate areas with slopes greater than 15 percent.

All seed will be certified weed free. The EIs will review all seed tags prior to use to ensure that the seed is properly certified.

5.7.2.1 Pollinator Habitat Planting

Atlantic, in support of a 2014 Presidential Memorandum that directs federal agencies to cooperate on the development of a national pollinator strategy, has committed to a pollinator habitat initiative where suitable along the rights-of-way. The successful establishment of pollinator habitat will require specialized: soil preparation, seeding techniques, and maintenance practices.

The most common causes for failed establishment when planting pollinator species are: (1) poor soil/seed contact and planting the seed more than one-quarter inch deep in the soil, and (2) competition from annual weeds, non-natives, or invasive vegetation. To prevent competition from other vegetation, Atlantic will reduce the existing seed bank in the rights-of-way. The seed bank will be reduced by clearing the existing vegetation (done during construction) and by using herbicides.

Additional soil preparation is also needed to ensure seed germination. The soil surface must be relatively smooth and compact to allow shallow seeding, no more than one-quarter inch deep. Typically, planting will include the use of a nurse crop or cover crop to ensure proper soil erosion control and the survival of the pollinator plant species. Cover crops (e.g., annual oats) are also generally used in traditional rights-of-way seeding.

The warm season grasses and endemic forbs used to establish pollinator habitat need to be planted in the Spring. Therefore,

- For Fall, Rights-of-way Restoration: Plant a cover crop and then plant the pollinator seed mix with a nurse crop in the Spring after a herbicide application.
- For Spring, Rights-of-way Restoration: Apply an herbicide prior to planting but after the weed seeds germinate and then plant the pollinator seed mix and a nurse crop together.
- For Summer, Rights-of-way Restoration: Plant a cover crop and then plant the pollinator seed mix with a nurse crop in the Spring after a herbicide application.

Atlantic plans to plant the pollinator species in both the permanent and construction rights-of-way. Atlantic has proposed seed mixes based on the recommendations from consultations with state and federal agencies. These seed mixes are described in more detail

below and in Appendix B. Pollinator species seed mixes will be finalized in consultation with these agencies.

5.7.2.2 Pollinator Habitat Maintenance

Additional mowing is required in the first two years to reduce the height of the weeds and to prevent them from going to seed which will greatly reduce weed competition. Spot use of herbicides should be an option to control woody and invasive plants. Pollinator habitat experts recommend periodic prescription burning of the rights-of-way to reduce accumulated duff (i.e., dead vegetation on top of the ground) so that the pollinator species (flowers) can continue to reseed and maintain a viable population. Mowing close, 4 inches, and or thatching/raking may be viable alternatives to prescribed burning. Maintenance practices should be adapted to what is proven to be the best practices to ensure quality pollinator habitat.

5.7.3 Seeding Revegetation Units along the Pipeline Route

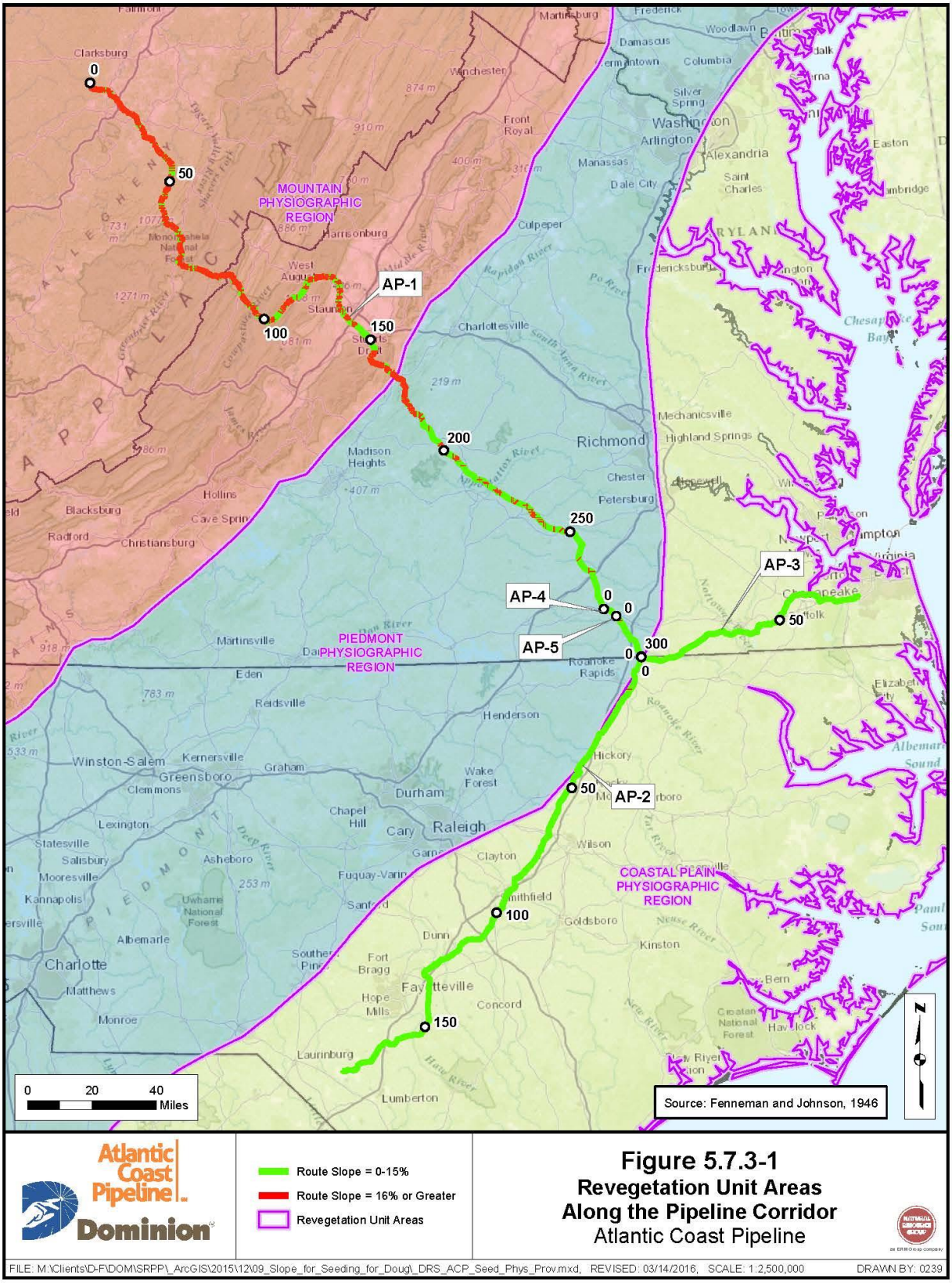
After consultations with Federal, State/Commonwealth, local resource and land managing agencies, and subject matter experts and in order to ensure optimum seed germination and growth, the areas crossed by the Projects were divided into four Revegetation Units (RU). One of the RUs is dependent on and defined by the steepness of the slopes crossed by the proposed pipelines. This RU can occur in site-specific locations anywhere along the pipeline corridors. The three other RUs are based on physiographic regions, and cover areas that are relatively homogenous with regards to factors such as soil type, vegetation, and climate that will affect the revegetation potential of the area. Each RU has distinct seed mix prescriptions. The four RUs include the following:

- Steep to Very Steep Slope RU;
- Mountain Physiographic Region RU;
- Piedmont Physiographic Region RU; and
- Coastal Plain Physiographic Region RU.

Figure 5.7.3-1 shows the distribution of the RUs, including the areas with slopes greater than 15 percent, along the pipeline route. Seed mix descriptions specific for each RU are provided in Appendix B.

5.7.3.1 Steep to Very Steep Slope

Although the Steep to Very Steep Slope RU includes areas with greater than 15 percent slope located anywhere along the Projects, most of these areas are located within the mountainous areas of the western Piedmont Physiographic RU and the Mountain Physiographic RU (see Figure 5.7.3-1). To a much lesser extent, the Steep to Very Steep Slope RU may also be found in smaller, site-specific areas along the pipeline rights-of-way where the steepness of the local terrain increases the erosion potential. The areas in this RU require appropriate seed mix prescriptions, erosion control measures, and BMPs that are able to quickly stabilize the disturbed areas to minimize erosion and sedimentation.


0
50
100
150
200
250
300
AP-1
AP-2
AP-3
AP-4
AP-5
MOUNTAIN PHYSIOGRAPHIC REGION
PIEDMONT PHYSIOGRAPHIC REGION
COASTAL PLAIN PHYSIOGRAPHIC REGION
Clarksburg
Martinsburg
Frederick
Damascus
Columbia
Silver Spring
Washington
Arlington
Alexandria
Manassas
Dale City
Front Royal
Culpeper
Fredericksburg
Charlottesville
Richmond
Mechanicsville
Highland Springs
Chester
Petersburg
Hopewell
Madison Heights
Harrisonburg
Staunton
Blacksburg
Christiansburg
Radford
Hollins
Cave Spring
Martinsville
Eden
Reidsville
Henderson
Roanoke Rapids
Winston-Salem
Greensboro
Kernersville
Graham
Clemmons
Lexington
Statesville
Salisbury
Asheboro
Mooresville
Kannapolis
Albemarle
Charlotte
Matthews
Monroe
Durham
Wake Forest
Chapel Hill
Cary
Raleigh
Hickory
Wilson
Clayton
Fuquay-Varina
Sanford
Dunn
Fort Bragg
Southern Pines
Fayetteville
Hope Mills
Laurinburg
Lumberton
Concord
Goldsboro
Kinston
Havelock
Elizabeth City
Albemarle Sound
Roanoke River
Neuse River
Tar River
Deep River
Uwharrie National Forest
Croatan National Forest
0 20 40 Miles
Source: Fenneman and Johnson, 1946
Route Slope = 0-15%
Route Slope = 16% or Greater
Revegetation Unit Areas
Figure 5.7.3-1
Revegetation Unit Areas
Along the Pipeline Corridor
Atlantic Coast Pipeline
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\2015\12\09_Slope_for_Seeding_for_Doug_DRS_ACP_Seed_Phys_Prov.mxd, REVISED: 03/14/2016, SCALE: 1:2,500,000 DRAWN BY: 0239

5.7.3.2 Mountain Physiographic Region

The ACP Project area extends across the Mountain Physiographic Region RU in West Virginia and western Virginia (see Figure 5.7.3-1). In West Virginia, the RU encompasses the Western Allegheny Plateau, Central Appalachians, and Ridge and Valley ecoregions. The SHP Project area also extends across the Western Allegheny Plateau in northeastern West Virginia and southwestern Pennsylvania. In Virginia, this RU encompasses the Ridge and Valley, Blue Ridge (mountains), and the Southeastern Plains ecoregions. The soils in the Mountain Region RU generally consist of shallow soils with a loamy surface and subsoil texture. Steep slopes with shallow, stony, droughty soils are common throughout the area, and many mountainous soils have been severely eroded due to steepness. In less steep areas, the soils are deep and stable (less erodible).

5.7.3.3 Piedmont Physiographic Region

The proposed ACP Project area extends across the Piedmont Physiographic Region RU in Virginia and encompasses the Piedmont, Northern Piedmont, and Southeastern Plains ecoregions. The Piedmont ecoregion is an area of rolling landscape, gentle hills and valleys with a few isolated mountains (see Figure 5.7.3-1). The Piedmont is characterized by deep, weathered, very old eroded rock surfaces. The ecoregion primarily consists of agricultural land and managed woodlands. The temperate climate supports forests dominated by hardwood species. In general, the Piedmont and Northern Piedmont ecoregions are similar, as they are characterized by irregular plains, open valleys, and hills with stony soils that support both forested and agricultural lands. The Southeastern Plains ecoregion consists of flat plains interspersed with croplands, pastures, forests, and wetlands with primarily sandy soils. The overall climate is warm with a much longer rainy season, which contributes to a longer growing season compared to the Piedmont and Northern Piedmont ecoregions.

5.7.3.4 Coastal Plain Region

The proposed ACP Project area extends across the Coastal Plain Region RU in Virginia and North Carolina (see Figure 5.7.3-1). This RU encompasses two ecoregions: the Southeastern Plains and Mid-Atlantic Coastal Plain. As described above, the Southeastern Plains region consists of flat plains interspersed with croplands, pastures, forests, and wetlands with primarily sandy soils. The Mid-Atlantic Coastal Plain ecoregion borders the Piedmont ecoregion and the Atlantic Ocean, and contains a mix of forests, agricultural lands, and wetlands. The soils crossed by the Projects in these ecoregions are generally well drained soils with a loamy surface and subsoil texture.

5.7.4 Summary of State and Federal Agencies and Subject Matter Experts Consulted

Table 5.7.4-1 provides a list of the Federal and State/Commonwealth agencies, and subject matter experts consulted to determine the appropriate seed mix prescriptions and BMPs to revegetate areas disturbed by the construction of the ACP and SHP facilities.

5.7.5 Seed Mix Recommendations

Appendix B compiles the recommended seeding mixes and amendments provided by Federal, State/Commonwealth, local resource, and land managing agencies and subject matter experts into seed mix prescriptions by County/City and by spread for the Projects. Atlantic and DTI will work with the Federal and State/Commonwealth land managing agencies to determine appropriate seed mixes and methods for revegetation and restoration of Federal and State/Commonwealth lands crossed by the pipelines (see Sections 6 and 7). The Virginia Department of Game and Inland Fisheries has requested that it be responsible for the reseeding of Wildlife Management Area (WMA) lands crossed in Virginia and under the jurisdiction of that agency.

The recommended seed mix prescriptions identified for each of the RUs will be identified by milepost in Appendix C, which will be filed with the FERC prior to construction. The site-specific seed mixes will also be included on the construction alignments sheets to identify the seed mixes to be used by the construction contractors during restoration.

TABLE 5.7.4-1

Summary of Federal and State/Commonwealth Agencies and Subject Matter Expert Consultations

Contact Name	Agency/ Organization	County	Title/Role	Phone	Email
West Virginia					
Greg Stone	NRCS - State Office	All Counties	Acting State Resource Conservationist	304-284-7579	greg.stone@wv.usda.gov
Jeff Griffith	USDA NRCS	Harrison; Lewis; Doddridge	District Conservationist	304-624-9232 x 110	jeff.griffith@wv.usda.gov
Jack O'Connell	USDA NRCS	Pocahontas	District Conservationist	304-799-4317	jack.oconnell@wv.usda.gov
Barbara Sargent	West Virginia Department of Natural Resources	Wetzel	Wildlife Biologist	304-637-0245	barbara.d.sargent@wv.gov
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Susan Davis	NRCS	Pocahontas	Soil Conservationist	304-799-4317	susan.davis@wv.usda.gov
Rob Silvester	West Virginia Department of Natural Resources	Randolph	District Wildlife Biologist	304-924-6211	rob.a.silvester@wv.gov
Steve Rauch	West Virginia Department of Natural Resources	Randolph; Wetzel	District Wildlife Biologist	304-825-6787	steven.e.rauch@wv.gov
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Jeremy Bennett	NRCS	Randolph; Upshur	District Conservationist	304-457-4516	jeremy.bennett@wv.nrcs.gov
Dustin Adkins	NRCS	Tyler; Wetzel	District Conservationist	304-758-2173 x 1	dustin.adkins@wv.usda.gov
Katie Fitzsimmons	NRCS	Marshall	District Conservationist	304-242-0576 x 108	katie.fitzsimmons@wv.usda.gov

TABLE 5.7.4-1 (continued)

Summary of Federal and State/Commonwealth Agencies and Subject Matter Expert Consultations

Contact Name	Agency/ Organization	County	Title/Role	Phone	Email
Virginia					
Amy Ewing	Virginia Department of Game and Inland Fisheries	Virginia Counties	Environmental Services Biologist/Fish & Wildlife Information Manager	804-367-2211	Amy.Ewing@dgif.virginia.gov
Charles Ivins	NRCS	Augusta; Highland	District Conservationist	540-248-6218 x 122	charles.ivins@va.usda.gov
Charles Simmons	NRCS	Bath	District Conservationist	540-463-7124 x111	charles.simmons@va.usda.gov
Justin Folk	NRCS/Virginia Department of Game and Inland Fisheries	Bath	Private Lands Wildlife Biologist	540-248-6218 x 108	justin.folks@va.usda.gov
Davie Wade Harris	NRCS	Brunswick	District Conservationist	434-848-2145 x 102	davie.harris@va.usda.gov
David Harris	NRCS	Buckingham; Cumberland	District Conservationist	434-983-4757 x 101	david.harris@va.usda.gov
Bryan Poovey	U.S. Fish and Wildlife Service	Chesapeake; Suffolk (City); (Great Dismal Swamp National Wildlife Refuge)	Forestry Scientist	757-986-3705	bryan_poovey@fws.gov
David Bryd	U.S. Fish and Wildlife Service	Great Dismal Swamp NWR	Forestry Scientist	804-824-2412	david_byrd@fws.gov
Robert E. Williams	NRCS	Chesapeake	District Conservationist	757-547-7172 x 102	robert.williams@va.usda.gov
Bob Glennon	NRCS	Eastern Virginia Counties	Private Lands Biologist	757-357-7004 x 126	robert.glennon@va.usda.gov
Anthony Howell	NRCS	Dinwiddie	District Conservationist	804-469-7297 x 106	anthony.howell@va.usda.gov
Harvey Baker	NRCS	Greensville	District Conservationist	434-634-2115 x 109	harvey.baker@va.usda.gov
Jay Jeffreys	Virginia Department of Game and Inland Fisheries	Highland; Nelson	Biologist	540-248-9360	jay.jeffreys@dgif.virginia.gov
Kory Kirkland	NRCS	Nelson	District Conservationist	540-967-0233 x 111	kory.kirkland@va.usda.gov
Jeffray Jones	NRCS	All Counties	State Biologist	804-287-1691	jeffray.jones@va.usda.gov
J.B. Daniel	NRCS	Prince Edward	Agronomist Director	434-392-4171	j.b.daniel@va.usda.gov
Derek Hancock	NRCS	Nottoway; Prince Edward	District Conservationist	434-392-4127 x 101	derek.hancock@va.usda.gov
Yamika Bennett	NRCS	Southampton	District Conservationist	757-653-2532 x 122	yamika.bennett@va.usda.gov
Michael A. Faulk	NRCS	Suffolk (City)	District Conservationist	757-357-7004 x 114	mike.faulk@va.usda.gov
Ryan McCormick	National Park Service		Specialist Coordinator	828-348-3441	

TABLE 5.7.4-1 (continued)

Summary of Federal and State/Commonwealth Agencies and Subject Matter Expert Consultations

Contact Name	Agency/ Organization	County	Title/Role	Phone	Email
J. Christopher Ludwig	DCR	All Counties	Chief Biologist	804-371-6206	Chris.Ludwig@dcr.virginia.gov
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North Carolina					
Renessa Hardy-Brown	NRCS	Cumberland	District Conservationist	910-484-8479	renessa.brown@nc.usda.gov
Terry Best	NRCS	Halifax	District Conservationist	252-583-3481	terry.best@nc.usda.gov
Brian Loadholt	NRCS	Johnston	District Conservationist	919-934-7156	brian.loadholt@nc.usda.gov
Patrick Evens	NRCS	Nash	District Conservationist	252-459-4116 x 124	patrick.evans@nc.usda.gov
Paul Boone	NRCS	Northampton	District Conservationist	252-534-2591	paul.boone@nc.usda.gov
Jeremy Ruston	NRCS	Robeson	District Conservationist	910-739-5478	jeremy.roston@usda.gov
Gavin Thompson	NRCS	Sampson	District Conservationist	910-592-7963	gavin.thompson@nc.usda.gov
David Little	NRCS	Wilson	District Conservationist	252-237-2711	david.little@nc.usda.gov
Pennsylvania					
Chris Droste	Westmoreland Conservation District	Westmoreland	Erosion Control Specialist	724-837-5271	chris@wcdpa.com
Subject Matter Experts					
Mark Fiely	Ernst Seeds	All Counties	Horticulturist	800-873-3321	hortpath@ernstseed.com
Jeremy Hamlington	Roundstone Native Seed	All Counties	Horticulturist	270-531-3034	jeremy@roundstoneseed.com
Bob Glennon	NRCS / The Xerces Society	All Counties	Private Lands Biologist	757-357-7004 x 126	robert.glennon@va.usda.gov
Nancy Lee Adamson	The Xerces Society for Invertebrate Conservation & NRCS East National Technology Support Center	All Counties	Pollinator Conservation Specialist	336-370-3443	nancy@xerces.org

5.7.5.1 Steep to Very Steep Slope Seed Mixes

As described in Sections 5.7.3, the Steep to Very Steep Slope RU includes areas with high erosion potential (e.g., slopes greater than 15 percent). These areas require appropriate seed mixtures and erosion control measures that are able to quickly stabilize disturbed areas. The recommended seed mixes include the use of cool season grasses, which are identified by County in Appendix B.

5.7.5.2 Mountain Physiographic Region Seed Mixes

Excessively to Moderately Well Drained Sites

West Virginia

The proposed Mountain Physiographic Region Seed Mix P-MUDW01 (Tables 5.7.5-1 and 5.7.5-2) was designed to be compatible with the Mountain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grass and forb species suitable for the restoration of excessively to moderately well-drained mountainous areas in West Virginia.

Virginia

The proposed Mountain Physiographic Region Seed Mix P-VABCHNP01 (Tables 5.7.5-3 and 5.7.5-4) was designed to be compatible with the Mountain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grass and forb species suitable for restoration in excessively to moderately well-drained mountainous areas in Virginia.

Somewhat Poorly to Very Poorly Drained Sites

West Virginia

The proposed Mountain Physiographic Region Seed Mix P-MUDW02 (Tables 5.7.5-5 and 5.7.5-6) was designed to be compatible with the Mountain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grasses and forb species suitable for restoration in somewhat poorly to very poorly-drained mountainous areas in West Virginia.

Virginia

The proposed Mountain and Upland Seed Mix P-VABCHNP02 (Tables 5.7.5-7 and 5.7.5-8) was designed to be compatible with the Mountain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grasses and forb species suitable for restoration in somewhat poorly to very poorly-drained mountainous areas in Virginia.

TABLE 5.7.5-1

Seed Mix P-MUDW01: Recommended Mountain Physiological Region
Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia [a]

Common Name	Scientific Name	Height (feet)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS) [b]
Little Bluestem	*Schizachyrium scoparium*	2 - 4	Full Sun	0.250
Virginia Wild Rye	*Elymus virginicus*	2 - 4	Full Sun	0.250
Tall Dropseed	*Sporobolus compositus*	2 - 3	Full Sun	0.050
Purple Top	*Tridens flavus*	3 - 5	Part Shade	0.058
Indian Grass	*Sorghastrum nutans*	3 - 6	Full Sun	0.167
Switchgrass	*Panicum virgatum*	3 - 7	Full Sun	0.183
Fall Panicum	*Panicum anceps*	2 - 4	Part Shade	0.042
Total	—	—	—	1.0

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] Recommended seeding application rate is 8 to 18 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-2

Seed Mix P-MUDW01: Recommended Mountain Physiological Region
Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia

Common Name	Scientific Name	Color	Bloom Period	Seed Application Rate (lbs/acre/PLS) [a]
Lance Leaved Coreopsis	*Coreopsis lanceolata*	Yellow	Spring,Summer	0.385
Smooth Beardtongue	*Penstemon digitalis*	White	Spring	0.146
Common Milkweed	*Asclepias syriaca*	Pink	Spring, Summer	0.128
Goat's Rue	*Tephrosia virginiana*	White/Pink	Spring, Summer	0.128
Partridge Pea	*Cassia fasciculata*	Yellow	Summer	0.745
Slender Mountain Mint	*Pycnanthemum tenuifolium*	White	Summer	0.069
Early Goldenrod	*Solidago juncea*	Yellow	Summer	0.086
Bergamot	*Monarda fistulosa*	Lavender	Summer	0.103
Spiked Blazing Star	*Liatris spicata*	Pink	Summer	0.343
Sneezeweed	*Helenium autumnale*	Yellow	Summer, Fall	0.128
Gray Goldenrod	*Solidago nemoralis*	Yellow	Fall	0.086
Iron Weed	*Vernonia altissima*	Purple	Summer, Fall	0.343
Tall Coreopsis	*Coreopsis tripteris*	Yellow	Summer, Fall	0.051
Total				2.74

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-3

Seed Mix P-VABCHNP01: Recommended Mountain Physiographic Region
Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia

Common Name	Scientific Name	Cultivar or Germplasm	Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Little Bluestem	*Schizachyrium scoparium*	Piedmont (NC) or Suther Germplasm (NC)	8 ounces	3
Broomsedge	*Andropogon virginicus*	—	8 ounces	3
Purple Top	*Tridens flavus*	North Carolina or Kentucky Ecotype	3 ounces	3
Common milkweed	*Asclepias syriaca*	—	3 ounces	0.210

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 5.7.5-4

Seed Mix P-VABCHNP01: Recommended Mountain Physiographic Region
Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia

Common Name [a]	Scientific Name	Flowering Season	Drilled Seeding Rate [b] (ounces/acre - weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Showy Tickseed	*Bidens aristosa*	Late Summer	11	3
Pea, Partridge (A)	*Chamaecrista fasciculata*	Mid-Summer	32	3
Susan, Black-eyed (B)	*Rudbeckia hirta*	Early Summer	2	3
Bergamot, Spotted (P)	*Monarda punctata*	Summer	2	3
Bergamot, Wild (P)	*Monarda fistulosa*	Summer	2	3
Beardtongue, Eastern Smooth (P)	*Penstemon laevigatus*	Late Spring	7	3
Penstemon, Talus Slope (P)	*Penstemon digitalis*	Late Spring	5	3
Slender Mountain Mint (P)	*Pycnanthemum tenuifolium*	Late Summer	1	3
New England Aster	*Aster novae-angliae*	Late Summer	2	3
Total	—	—	**64.0 ounces/acre (4.0 lbs/acre)**	**27**

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

[b] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 5.7.5-5

Seed Mix P-MUMP02: Recommended Mountain Physiographic Region
Grass Seed Mix and Application Rate for Somewhat Poorly to Very Poorly Drained Sites in West Virginia [a]

Common Name	Scientific Name	Height (feet)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Switchgrass	*Panicum virgatum*	3 - 7	Full Sun	0.233
Red Top Panicum	*Panicum rigidulum*	2 - 4	Full Sun	0.017
Fowl Manna Grass	*Glyceria striata*	3 - 5	Part Shade	0.008
Virginia Wild Rye	*Elymus virginicus*	2 - 4	Full Sun	0.217
Canada Wild Rye	*Elymus canadensis*	2 - 5	Part Shade	0.167
Deer Tongue Grass	*Panicum clandestinum*	2 - 4	Full Sun	0.058
Big Bluestem	*Andropogon gerardii*	4 - 10	Full Sun	0.167
Frank's Sedge	*Carex frankii*	1 - 2	Part Shade	0.042
Fox Sedge	*Carex vulpinoidea*	2 - 3	Part Shade	0.025
Fall Panicum	*Panicum anceps*	2 - 4	Part Shade	0.067
Total	—	–	—	1.0

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] Recommended seeding application rate is 8 to 18 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-6

Seed Mix P-MUMP02: Recommended Mountain Physiographic Region
Forb Seed Mix Application Rate for Somewhat Poorly to Very Poorly Drained Sites in West Virginia

Common Name	Scientific Name	Color	Bloom Period	Seed Application Rate (lbs/acre/PLS)[a]
Ohio Spiderwort	*Tradescantia ohiensis*	Blue	Spring, Summer	0.167
Smooth Beardtongue	*Penstemon digitalis*	White	Spring	0.083
Butterfly Milkweed	*Asclepias tuberosa*	Orange	Spring, Summer	0.083
Blackeyed Susan	*Rudbeckia hirta*	Yellow	Spring, Summer	0.134
Wild Senna	*Senna marilandica*	Yellow	Summer	0.668
Hoary Mountain Mint	*Pycnanthemum incanum*	White	Summer	0.033
Lupine	*Lupinus perennis*	Blue	Summer	0.501
Bergamot	*Monarda fistulosa*	Lavender	Summer	0.083
Boneset	*Eupatorium perfoliatum*	White	Summer	0.083
Joe-Pye Weed	*Eupatorium fistulosum*	Pink	Summer, Fall	0.125
Showy Tickseed	*Bidens aristosa*	Yellow	Summer, Fall	0.501
Sneezeweed	*Helenium autumnale*	Yellow	Summer, Fall	0.125
Rough Goldenrod	*Solidago rugosa*	Yellow	Fall	0.083
Total	—	—	—	2.67

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-7

Seed Mix P-VABCHNP02: Recommended Mountain Physiographic Region
Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia [a]

Common Name	Scientific Name	Cultivar or Germplasm	Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Beaked Panicum	*Panicum anceps*	SC or MD Ecotype	4 ounces	3
Redtop Panicum	*Panicum rigidulum*	NC Ecotype	3 ounces	3
Slender Rush	*Juncus tenuis*	—	1 ounce	3

Source: Glennon, 2015; Roundstone Native Seed, 2017.

[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 5.7.5-8

Seed Mix P-VABCHNP02: Recommended Mountain Physiographic Region
Forb Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia

Common Name [a]	Scientific Name	Flowering Season	Drilled Seeding Rate [b] (ounces/acre - weight of pure live seed (PLS) per acre	Seeds per Square Foot
New England Aster	*Symphyotrichum puniceum*	Fall	3	3
Bergamot, Wild (P)	*Monarda fistulosa*	Summer	1	3
Ironweed, New York (P)	*Vernonia novaboracensis*	Late Summer	7	3
Rough-stemmed goldenrod	*Solidago rugosa*	Late Summer	3	3
Joe Pye Weed, Spotted (P)	*Eutrochium fistulosus*	Late Summer	2	3
Pea, Partridge (A)	*Chamaecrista fasciculata*	Mid-Summer	32	3
Rosemallow (P)	*Hibiscus moscheutos*	Summer	2	3
Showy Tickseed	*Bidens aristosa*	Late Summer	11	3
Total	**—**	**—**	**61.0 ounces/ acre (3.8 lbs/acre)**	**24**

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

[b] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

Pennsylvania

In Pennsylvania, the SHP pipeline (approximately 3.9 miles) will be collocated with DTI's existing LN-25 pipeline in Westmoreland County. In general, the SHP pipeline will be constructed within and directly adjacent to the existing LN-25 pipeline rights-of-way which is seeded with cool season grasses. As presented in Appendix B, the recommended seed mixtures, rates, and amendments for the SHP were based on existing site conditions and compatibility with existing grasses, which includes the use of cool season grasses. No pollinator species specific to the area were recommended.

5.7.5.3 Piedmont Physiographic Region Seed Mixes

Excessively to Moderately Well Drained Sites

Virginia

The proposed Mountain Physiographic Seed Mix P-VABCHNP01 that is described in Section 5.7.5.2 was designed to also be compatible with the Piedmont Physiographic Region RU in excessively to moderately well drained areas in Virginia.

Somewhat Poorly to Very Poorly Drained Sites

Virginia

The proposed Mountain Physiographic Seed Mix P-VABCHNP02 described in Section 5.7.5.2 was designed to also be compatible with the Piedmont Physiographic Region RU in somewhat poorly to very poorly drained sites in Virginia.

5.7.5.4 Coastal Plain Physiographic Region Seed Mixes

Excessively to Moderately Well Drained Sites

Virginia

The proposed Coastal Plain Seed Mix P-VACSDGS01 (Tables 5.7.5-9 and 5.7.5-10) was designed to be compatible with the Coastal Plain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grass and forb species suitable for restoration in excessively to moderately well drained coastal areas in Virginia.

North Carolina

The proposed Coastal Plain Seed Mix P-CPDW01 (Tables 5.7.5-11 and 5.11.5-12) was designed to be compatible with the Coastal Plain Physiographic Region RU in areas with slopes of 15 percent or less and is based on selected native grass and forb species suitable for restoration in excessively to moderately well drained coastal areas in North Carolina.

Somewhat Poorly to Very Poorly Drained Sites

Virginia

The proposed Coastal Plain Seed Mix P-VACSDGS02 (Tables 5.7.5-13 and 5.7.5-14) was designed to be compatible with the Coastal Plain Physiographic Region RU in areas with slopes of 15 percent or less. The mix is based on selected native grass and forb species suitable for restoration in somewhat poorly to very poorly drained coastal areas in Virginia.

TABLE 5.7.5-9

Seed Mix P-VACSDGS01: Recommended Coastal Plain Physiographic Region
Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia

Common Name	Scientific Name	Cultivar or Germplasm	Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Little Bluestem	*Schizachyrium scoparium*	Piedmont (NC) or Suther Germplasm (NC)	8 ounces	3
Splitbeard Bluestem	*Andropogon ternarius*	Virginia Ecotype	8 ounces	3
Common milkweed	*Asclepias syriaca*	—	3 ounces	0.21

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 5.7.5-10

Seed Mix P-VACSDGS01: Recommended Coast Plain Physiographic Region
Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia

Common Name [a]	Scientific Name	Flowering Season	Drilled Seeding Rate [b] (ounces/acre - weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Mountain Mint, Narrowleaf (P)	*Pycnanthemum tenuifolium*	Late Summer	1	3
Showy Tickseed	*Bidens aristosa*	Late Summer	11	3
Pea, Partridge (A)	*Chamaecrista fasciculata*	Mid-Summer	32	3
Susan, Black-eyed (B)	*Rudbeckia hirta*	Early Summer	2	3
Bergamot, Spotted (P)	*Monarda punctata*	Summer	2	3
Beardtongue, Eastern Smooth (P)	*Penstemon laevigatus*	Late Spring	7	3
Penstemon, Talus Slope (P)	*Penstemon digitalis*	Late Spring	5	3
Bergamot, Wild (P)	*Monarda fistulosa*	Summer	2	3
Total	—	—	**65.0 ounces/acre (4.4 lbs/acre)**	**24**

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

[b] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 5.7.5-11

Seed Mix P-CPDW01: Recommended Coastal Plain Physiographic Region
Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in North Carolina

Common Name	Scientific Name	Height (feet)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Little Bluestem	*Schizachyrium scoparium*	2- 4	Full Sun	0.250
Virginia Wild Rye	*Elymus virginicus*	2 - 4	Full Sun	0.250
Tall Dropseed	*Sporobolus compositus*	2 - 3	Full Sun	0.050
Purple Top	*Tridens flavus*	3 - 5	Part Shade	0.058
Indian Grass	*Sorghastrum nutans*	3 - 6	Full Sun	0.167
Switchgrass	*Panicum virgatum*	3 - 7	Full Sun	0.183
Fall Panicum	*Panicum anceps*	2 - 4	Part Shade	0.042
Total	—	—	—	**1.0**

Sources: Roundstone Native Seed, 2017; Glennon, 2017.

[a] Recommended seeding application rate is 8 to 18 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed.

TABLE 5.7.5-12

Seed Mix P-CPDW01: Recommended Coastal Plain Physiographic Region
Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in North Carolina

Common Name	Scientific Name	Color	Bloom Period	Seed Application Rate (lbs/acre/PLS)[a]
Lance Leaved Coreopsis	*Coreopsis lanceolata*	Yellow	Spring, Summer	0.266
Spotted Beebalm	*Monarda punctata*	Pink	Spring, Summer	0.124
Common Milkweed	*Asclepias syriaca*	Pink	Spring, Summer	0.107
Smooth Beardtongue	*Penstemon digitalis*	White	Spring	0.107
Bergamot	*Monarda fistulosa*	Lavender	Summer	0.124
Partridge Pea	*Cassia fasciculata*	Yellow	Summer	0.621
Spiked Blazing Star	*Liatris spicata*	Pink	Summer	0.222
Lupine	*Lupinus perennis*	Blue	Summer	0.497
Early Goldenrod	*Solidago juncea*	Yellow	Summer	0.160
Starry Silphium	*Silphium asteriscus*	Yellow	Summer, Fall	0.178
Iron Weed	*Vernonia altissima*	Purple	Summer, Fall	0.222
Sneezeweed	*Helenium autumnale*	Yellow	Summer, Fall	0.124
Hairy Mountain Mint	*Pycnanthemum pilosum*	White	Summer, Fall	0.089
Total	—	—	—	**2.84**

Sources: Roundstone Native Seed, 2017; Glennon, 2017.
[a] lbs/acre/PLS = pounds per acre of pure live seed.

TABLE 5.7.5-13

Seed Mix P-VACSDGS02: Recommended Coastal Plant Physiographic Region
Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia

Common Name	Scientific Name	Cultivar or Germplasm	Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Panicum, Beaked	*Panicum anceps*	SC or MD Ecotype	4 ounces	3
Panicum, Redtop	*Panicum rigidulum*	NC Ecotype	3 ounces	3

Source: Glennon, 2017; Roundstone Native Seed, 2017.
[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 5.7.5-14

Seed Mix P-VACSDGS02: Recommended Coastal Plant Physiographic Region
Forb Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia

Common Name [a]	Scientific Name	Flowering Season	Drilled Seeding Rate (weight of bulk seed per acre)	Seeds per Square Foot
New England Aster	*Aster novae-angliae*	Fall	3	3
Sneezeweed, Common (P)	*Helenium autumnale*	Fall	2	3
Showy Tickseed	*Bidens aristosa*	Late Summer	11	3
New York Ironweed (P)	*Vernonia nova boracensis*	Late Summer	7	3
Goldenrod, Wrinkleleaf (P)	*Solidago rugosa*	Late Summer	2	3
Joe Pye Weed, Spotted (P)	*Eutrochium fistulosus*	Late Summer	2	3
Partridge Pea (A)	*Chamaecrista fasciculata*	Mid-Summer	32	3
Rosemallow (P)	*Hibiscus moscheutos*	Summer	2	3
Narrowleaf Sunflower (P)	*Helianthus angustifolius*	Late Summer	4	3
Total	—	—	**65.0 ounces/acre (4.1 lbs/acre**	**27**

Source: Glennon, 2017; Roundstone Native Seed, 2017.
[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.
[b] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

North Carolina

The proposed Coastal Plain Seed Mix P-CPDW02 (Tables 5.7.5-15 and 5.7.5-16) was designed to be compatible with the Coastal Plain Physiographic Region RU in areas with slopes of 15 percent or less and is based on selected native grass and forb species suitable for restoration in somewhat poorly to very poorly drained coastal areas in North Carolina.

TABLE 5.7.5-15

Seed Mix P-CPDW02: Recommended Coastal Plain Physiographic Region
Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in North Carolina [a]

Common Name	Scientific Name	Height (feet)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Switchgrass	*Panicum virgatum*	3 - 7	Full Sun	0.233
Red Top Panicum	*Panicum rigidulum*	2 - 4	Full Sun	0.017
Fowl Manna Grass	*Glyceria striata*	3 - 5	Part Shade	0.008
Virginia Wild Rye	*Elymus virginicus*	2 - 4	Full Sun	0.217
Deer Tongue Grass	*Panicum clandestinum*	2 - 4	Full Sun	0.058
Big Bluestem	*Andropogon gerardii*	4 - 10	Full Sun	0.167
Frank's Sedge	*Carex frankii*	1 - 2	Part Shade	0.042
Fox Sedge	*Carex vulpinoidea*	2 - 3	Part Shade	0.025
Fall Panicum	*Panicum anceps*	2 - 4	Part Shade	0.067
Total	—	—	—	0.83

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] Recommended seeding application rate is 8 to 18 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 5.7.5-16

Seed Mix P-CPDW02: Recommended Coastal Plain Physiographic Region
Forb Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in North Carolina

Common Name	Scientific Name	Color	Bloom Period	Seed Application Rate (lbs/acre/PLS)[a]
Smooth Beardtongue	*Penstemon digitalis*	White	Spring	0.169
Butterfly Milkweed	*Asclepias tuberosa*	Orange	Spring, Summer	0.056
Ohio Spiderwort	*Tradescantia ohiensis*	Blue	Spring, Summer	0.084
Blackeyed Susan	*Rudbeckia hirta*	Yellow	Spring, Summer	0.180
Spiked Blazing Star	*Liatris spicata*	Pink	Summer	0.264
Hoary Mountain Mint	*Pycnanthemum incanum*	White	Summer	0.034
Early Goldenrod	*Solidago juncea*	Yellow	Summer	0.113
Bergamot	*Monarda fistulosa*	Lavender	Summer	0.169
Showy Tickseed	*Bidens aristosa*	Yellow	Summer, Fall	0.366
Starry Silphium	*Silphium asteriscus*	Yellow	Summer, Fall	0.113
Narrow-Leaved Sunflower	*Helianthus angustifolius*	Yellow	Summer, Fall	0.113
Joe-Pye Weed	*Eupatorium fistulosum*	Pink	Summer, Fall	0.141
Total	—	—	—	2.84

Sources: Roundstone Native Seed, 2015; Glennon, 2015

[a] lbs/acre/PLS = pounds per acre of pure live seed

5.7.6 Seeding Methods

Seeding may be conducted with the use of a seed drill, a mechanical broadcast seeder, or by hydroseeding. In the absence of requirements to the contrary, the standard application method will be seeding with a seed drill equipped with a cultipacker. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by an EI. Broadcast or hydroseeding at double the recommended seeding rates may be used in lieu of drilling (see Appendix B for recommendations).

Broadcast seeding will be used for areas with minimal to moderate slopes and will be performed by dry dispersal or wet broadcast seeding. Wet broadcast seeding is an effective treatment for temporary erosion control and may be used when hydroseeding late in the season or on certain site conditions where hydroseeding is not practical. To support successful seed germination, seed will be broadcast once soil compaction has been rectified and soil composition includes proper aeration and water percolation to support plant development. Where seed is broadcast, the seedbed will be restructured with a cultipacker or imprinter after seeding. Once seed is broadcast, Atlantic and DTI will rake the area lightly to encourage plant establishment and minimize the seed that migrates from the site (North Carolina Department of Environment and Natural Resources, 2009).

Hydroseeding involves the mixing of slurry (i.e., seed, water, fertilizer, tackifier, or mulch) in a truck-mounted mixing tank and ground application via a pressurized pump. Hydroseeding is the preferred method of seed dispersal on steep slopes greater than 60 percent, where site conditions require seed adherence to the disturbed soil. Prior to hydroseeding, Atlantic and DTI will scarify the seedbed to facilitate lodging and germination of seed. Tackifiers will be applied where necessary so that seed adheres to soil. Polymer binders, if selected, will be used in accordance with manufacturer's specifications to ensure proper compatibility with fertilizers and to avoid foaming that might otherwise result from excessive agitation. All chemical components will be mixed and administered in accordance with manufacturer and applicable agency guidelines. In addition, hydroseeding near wetlands or waterbodies will only be conducted in accordance with the FERC Plan and Procedures and other applicable agency regulations.

5.8 SEEDBED AUGMENTATION

5.8.1 Lime and Fertilizer Application

Lime and fertilizer recommendations provided by the various Federal, State/Commonwealth, local and land management and subject matter experts consulted for each County/City are provided in Appendix B. Each county crossed by the Projects may have different fertilization and liming requirements based on the soil characteristics and the proposed seed mix prescriptions. In general, and in accordance with the Plan and Procedures, upland areas will have a fertilizer and pH supplement (i.e., lime) mixed in to the upper two inches of topsoil. No lime or fertilizer will be used within 100 feet of wetlands or waterbodies or within 300 feet of karst features. In upland areas without specific fertilization requirements, Atlantic and DTI will:

- apply 150 pounds per acre of 10-20-20 (or similar) fertilizer;
- apply phosphorus or potassium during the same installation, if required;
- avoid fertilizer drift through restricted application times that exclude periods of high winds or heavy rains; and
- store and mix all fertilizers in upland areas and away from karst features, so as to avoid wetlands, waterbodies, or karst features.

5.8.2 Mulching

Mulching recommendations provided by the various Federal, State/Commonwealth, local and land management agencies, and subject matter experts consulted for each County/City are provided in Appendix B. Each County/City crossed by the Projects may have different mulching requirements based on the landscape characteristics, soil types, and the proposed seed mix prescriptions. In general, and in accordance with the Plan, Atlantic and DTI will apply mulch to slopes immediately after seeding to prevent erosion. In non-forested areas, mulch will be spread uniformly over a minimum of 75 percent of the surface at a rate of 2 tons per acre, or 1 ton per acre if wood chips are used, or per directions from land managing agencies or landowners. In forested areas, if the amount of mulch will likely exceed these parameters due to the shredding of non-merchandisable forest materials cleared from the rights-of-way, Atlantic and DTI will request a variance from FERC prior to applying mulch greater than 1 ton/acre. Mulch materials will be anchored to the soil with stakes or liquid mulch tackifiers. No tackifiers will be used within 100 feet of wetlands and waterbodies or within 300 feet of karst features.

Possible mulch materials and application techniques are described below.

- Salvaged wood materials, including slash and non-merchantable timber, will be retained in forested areas and placed on the rights-of-way after final grading, re-contouring, and seeding is complete. Woody debris is expected to support revegetation while preventing erosion and providing micro-habitat for various species.
- Native wood chip materials will be used in forested systems and will be generated from cleared materials that are chipped and stockpiled on the edge of the rights-of-way. Native wood chips are expected to aid in the successful revegetation of disturbed areas.
- Wood fiber hydromulch may be used in shrubby areas to augment biomass salvaged during clearing. Hydromulch is evenly distributed and absorbs water quickly, which enhances seed survival rates and discourages erosion during regeneration of shrubby species.
- Bonded fiber matrix (BFM), a type of hydromulch designed to control erosion on steep slopes, may also be used where appropriate. BFM slurry contains thermally processed wood fibers (approximately 80 percent), water (approximately

10 percent), and tackifiers and polymer-based binding agents that are quick to dry upon application. BFM is hydraulically applied, which allows for controlled application on steep slopes where access may be difficult. BFM will only be applied to stable slopes where final grading has been completed and water runoff has been diverted from the slope face. Once BFM has had 24 to 48 hours to cure, an erosion-resistant blanket is formed that is flexible, absorbent, and biodegradable, and that will accelerate plant growth. BFM may be used in conjunction with slope breakers and other erosion control devices on slopes longer than 70 feet. BFM application rates will depend on manufacturers specifications, based upon the slope of the disturbed areas.

- Straw or hay that has been certified as weed-free will be used to preserve the soil base in areas where native salvaged material is not available. In areas that are seeded by drill, Atlantic and DTI will apply one bale of clean straw or hay per 1,000 square feet. Where broadcast seeding is used, Atlantic and DTI will apply two bales of clean straw or hay per 1,000 square feet, or in accordance with requirements specified by Federal or State/Commonwealth land managing agencies.

5.8.3 Supplemental Plantings

Where required, Atlantic and DTI may supplement seeding with the planting of tree seedlings or small shrubs. No supplemental plantings are anticipated for maintained areas within the permanent easements for the pipelines. Public lands will be revegetated in accordance with land management objectives and direction from land managing agencies (see Sections 5.0 and 6.0).

5.9 RIPARIAN RESTORATION

Following initial stream bank stabilization, Atlantic and DTI will restore the banks of waterbodies to preconstruction contours to the extent practicable. In steep-slope areas, re-grading may be required to reestablish stable contours capable of supporting preconstruction drainage patterns. Riparian areas will be revegetated with native species across the entire width of the construction corridor. Restoration of riparian areas will be designed to:

- restore stream bank integrity, including both shore crossings up to the ordinary high water mark;

- withstand periods of high flow without increasing erosion and downstream sedimentation; and

- include temporary erosion control fencing, which will remain in place until stream bank and riparian restoration is complete.

Permanent bank stabilization and erosion control devices (e.g., natural structures, rock riprap, and/or large woody debris) will be installed as necessary on steep banks in accordance

with permit requirements to permanently stabilize the banks and minimize sediment deposition into waterbodies.

5.9.1 Non-forested Riparian Areas

All disturbed banks and riparian work areas will be seeded as soon as possible after final grading, weather and soil conditions permitting and subject to the recommended seeding dates for the area. Seeding is intended to stabilize the soil, improve the appearance of the area disturbed by construction, and restore native flora. As discussed above, Atlantic and DTI will determine appropriate seeding prescriptions based upon the vegetative community of the disturbed area, and will continue to consult with land managing agencies regarding seeding requirements for riparian areas.

5.9.2 Forested Riparian Areas

Restoration of forested riparian areas will include seeding as discussed above, and may include supplemental plantings of tree seedlings and shrubs. Clearing of riparian trees in forested areas will reduce shade near streams, and may allow for an increase in local water temperature. Large woody debris, where available and appropriate habitat conditions exist, will be placed adjacent to waterbody crossings to add shade and fish habitat. Forested riparian areas will be restored and enhanced using plantings of native shrubs and trees, excluding the permanent easement, which will be retained in an herbaceous state. On a site-specific basis and in consultation with land managing agencies or landowners, Atlantic and DTI will design riparian revegetation with the use of fast growing native trees and shrubs placed closest to the bank top to provide canopy recovery as quickly as possible to shade and overhang the waterbodies. Restoration of forested riparian areas on Federal and State/Commonwealth lands will be determined based upon consultations with the appropriate land managing agencies.

5.10 WETLAND RESTORATION

Atlantic and DTI will employ clearing and construction techniques designed to support regeneration of existing wetland vegetation, including the following:

- clearing vegetation at ground level in all non-forested wetland areas outside of the trench line to leave existing root systems intact to help stabilize soils, preserve existing ground elevations, and promote revegetation through sprouting and from existing seed stocks;

- using equipment mats to prevent soil compaction and allow intact root systems to regrow;

- replacing the topsoil segregated from the trenchline in unsaturated wetlands to promote reestablishment of existing wetland species and preserving the vegetative propagules (i.e., seeds, tubers, rhizomes, and bulbs) within the soil, which will have the potential to germinate or sprout when the topsoil is replaced; and

- limiting the removal of stumps to the trench area in forested wetlands, except where safety considerations necessitate additional stump removal, as retained

stumps will facilitate reestablishment of woody species by enabling re-sprouting from existing root structures.

In accordance with the Procedures, sediment barriers will be installed immediately following clearing activities occurring within wetlands or adjacent upland areas along the pipeline rights-of-way. Where necessary, sediment barriers will be installed across the construction rights-of-way immediately upslope of the wetland boundary to prevent sediment flow into wetlands. Sediment barriers will be properly maintained throughout construction, reinstalled as necessary, and removed after restoration is complete and revegetation has stabilized the disturbed areas.

Seeding of wetlands is not anticipated as wetlands are expected to naturally revegetate. Unless specified by landowners or land managing agencies, revegetation will be monitored annually until wetland revegetation is successful in accordance with the Procedures. Wetland revegetation will be considered successful when vegetation community characteristics are similar to the vegetation in adjacent wetland areas that were not disturbed by construction. As described in the Procedures, restored wetland vegetation will include at least 80 percent of the species targeted for restoration, and the density (i.e., percent cover) and distribution (e.g., microsites and patches) of individual plants will be similar to areas not disturbed by construction. Revegetation requirements appropriate for Federal and State/Commonwealth lands will be determined through consultation with those agencies.

After revegetation, Atlantic and DTI anticipate no permanent impact on emergent wetland vegetation within the rights-of-way. Scrub-shrub and forested wetlands will not be allowed to fully reestablish within portions of the permanent rights-of-way centered over the pipeline trench lines. Atlantic and DTI will periodically remove woody species from wetlands to facilitate post-construction inspections of the permanently maintained rights-of-way. Where the pipelines cross wetlands, Atlantic and DTI will maintain a 10-foot-wide corridor centered over the pipelines in an herbaceous condition, and remove deep rooted trees within a 30-foot-wide corridor centered over the pipelines.

5.11 AGRICULTURAL AREAS

Atlantic and DTI will work with individual landowners to address restoration of active agricultural areas. Generally, agricultural areas will be replanted by the landowner or tenant, unless otherwise requested by the landowner. Anticipated impacts on and restoration of irrigation systems, drain tiles, gates, and other structures are discussed in Resource Report 8.

5.12 EXPOSED BEDROCK

In areas with exposed bedrock or bedrock, Atlantic and DTI will restore the area using crushed rock rather than attempting to revegetate the area.

5.13 UPLAND FOREST

Atlantic and DTI have prepared and will implement a *Timber Removal Plan*, which describes construction and restoration activities in areas where timber is removed. The plan also

addresses compensation for loss of merchantable timber as well as elements of timber removal/sale that are unique to public lands. Elements of the plan include:

- completion of a timber cruise to appraise the value of merchantable timber;
- installation of flagging/fencing of timber removal limits, riparian areas, and other exclusion zones prior to timber removal operations;
- identification of access and staging requirements for timber removal, including log landing locations, temporary bridges at waterbody crossings, etc.; and
- identification of timber removal methods (e.g., high line yarder logging, mechanical harvesting, helicopter logging).

Following construction in forested areas, seed mixes, and/or seedlings will be planted in temporary workspace areas in accordance with recommendations from the NRCS, land managing or other applicable agencies, and operators of commercial tree farms. In non-cultivated uplands, including forested areas, the permanent easement for each pipeline will be maintained in an herbaceous state.

6.0 FEDERAL LANDS

The AP-1 mainline will cross approximately 5.5 miles of Federal lands in the Monongahela National Forest and approximately 14.5 miles of Federal lands in the George Washington National Forest, which are administered by the USFS. As described in Atlantic's and DTI's Resource Reports, Federal lands are managed in accordance with various management directives, including standards and guidelines for restoration and revegetation activities. Restoration activities on Federal lands will be in accordance with these standards and guidelines. Additional or site-specific requirements for restoration of Federal lands will be addressed in a Construction, Operations, and Maintenance Plan to be developed in conjunction with USFS staff.

Consultation with USFS staff regarding seed mixes, soil amendments, and application rates, including appropriate cultural practices recommended by USFS staff to be used in the Monongahela National and George Washington National Forest is ongoing. This information will be provided in Appendix B when consultation is complete.

In addition to USFS lands, the AP-1 mainline will also cross approximately 0.1 mile of National Park Service lands along the Blue Ridge Parkway. Atlantic is proposing the use of the horizontal directional drill construction method to install the proposed pipeline under the Blue Ridge Parkway at this location. The horizontal directional drill method will avoid direct impacts on the parkway, including impacts on adjacent vegetation.

7.0 STATE LANDS

In West Virginia, the AP-1 mainline crosses 3.8 miles of the Seneca State Forest in Pocahontas County, West Virginia, and the SHP crosses approximately 3.6 miles of the Lewis Wetzel WMA in Wetzel County, West Virginia. Seneca State Forest is managed by the WV Division of Forestry and the Lewis Wetzel WMA is managed by the West Virginia Department

of Natural Resources. The AP-1 mainline crosses 1.2 miles of the James River WMA in Nelson County, Virginia, which is managed by the Virginia Department of Game and Inland Fisheries.

The seed mixes, soils amendments, and application rates, including appropriate cultural practices recommended by the State/Commonwealth staff, for the Lewis Wetzel WMA and James River WMA are provided in Appendix B. In Virginia, the Department of Game and Inland Fisheries has indicated that it may want to be responsible for replanting the rights-of-way on its lands. Consultation with the WV Division of Forestry regarding seed mixes, soil amendments, and application rates is ongoing. This information will be provided in Appendix B when consultation is complete.

8.0 RESTORATION MONITORING AND MAINTENANCE

8.1 MONITORING

The general objectives of the monitoring program will be to determine the status and effectiveness of restoration efforts and to determine locations where additional maintenance may be required. Atlantic and DTI will inspect disturbed areas after the first and second growing seasons to determine the success of revegetation. In agricultural areas, revegetation will be considered successful when the area has been revegetated and is similar to adjacent undisturbed areas of the same field. In all other non-forested areas, revegetation will be considered successful when the density and cover of non-nuisance vegetation is similar to adjacent areas that were not disturbed by construction activities. In Federal and State/Commonwealth forested areas, monitoring activities will be performed until reforestation is determined successful based on pre-defined success criteria, as determined through consultations with Federal and State/Commonwealth land managing agencies.

Atlantic and DTI will continue revegetation efforts until they are successful. Restoration will be considered successful when construction debris is removed, similar vegetative cover or bedrock has been restored, the original surface elevations are restored as closely as practicable to preconstruction contours, the surface condition is similar to adjacent non-disturbed areas, and proper drainage is restored.

8.2 GRAZING DEFERMENTS

Where warranted, Atlantic and DTI will work with landowners or lessees to implement grazing deferment plans (e.g., by fencing off restoration sites) to minimize impacts on emergent vegetation due to grazing.

8.3 PERMANENT RIGHTS-OF-WAY MAINTENANCE

In order to maintain accessibility of the rights-of-way and to accommodate pipeline integrity surveys, vegetation within the permanent easements will be periodically cleared over the pipelines. In accordance with the Plan, in non-cultivated uplands, a 10-foot-wide herbaceous corridor may be maintained annually, as needed. In addition, trees and brush will be cleared over the entire width of the permanent rights-of-way on an as-needed basis not to exceed once every 3 years. In wetlands and riparian areas, the Procedures allow a 10-foot-wide corridor centered over pipelines to be permanently maintained in an herbaceous state. The Procedures

also allow for cutting and removing trees greater than 15 feet in height within 15 feet of pipelines in wetlands.

Atlantic and DTI will use mechanical mowing or cutting along their rights-of-way for normal vegetative maintenance. Atlantic and DTI will monitor the rights-of-way for infestations of invasive species that may have been created or exacerbated by construction, restoration, or maintenance activities, and will treat such infestations in consultation with landowners and applicable agencies in accordance with its *Invasive Species Management Plan*.

9.0 ROLES AND RESPONSIBILITIES

9.1 ENVIRONMENTAL INSPECTORS

EIs will have the authority to stop activities that violate environmental conditions of Federal or State/Commonwealth environmental permits and landowner agreements and to order appropriate corrective action. During revegetation and restoration, the EIs will be responsible for:

- ensuring compliance with the requirements of the Plan and Procedures; Atlantic's and DTI's construction, restoration, and mitigation plans; conditions required by permits and other approvals; this Restoration and Rehabilitation Plan; and environmental requirements identified in landowner easement agreements;
- identifying, documenting, and overseeing corrective actions, as necessary, to bring an activity back into compliance;
- verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing;
- verifying the location of restoration sites, and maintaining appropriate signage for boundaries of sensitive resource areas, waterbodies, wetlands, farm improvements (i.e., repair of fences, drain tiles, irrigation systems, or structures), or areas with special restoration requirements;
- monitoring erosion and sediment control devices and soil stabilization measures in construction areas, and identifying additional needs for new controls or maintenance of existing controls;
- verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive environmental resource areas, including but not limited to wetlands, waterbodies, cultural resource sites, and sensitive species habitats;
- ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;

- advising the Construction Inspector when environmental conditions (such as wet or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;

- ensuring restoration of contours and topsoil;

- verifying that soils imported for agricultural or residential use have been certified as free of invasive species and soil pests, unless otherwise approved by the landowner;

- determining the need for and ensuring that erosion controls are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads;

- inspecting and ensuring the maintenance of temporary erosion control measures at least:

    - on a daily basis in areas of active construction or equipment operation;

    - on a weekly basis in areas with no construction or equipment operation; and

    - within 24 hours of each 0.5 inch of rainfall.

- ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification;

- keeping records of compliance or non-compliance with conditions of environmental regulatory permits and approvals, including activities that could result in decertification of organic farms; and

- identifying areas that will require special attention to ensure stabilization and restoration success.

Where appropriate for local resource needs, the role of EIs may be filled by agricultural or horticultural specialists.

9.2 DOCUMENTATION

In accordance with the Plan, Atlantic and DTI will maintain post-construction records of activities performed and will submit quarterly activity reports to the FERC. Reports will document any issues that arise during revegetation, including those identified by the landowner or land managing agency, and corrective actions taken for at least two years following construction. Reports will identify by milepost:

- method of application, application rate, and type of fertilizer, pH modifier, seed, and mulch used;

- acreage treated;
- dates of backfilling and seeding;
- names of landowners requesting special seeding treatment and a description of the follow-up actions;
- the location of subsurface drainage repairs or improvements made during restoration; and
- problem areas, such areas where vegetation did not establish or erosion occurred, and how they were addressed.

10.0 REFERENCES

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ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT

Restoration and Rehabilitation Plan

Appendix A
Major Soil Drainage and Slope Classes Crossed by the Projects

TABLE 5.6-1

Atlantic Coast Pipeline and Supply Header Project
Major Soil Drainage and Slope Classes Crossed by the Projects

Project /State or Commonwealth/County	Drainage Class [a]	Crossing Length (miles)		
		Total	0-15% [b]	>16% [b]
ATLANTIC COASTAL PIPELINE				
West Virginia				
Harrison	Excessively to Moderately Well Drained	1.0	0.2	0.8
	Somewhat Poorly to Very Poorly Drained	0.1	<0.1	<0.1
	Total	1.1	0.3	0.8
Lewis	Excessively to Moderately Well Drained	19.8	6.9	12.9
	Null [b/]	0.1	<0.1	0.1
	Total	19.9	6.9	13.0
Upshur	Excessively to Moderately Well Drained	21.5	8.8	12.7
	Somewhat Poorly to Very Poorly Drained	0.6	0.6	<0.1
	Null	0.1	0.1	<0.1
	Total	22.2	9.5	12.7
Randolph	Excessively to Moderately Well Drained	28.6	12.3	16.3
	Somewhat Poorly to Very Poorly Drained	0.3	0.3	0.00
	Null	1.9	1.4	0.5
	Total	30.8	14.0	16.8
Pocahontas	Excessively to Moderately Well Drained	23.4	8.4	15.0
	Somewhat Poorly to Very Poorly Drained	0.8	0.8	<0.1
	Null	<0.1	<0.1	0.00
	Total	24.3	9.3	15.0
Virginia				
Highland	Excessively to Moderately Well Drained	10.5	3.0	7.5
	Somewhat Poorly to Very Poorly Drained	0.1	0.1	0.0
	Null	<0.1	<0.1	0.0
	Total	10.6	3.1	7.5
Bath	Excessively to Moderately Well Drained	20.4	9.6	10.8
	Somewhat Poorly to Very Poorly Drained	1.2	1.2	0.00
	Null	<0.1	<0.1	<0.1
	Total	21.6	10.8	10.8
Augusta	Excessively to Moderately Well Drained	50.4	35.5	14.9
	Somewhat Poorly to Very Poorly Drained	1.9	1.9	<0.1
	Null	2.0	1.1	0.9
	Total	54.3	38.5	15.8
Nelson	Excessively to Moderately Well Drained	26.9	10.3	16.7
	Somewhat Poorly to Very Poorly Drained	0.3	0.3	<0.1
	Null	<0.1	<0.1	0.0
	Total	27.3	10.6	16.7
Buckingham	Excessively to Moderately Well Drained	22.8	20.0	2.7
	Somewhat Poorly to Very Poorly Drained	4.9	4.6	0.3
	Null	<0.1	<0.1	0.0
	Total	27.7	24.7	3.0
Cumberland	Excessively to Moderately Well Drained	8.5	7.8	0.7
	Somewhat Poorly to Very Poorly Drained	0.5	0.5	0.0
	Null	<0.1	<0.1	0.0
	Total	9.1	8.4	0.7

TABLE 5.6-1 (cont'd)

Atlantic Coast Pipeline and Supply Header Project
Major Soil Drainage and Slope Classes Crossed by the Projects

Project /State or Commonwealth/County	Drainage Class [a]	Crossing Length (miles)		
		Total	0-15% [b]	>16% [b]
Prince Edward	Excessively to Moderately Well Drained	5.0	4.1	0.9
	Somewhat Poorly to Very Poorly Drained	0.2	0.2	<0.1
	Null	<0.1	<0.1	0.0
	Total	5.2	4.3	0.9
Nottoway	Excessively to Moderately Well Drained	21.1	19.1	2.0
	Somewhat Poorly to Very Poorly Drained	2.3	2.2	0.1
	Null	<0.1	<0.1	0.0
	Total	23.4	21.3	2.1
Dinwiddie	Excessively to Moderately Well Drained	11.0	10.9	0.1
	Somewhat Poorly to Very Poorly Drained	0.8	0.8	0.0
	Total	11.8	11.7	0.1
Brunswick	Excessively to Moderately Well Drained	21.4	21.2	0.2
	Somewhat Poorly to Very Poorly Drained	1.6	1.6	<0.1
	Total	23.0	22.8	0.2
Greensville	Excessively to Moderately Well Drained	11.4	11.1	0.3
	Somewhat Poorly to Very Poorly Drained	7.1	7.1	0.0
	Null	0.1	0.1	0.0
	Total	18.6	18.3	0.3
Southampton	Excessively to Moderately Well Drained	16.1	16.0	<0.1
	Somewhat Poorly to Very Poorly Drained	10.0	10.0	0.0
	Null	<0.1	<0.1	0.0
	Total	26.1	26.1	<0.1
City of Suffolk	Excessively to Moderately Well Drained	16.2	15.8	0.4
	Somewhat Poorly to Very Poorly Drained	16.4	16.3	0.1
	Null	0.6	0.6	0.0
	Total	33.2	32.7	0.5
City of Chesapeake	Excessively to Moderately Well Drained	0.6	0.6	0.0
	Somewhat Poorly to Very Poorly Drained	9.0	9.0	0.0
	Null	1.7	1.7	0.0
	Total	11.3	11.3	0.0
North Carolina				
Northampton	Excessively to Moderately Well Drained	17.8	17.6	0.2
	Somewhat Poorly to Very Poorly Drained	4.2	4.2	<0.1
	Null	0.1	0.1	0.0
	Total	22.1	21.9	0.2
Halifax	Excessively to Moderately Well Drained	16.8	16.6	0.2
	Somewhat Poorly to Very Poorly Drained	7.5	7.5	<0.1
	Null	0.0	0.0	0.0
	Total	24.3	24.1	0.2
Nash	Excessively to Moderately Well Drained	20.1	19.9	0.2
	Somewhat Poorly to Very Poorly Drained	11.8	11.8	0.0
	Null	<0.1	<0.1	0.0
	Total	31.9	31.7	0.2
Wilson	Excessively to Moderately Well Drained	6.5	6.5	0.0
	Somewhat Poorly to Very Poorly Drained	5.4	5.4	<0.1
	Total	11.9	11.9	<0.1

TABLE 5.6-1 (cont'd)

Atlantic Coast Pipeline and Supply Header Project
Major Soil Drainage and Slope Classes Crossed by the Projects

Project /State or Commonwealth/County	Drainage Class [a]	Crossing Length (miles)		
		Total	0-15% [b]	>16% [b]
Johnston	Excessively to Moderately Well Drained	19.0	19.0	<0.1
	Somewhat Poorly to Very Poorly Drained	19.1	19.1	0.0
	Null	<0.1	<0.1	0.0
	Total	38.1	38.1	<0.1
Sampson	Excessively to Moderately Well Drained	4.7	4.7	0.0
	Somewhat Poorly to Very Poorly Drained	3.1	3.1	0.0
	Total	7.8	7.8	0.0
Cumberland	Excessively to Moderately Well Drained	16.8	16.7	0.1
	Somewhat Poorly to Very Poorly Drained	22.7	22.7	0.0
	Null	0.1	0.1	0.0
	Total	39.6	39.5	0.1
Robeson	Excessively to Moderately Well Drained	9.4	9.4	0.0
	Somewhat Poorly to Very Poorly Drained	13.1	13.1	0.0
	Total	22.5	22.5	0.0
TOTAL		**599.7**	**482.1**	**117.6**
SUPPLY HEADER PROJECT				
Pennsylvania				
Westmoreland	Excessively to Moderately Well Drained	3.8	2.2	1.6
	Somewhat Poorly to Very Poorly Drained	0.1	0.1	0.0
	Total	3.9	2.3	1.6
West Virginia				
Harrison	Excessively to Moderately Well Drained	0.3	0.2	0.1
	Somewhat Poorly to Very Poorly Drained	0.3	0.1	0.2
	Total	0.6	0.3	0.3
Doddridge	Excessively to Moderately Well Drained	22.1	4.2	17.9
	Null	0.1	0.1	<0.1
	Total	22.2	4.3	17.9
Tyler	Excessively to Moderately Well Drained	0.8	0.1	0.7
	Total	0.8	0.1	0.7
Wetzel	Excessively to Moderately Well Drained	10.0	1.2	8.8
	Total	10.0	1.2	8.8
TOTAL		**37.5**	**8.2**	**29.3**
GRAND TOTAL		**637.2**	**490.3**	**146.9**

[a] Null = soil map units with no assigned drainage class.

[b] Slope was determined using available digital elevation model raster data and running the slope analysis tool in ArcGIS: ArcMap. The drainage classes were determined using the SSURGO database.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT

Restoration and Rehabilitation Plan

Appendix B
Recommended Seed Mix Prescriptions and Soil Amendments

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket Nos. CP15-554-000 &
CP15-554-001

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT
Docket No. CP15-555-000

Recommended Seed Mixes by Milepost

Updated, Rev 5

Prepared by

ERM

May 1, 2017

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LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
NRCS	Natural Resources Conservation Service
SHP	Supply Header Project
WMA	Wildlife Management Area

ATLANTIC COAST PIPELINE – Docket Nos. CP15-554-000 & CP15-554-001
SUPPLY HEADER PROJECT – Docket No. CP15-555-000

1.0 INTRODUCTION

This appendix compiles seed mix prescriptions and soil amendment recommendations provided by Federal and State/Commonwealth agencies, and subject matter experts consulted for the restoration and rehabilitation of the proposed Atlantic Coast Pipeline (ACP) and Supply Header Project (SHP). The recommendations are summarized by county in Attachment A and discussed below.

2.0 ATLANTIC COAST PIPELINE

2.1 WEST VIRGINIA

2.1.1 Harrison, Lewis, Randolph, and Upshur Counties

The following seed mixtures and application rates, seeding dates, soil amendments recommendations, and planting recommendations are for Harrison, Lewis, Randolph, and Upshur counties in West Virginia. These recommendations are based on the collection of correspondences and discussions with Federal and State agencies, including communication with Greg Stone (Natural Resources Conservation Service [NRCS] Acting State Resource Conservationist) and Jeff Griffith (NRCS Conservationist). The tables and lists below provide the specific recommendations for these counties. No specific recommendations were made in these counties regarding tackifiers, mulching, or anchoring of mulch or seed.

Recommended Seed Mixes and Application Rates

TABLE 2.1.1-1

Seed Mix WVHLRU01: Recommended Cool Season Seed Mixture

Seed Mixture	Potentially Suitable Land Use	Common Species Name [a]	Seed Application Rate (lbs/acre/PLS)[b]
1	Pasture or Hay	Orchardgrass	10
		Ladino Clover	2
		Red Clover	3
		Redtop	3
2	Pasture	**Kentucky Bluegrass**	20
		Ladino Clover	2
		Red Clover	3
		Redtop	3
3	Pasture or Hay	Orchardgrass	20
		Redtop	5
		Birdsfoot Trefoil	10

[a] Species in bold are more wildlife-friendly; species in italics are suitable for use in filter strips.
[b] lbs/acre/PLS = pounds per acre of pure live seed

Recommended Seeding Dates

TABLE 2.1.1-2

Harrison, Lewis, Randolph, and Upshur Counties, West Virginia Recommended Seeding Dates for Permanent Cover

Seeding Dates	Suitability
March 1 to April 15	Best seeding period
August 1 to October 1	Best seeding period
December 1 to March 1	Good seeding period (dormant seeding)
April 15 to August 1	High risk (moisture stress likely)
October 1 to December 1	High risk (potential freeze damage to young seedlings)

Recommended Soil Amendments and Application Rates

TABLE 2.1.1-3

Harrison, Lewis, Randolph, and Upshur Counties, West Virginia Recommended Soil Amendments and Application Rates

Soil Amendment Type	Application Rate
Lime	3 tons per acre
Fertilizer [a]	400 pounds per acre

[a] Fertilizer with a 10-20-20 ratio of nitrogen, phosphorus, and potassium is recommended.

Planting Recommendations

- Certified seed is preferred.
- Use proper inoculants prior to seeding for all legumes.
- Amend soil fertility and pH levels to satisfy the needs of the plant species.
- For unprepared seedbeds or seeding outside the optimum timeframes:
    - Add 50 percent more seed to the specified application rate, particularly during the periods of April 15 – August 1, and October 1 – March 1.
    - Double the seed application rate and consider planting an annual small grain like wheat (2 bushels [120 pounds] per acre) to act as a nurse crop.

2.1.2 Pocahontas County

The following seed mixtures, application rates, and soil amendment recommendations are for Pocahontas County, West Virginia. The recommendations are based on correspondence and discussions with Iden Gunther (NRCS Conservationist) and Susan Davis (West Virginia Department of Natural Resources). Seed Mix WVPO01 provides seeding recommendations for disturbed areas from the NRCS Critical Area Planting Standard that is commonly used with a high success rate in the County.

Recommended Seed Mixes and Application Rates

TABLE 2.1.2-1

Seed Mix WVPO01: Recommended Cool or Warm Seed Mixes for Pocahontas County, West Virginia

Seed Mixture	Species / Mixture [a]	Seeding Application Rate (lbs/acre/PLS)[b]	Soil Drainage Preference	pH Range
1	Crownvetch	10 – 15	Well – Moderately Well	5.0 – 7.5
	Perennial Ryegrass	20		
2	**KY Bluegrass**	20	Well – Moderately Well	5.5 – 7.5
	Redtop	3		
	Ladino Clover or	2		
	Birdsfoot Trefoil	10		
3	**Timothy**	8	Well - Poorly	5.5 – 7.5
	Birdsfoot Trefoil	8		
4	***Orchardgrass***	10	Well – Moderately Well	5.5 – 7.5
	Ladino Clover	2		
	Redtop	3		
5	***Orchardgrass***	10	Well – Moderately Well	5.5 – 7.5
	Ladino Clover	2		
5	**Birdsfoot Trefoil**	10	Well – Moderately Well	5.5 – 7.5
	Redtop	5		
	Orchardgrass	20		

Source: WVDEP, 2012

[a] Species in bold are more wildlife-friendly; species in italics are suitable for use in filter strips.

[b] lbs/acre/PLS = pounds per acre of pure live seed

Recommended Soil Amendments and Application Rates

TABLE 2.1.2-2

Recommended Lime and Fertilizer Application

pH of Soil [a]	Lime Application Rate (tons/acre)[b]	Fertilizer Application Rate (10-20-20 or equivalent) (lbs/acre)
> 6.0	2	500
5.0 to 6.0	3	
< 5.0	4	

Source: WVDEP, 2012

[a] The pH can be determined with a portable pH testing kit or by sending the soil samples to a soil testing laboratory. When four tons of lime per acre is applied it must be incorporated into the soil by disking, backblading, or tracking up and down the slope.

[b] lbs/acre/PLS = pounds per acre of pure live seed

Recommended Mulch Material and Application Rates

TABLE 2.1.2-3

Recommended Mulch Material Rates and Uses

Material	Minimum Rates Per Acre	Coverage	Remarks
Hay or Straw	2-3 Tons (100 – 150 Bales)	75% - 90%	Subject to wind blowing or washing unless tied down
Wood Fiber, Pulp Fiber, Wood-Cellulose, Recirculated Paper	1,000 – 1,500 lbs	Cover all disturbed areas	Hydroseeding

Source: WVDEP, 2012

Chemical Mulches, Soil Binders, and Tackifiers Recommendations

- Determine mulch-type and its appropriate application rate;
- A wide range of synthetic tackifiers (e.g., spray-on materials) are marketed to stabilize and protect the seeds and soil surfaces. These tackifiers are mixed with water and seed mixtures, and sprayed over the mulch and soils. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulch, straw or hay; and
- Chemical tackifiers, when used alone, do not have the capability to insulate the soil or retain soil moisture as effectively as organic mulches such wood fiber, straw, or hay.

Mulch Anchoring

- Depending on field conditions, mulch anchoring (e.g., mechanical methods or netting) may become necessary due to environmental conditions, including heavy winds or rapid water runoff (e.g., rain or snowmelt).
- Mechanical Anchoring
    - Apply mulch and pull a mulch anchoring tool over the mulch. When a disk is used, set the disk straight and pull across the slope. Mulch material should be tucked into the soil about three inches.
- Mulch Netting
    - Follow manufacturer's recommendations when positioning and stapling mulch netting into the soil.

2.1.3 Federal Lands

Monongahela National Forest – Pocahontas County

This section is pending additional consultation with the U.S. Forest Service.

2.1.4 State Lands

Seneca State Forest – Pocahontas County

This section is pending additional consultation with the West Virginia Department of Natural Resources.

2.1.5 Recommended Native Grasses and Pollinators Seed Mixtures, Application Rates, and Non-Native Cover Crop by Physiographical Region

Recommended Seed Mixtures by Geographical Region (Mountain Physiographic Region) and Drainage Class

The following seed mixtures are for the mountain and upland areas of West Virginia. These recommendations are based on discussions with Roundstone Native Seed and Robert Glennon, private lands biologist from the Conservation Management Institute, Virginia Tech and NRCS, and the Xerces Society.

West Virginia Excessively to Moderately Well Drained Sites

TABLE 2.1.5-1

Seed Mix P-MUDW01: Recommended Mountain Physiological Region
Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia

Common Name	Scientific Name	Height (feet)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Little Bluestem	*Schizachyrium scoparium*	2 - 4	Full Sun	0.250
Virginia Wild Rye	*Elymus virginicus*	2 - 4	Full Sun	0.250
Tall Dropseed	*Sporobolus compositus*	2 - 3	Full Sun	0.050
Purple Top	*Tridens flavus*	3 - 5	Part Shade	0.058
Indian Grass	*Sorghastrum nutans*	3 - 6	Full Sun	0.167
Switchgrass	*Panicum virgatum*	3 - 7	Full Sun	0.183
Fall Panicum	*Panicum anceps*	2 - 4	Part Shade	0.042
Total	**—**	**—**	**—**	**1.0**

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.1.5-2

Seed Mix P-MUDW01: Recommended Mountain Physiological Region
Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in West Virginia

Common Name	Scientific Name	Color	Bloom Period	Seed Application Rate (lbs/acre/PLS)[a]
Lance Leaved Coreopsis	*Coreopsis lanceolata*	Yellow	Spring, Summer	0.385
Smooth Beardtongue	*Penstemon digitalis*	White	Spring	0.146
Common Milkweed	*Asclepias syriaca*	Pink	Spring, Summer	0.128
Goat's Rue	*Tephrosia virginiana*	White/Pink	Spring, Summer	0.128
Partridge Pea	*Cassia fasciculata*	Yellow	Summer	0.745
Slender Mountain Mint	*Pycnanthemum tenuifolium*	White	Summer	0.069
Early Goldenrod	*Solidago juncea*	Yellow	Summer	0.086
Bergamot	*Monarda fistulosa*	Lavender	Summer	0.103
Spiked Blazing Star	*Liatris spicata*	Pink	Summer	0.343
Sneezeweed	*Helenium autumnale*	Yellow	Summer, Fall	0.128
Gray Goldenrod	*Solidago nemoralis*	Yellow	Fall	0.086
Iron Weed	*Vernonia altissima*	Purple	Summer, Fall	0.343
Tall Coreopsis	*Coreopsis tripteris*	Yellow	Summer, Fall	0.051
Total	**—**	**—**	**—**	**2.74**

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[b] lbs/acre/PLS = pounds per acre of pure live seed

West Virginia Somewhat Poorly to Very Poorly Drained Sites

TABLE 2.1.5-3

Seed Mix P-MUMP02: Recommended Mountain Physiographic Region
Grass Seed Mix and Application Rate for Somewhat Poorly to Very Poorly Drained Sites in West Virginia

Common Name	Scientific Name	Height (feet)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Switchgrass	*Panicum virgatum*	3 - 7	Full Sun	0.233
Red Top Panicum	*Panicum rigidulum*	2 - 4	Full Sun	0.017
Fowl Manna Grass	*Glyceria striata*	3 - 5	Part Shade	0.008
Virginia Wild Rye	*Elymus virginicus*	2 - 4	Full Sun	0.217
Canada Wild Rye	*Elymus canadensis*	2 - 5	Part Shade	0.167
Deer Tongue Grass	*Panicum clandestinum*	2 - 4	Full Sun	0.058
Big Bluestem	*Andropogon gerardii*	4 - 10	Full Sun	0.167
Frank's Sedge	*Carex frankii*	1 - 2	Part Shade	0.042
Fox Sedge	*Carex vulpinoidea*	2 - 3	Part Shade	0.025
Fall Panicum	*Panicum anceps*	2 - 4	Part Shade	0.067
Total	**—**	**–**	**—**	**1.0**

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.1.5-4

Seed Mix P-MUMP02: Recommended Mountain Physiographic Region
Forb Seed Mix Application Rate for Somewhat Poorly to Very Poorly Drained Sites in West Virginia

Common Name	Scientific Name	Color	Bloom Period	Seed Application Rate (lbs/acre/PLS)[a]
Ohio Spiderwort	*Tradescantia ohiensis*	Blue	Spring, Summer	0.167
Smooth Beardtongue	*Penstemon digitalis*	White	Spring	0.083
Butterfly Milkweed	*Asclepias tuberosa*	Orange	Spring, Summer	0.083
Blackeyed Susan	*Rudbeckia hirta*	Yellow	Spring, Summer	0.134
Wild Senna	*Senna marilandica*	Yellow	Summer	0.668
Hoary Mountain Mint	*Pycnanthemum incanum*	White	Summer	0.033
Lupine	*Lupinus perennis*	Blue	Summer	0.501
Bergamot	*Monarda fistulosa*	Lavender	Summer	0.083
Boneset	*Eupatorium perfoliatum*	White	Summer	0.083
Joe-Pye Weed	*Eupatorium fistulosum*	Pink	Summer, Fall	0.125
Showy Tickseed	*Bidens aristosa*	Yellow	Summer, Fall	0.501
Sneezeweed	*Helenium autumnale*	Yellow	Summer, Fall	0.125
Rough Goldenrod	*Solidago rugosa*	Yellow	Fall	0.083
Total	—	—	—	**2.67**

Sources: Roundstone Native Seed, 2015; Glennon, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

Recommended Non-Native Temporary Cover Crop Species and Non-Native Grass Cover Mix for Inclusion with Pollinator Mixtures

In areas where the erosion potential is high (e.g., steep slope areas) and/or sites that require stabilization within 30 days of disturbance, non-native temporary cover species in seed mixture P-NNTC, as shown in Table 2.1.5-5, should be used. In areas where erosion is likely to occur on steep slopes prior to the germination of native grasses and forbs, non-native grass mixture P-NNGC should be used in combination with the forb mixtures that are prescribed for non-steep slope areas within the Mountain Physiographic Region of West Virginia. Table 2.1.5-6 provides the specific non-native grass species to be included with the native forb seed mix in these areas.

TABLE 2.1.5-5

Seed Mix P-NNTC: Recommended Mountain Physiographic Region
Non-Native Temporary Cover Crop Species for Steep Slope Areas in West Virginia

Common Name	Scientific Name	Height (Inches)	Sun Exposure	Seeding Application Rate (lbs/acre/PLS)[a]	Seed Mix Planting Season
Brown Top Millet	*Panicum ramosum*	3 - 3.5	Full sun	5.0	Summer
Spring Oats	*Avena sativa*	2 – 2.5	Full sun	30.0	Spring and Fall
Annual Rye Grass	*Lolium multiflorum*	2 – 2.5	Part shade	6.0	Fall and Winter

Source: Roundstone Native Seed, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.1.5-6

Seed Mix P-NNGC: Recommended Mountain Physiographic Region
Non-Native Grass Cover Mix for Steep Slope Areas in West Virginia [a]

Common Name	Scientific Name	Height (Inches)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Fescue	*Festuca arundinacea*	2 - 3	Part Shade	0.300
Timothy	*Phleum pratense*	2 - 4	Part Shade	0.100
Orchard Grass	*Dactylis glomerata*	2 - 3	Part Shade	0.100
Red Top	*Agrostis alba*	2 - 3	Full Sun	0.020
Ladino Clover	*Trifolium repens*	1 - 1.5	Part Shade	0.040
Annual Rye Grass	*Lolium multiflorum*	2 - 2.5	Part Shade	0.170
Creeping Red Fescue	*Festuca rubra*	1 - 2	Full Sun	0.250
Kentucky Bluegrass	*Poa pratensis*	1-2	Full Sun	0.020
Total	**—**	**—**	**—**	**1.0**

Source: Roundstone Native Seed, 2015

[a] Recommended seeding application rate is 30 to 50 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

2.2 VIRGINIA

2.2.1 Augusta, Brunswick, Buckingham, Cumberland, Highland, Bath, Nelson, Nottoway, and Prince Edward Counties

The following erosion control prevention, forage species seed mixtures, and recommended soil amendments are for the Mountain and Piedmont Physiographic Regions of Virginia, which include Augusta, Brunswick, Buckingham, Cumberland, Highland, Nelson, Nottoway, and Prince Edward Counties. These recommendations are based on the U.S. Department of Agriculture-NRCS Virginia Plant Establishment Guide (Jones, et. al., 2014), which was recommended by Federal and Commonwealth agency contacts, including Charles Ivins (NRCS Conservationist), Charles Simmons (NRCS Conservationist), Davie Wade Harris (NRCS Conservationist), Jeffray Jones (State Biologist), J.B. Daniel (NRCS Conservationist), and Derek Hancock (NRCS Conservationist).

Recommended Grass Seed Mixtures, Species, Application Rates, and Planting Dates

Seed Mix VABCHNP01 (Table 2.2.1-1) provides a cool season species list mixture for erosion prevention, while Seed Mix VABCHNP02 (Table 2.2.1-2) provides cool and warm season species mixtures for forage.

TABLE 2.2.1-1

Seed Mix VABCHNP01: Recommended Cool Season Erosion Prevention Species and Seed Mixtures

Seeding Mix	Common Species Name	Virginia Native	Seeding Rate (lbs/acre/PLS)[a] B:broadcast; D:drill (4-9" row)	Plant Depth (inches)	Mountain/Valley/Northern Piedmont		Southern Piedmont	
					Best Dates	Possible Dates	Best Dates	Possible Dates
	Average Last Frost				May 1		Apr 15	
Perennial Grass								
1	Canada wild rye (Elymus canadensis), Virginia wild rye (Elymus virginicus), and Common milkweed (Asclepias syriaca) (use in high velocity and highly erosive situations		B: 60	¼-½	Aug 15-Sep 10; Mar 15-Apr 10	Aug 1-Sep 30; Mar 1-Apr 30	Sep 1-Sep 20; Mar 1-Apr 1	Aug 25-Nov 1; Feb 15-Apr 15
2	Switchgrass and Common milkweed (Asclepias syriaca)	√	D:10; B:15	¼	Mar 15-Jun 30		Mar 1-Jun15	
Mixtures								
3	Canada wild rye and Virginia wild rye + Virginia lespedeza (Lespedeza virginica), + hairy lespedeza (Lespedeza hirta) + Common milkweed (Asclepias syriaca)		B:40+3	¼	Aug 15-Sep 10; Mar 15-Apr 10	Aug 1-Sep 30; Mar 1-Apr 30	Sep 1-Sep 20; Mar 1-Apr 1	Aug 25-Nov 1; Feb 15-Apr 15
4	Canada wild rye + Virginia wild rye + Virginia lespedeza + hairy lespedeza + Common milkweed (Asclepias syriaca)		B:40+6	¼	Aug 15-Sep 10; Mar 15-Apr 10	Aug 1-Sep 30; Mar 1-Apr 30	Sep 1-Sep 20; Mar 1-Apr 1	Aug 25-Nov 1; Feb 15-Apr 15
5	Canada wild rye + Virginia wild rye + Virginia, + hairy lespedeza (Lespedeza hirta) + Common milkweed (Asclepias syriaca)		B:40+10; D:30+8	¼	Mar 1-Apr 15	Mar 1-Apr 15	Feb 15-Apr 1	Feb 15-Apr 1
6	Canada wild rye + Virginia wild rye + Redtop + Common milkweed (Asclepias syriaca)		D/B: 40+10	¼-½	Jul 25-Sep 1; Mar 20-Apr 20	Jul 15-Sep 15; Mar 1-May 15	Aug 25-Sep 15	Aug 25-Oct 25; Feb 15-Mar 31
7	Switchgrass + Red Fescue + Partridge Pea + Common milkweed (Asclepias syriaca)		D/B: 10+15+4	¼	Mar 15-April 30	Mar 15-Jun 30	Mar 1-Apr 15	Feb 15-May 31
8	Switchgrass + Indiangrass + Big Bluestem + Common milkweed (Asclepias syriaca)		D/B: 5 each	¼	Mar 15-Jun 30	Mar 15-Jun 30	Mar 1-Jun 15	Mar 1-Jun 15

TABLE 2.2.1-1

Seed Mix VABCHNP01: Recommended Cool Season Erosion Prevention Species and Seed Mixtures

Seeding Mix	Common Species Name	Virginia Native	Seeding Rate (lbs/acre/PLS)[a] B:broadcast; D:drill (4-9" row)	Plant Depth (inches)	Mountain/Valley/Northern Piedmont		Southern Piedmont	
					Best Dates	Possible Dates	Best Dates	Possible Dates
9	Canada wild rye + Virginia wild rye + Redtop + Virginia lespedeza and hairy lespedeza + Common milkweed (Asclepias syriaca)		D/B: 60+6+10	¼-½	Jul 25-Sep 1; Mar 20-Apr 20	Jul 15-Sep 15; Mar 1-May 15	Aug 25-Sep 15	Aug 25-Oct 25; Feb 15-Mar 31
10	Switchgrass + Deer tongue + Partridge Pea + Common milkweed (Asclepias syriaca)	√	D/B: 8+8+4	¼	Mar 15-April 30	Mar 15-Jun 30	Mar 1-Apr 15	Feb 15-May 31
11	Perennial Ryegrass + Redtop + Common milkweed (Asclepias syriaca)		D:5+2; B:7+3	½-¾	Mar 1-Apr 15	Aug 1-Sep 15	Feb 15-April 1	Aug 15-Oct 1

Source: Jones, et. al., 2014

[a] lbs/acre/PLS = pounds per acre of pure live seed

Note: The Virginia Plant Establishment Guide (Jones, et. al., 2014) provides acceptable seed mixtures and/or plant species rates, seeding dates, and other information that may be needed in the planning of practices and development of specifications for individual sites.

TABLE 2.2.1-2

Seed Mix VABCHNP02: Recommended Cool and Warm Season Forage Species and Seed Mixtures

Seeding Mix	Common Species Name	Virginia Native	Seeding Rate (lbs/acre/PLS) B:broadcast; D:drill (4-9" row)	Plant Depth (inches)	Mountain/Valley/Northern Piedmont [a]		Southern Piedmont	
					Best Dates	Possible Dates	Best Dates	Possible Dates
	Average Last Frost				May 1		Apr 15	
Perennial Grasses [k]								
101	Bermudagrass (Hybrid) [b] Sprigs – 1 bushel = 1.25 ft^3		B:30-40 bushels D:15-20 bushels	2"-4"	Not well adapted	May 1-Jun 15	Apr 15-Jun 1	Apr 1thru Jun 15 or thru Jul if irrigated
102	Bermudagrass [b], Coated Seeds (Common & Cultivars)		B:10-12; D:8-10	¼	Not well adapted	May 1-Jun 15	Apr 15– May 15	Apr 15-Jun 15
103	Big Bluestem [c]	√	B:10-12; D:8-10	¼	Mar 15-Jun 30	Mar 15-Jun 30	Mar 1-Jun 15	Mar 1-Jun 15
104	Bluegrass		B:10-15; D:8-12 4-5 in mixtures	¼	Aug 15-Sep 1; Mar 15-Apr 1	Aug 1-Sep 15; Mar 1-Apr 15	Seed in mixtures Mar 1- Apr 1; Aug 15 - Oct 1	Seed in mixtures Mar 1- Apr 1; Aug 15 - Oct 1
105	Eastern Gamagrass [d] (use non-stratified seed for winter planting and stratified seed for spring plantings)	√	R:8-10	1- 1.5	Nov 15-Feb 15; May 1-May30	Nov 15- Feb 15: May 1-Jun 30	Nov 25-Jan 31; Apr 20- May 15	Nov 25-Jan 31; Apr 15 - Jun 10
106	Indiangrass [c]	√	B:10-12; D:8-10	¼	Mar 15-Jun 30	Mar 15-Jun 30	Mar 1-Jun 15	Mar 1-Jun 15
107	Orchardgrass [e]		B:12-15; D:8-12	¼-½	Aug 20-Sep 10; Mar 15-Apr 1	Aug 15-Oct 1; Mar 1-Apr 15	Aug 25-Sep 15; Mar 1-Apr 1	Aug 25-Oct 25; Mar 1-Apr 15
109	Perennial Ryegrass [e]		D: 12-15 B:20-25; 6-10 in mixtures	¼-½	Aug 20-Sep 10; Mar 15-Apr 1	Aug 15-Sep 25; Mar 1-Apr 15	Not well adapted	Aug 25-Oct 1; Feb 25-April 1
110	Prairiegrass		D:20-25; B:30-35 10-15 in mixtures	¼-½	Aug 15 - Sep 15; Mar 15-Apr 15	Aug 15-Oct 15; Mar 1-Apr 30	Sep 1 - Oct 1; Mar 1-Mar 20	Aug 15-Oct 25; Feb 20-Apr 15
111	Switchgrass [c]	√	B:8-10; D:6-8	¼	Mar 15-Jun 30	Mar 15-Jun 30	Mar 1-Jun 15	Mar 1-Jun 15
112	Tall Fescue		B:20-25; D:15-20	¼-½	Aug 15-Sep 10; Mar 15-Apr 15	Aug 1-Sep 30; Mar 1-Apr 30	Sep 1-Sep 30; Mar 1-Apr 1	Aug 25-Nov 1; Feb 25-Apr 15
113	Timothy		B:10-12; D: 8-10	¼-½	Aug 15-Sep 10; Mar 15-Apr 1	Aug 15-Oct 1; Mar 1-Apr 15	Not well adapted	Not well adapted
Mixtures [k]								
114	Orchardgrass + Alfalfa [f]		B:5+20; D:3+15	¼-½	Aug 15-Sep 1; Mar 15-Apr 1	Aug 1-Sep 15; Mar 1-Apr15	Aug 25-Sep 15; Mar 1-Mar 20	Aug 25-Oct 15; Feb 25-Apr 1

TABLE 2.2.1-2

Seed Mix VABCHNP02: Recommended Cool and Warm Season Forage Species and Seed Mixtures

Seeding Mix	Common Species Name	Virginia Native	Seeding Rate (lbs/acre/PLS) B:broadcast; D:drill (4-9" row)	Plant Depth (inches)	Mountain/Valley/Northern Piedmont [a]		Southern Piedmont	
					Best Dates	Possible Dates	Best Dates	Possible Dates
115	Orchardgrass with 1 or more of the following: Ladino Clover Red Clover Annual Lespedeza		B: 10-12; D:8-10 1-2 4-6 10-12	¼-½	Aug 20-Sep 10; Mar 15-Apr 1	Aug 15-Oct 1; Mar 1-Apr 15	Aug 25-Sep 15; Mar 1-Mar 20	Aug 25-Oct 15; Feb 25-Apr 1
116	Orchardgrass and Timothy with 1 or more of the following: Ladino Clover Red Clover Annual Lespedeza		B: 10-12; D:8-10 B: 4; D:2 1-2 4-6 10-12	¼-½	Aug 20-Sep 10; Mar 15-Apr 1	Aug 15-Oct 1; Mar 1-Apr 15	Aug 25-Sep 15; Mar 1-Mar 20	Aug 25-Oct 15; Feb 25-Apr 1
117	Tall Fescue with 1 or more of the following: Ladino Clover Red Clover Annual Lespedeza		B:20-25; D:15-20 1-2 4-6 10-12	¼-½	Aug 15- Oct 1; Mar 1-Apr 15	Aug 15- Oct 1; Mar 1-Apr 15	Aug 25 - Oct 15; Feb 20-Apr 1	Aug 25 - Oct 15; Feb 20-Apr 1
118	Prairiegrass with 1 or more of the following: Red Clover Alfalfa [f]		B:20-25; D:15-20; 4-6 15	¼-½	Aug 15 - Sep 15; Mar 10-Apr 10	Aug 1-Sep 20; Mar 1-Apr 15	Aug 25 - Sep 15; Mar 1-Mar 20	Aug 15-Oct 15; Feb 25-Apr 1
Annual Grasses [k]								
119	Crabgrass [g]		B:6-8; D:4-6	¼	May 15-May 31	May 1-Jun 30	May 1-May 31	Apr 15-Jun 30
120	Barley		B:140; D:120	1 – 1.5	Aug 15-Sep 15	Aug 10-Sep 30	Aug 25-Sep 15	Aug 15-Sep 30
121	Millet, Pearl		B:30-40; D:15-20	½ - 1	May 15-May 31	May 1-Jun 30	May 1-May 31	Apr 25-Jun 30
122	Millet, German Foxtail, Japanese		B:20-30;D:15-20	¼	May 15-May 31	May 1-Jun 30	May 1-May 31	May 1-Jun 30
123	Oats, Winter [h]		B:80-96; D:65-80	1 – 1.5	Aug 15-Sep 10	Aug 10-Sep 15; Feb 1-Mar 1	Sep 1-Sep 15	Aug 25-Oct 1; Feb 1-Mar 1
124	Oats, Spring		B:80-96; D:65-80	1 – 1.5	Mar 15-Apr 1	Mar 15-Apr 10	Mar 5-Mar 20	Mar 5-Apr 1
125	Rye		B:120-150; D:90-110	1 – 1.5	Aug 15-Aug 31	Aug 15-Oct 25	Aug 25-Sep 15	Aug 20-Oct 31
126	Ryegrass		B:30-40; D:20-30	¼-½	Aug 15-Sep 10	Aug 10-Sep 30	Aug 25-Sep 15	Aug 20-Oct 31
127	Teff [g, i]		B: 6-8; D 5-6	1/8	Jun 1-Jun 15	May 15 - Jul 1	May 20-Jun 10	May 1 - Jul 1
128	Wheat		B:150; D: 120	1 – 1.5	Aug 15-Aug 31	Aug 15-Oct 25	Aug 25-Sep 15	Aug 20-Oct 31
129	Small grain Mix (2 Grains)		Reduce each selection by 50%	1 – 1.5	See dates for small grains.	See dates for small grains.	See dates for small grains.	See dates for small grains.
130	Small grain mixed with annual ryegrass		Reduce Small grain 25% & ryegrass 50%	½ - 1	See dates for grains and ryegrass.		See dates for grains and ryegrass.	
131	Sorghum-Sudangrass		B:30-40; D:20-30	½ - 1	May 15-May 31	May 1-Jun 30	May 1- May 31	Apr 25-Jun 30

TABLE 2.2.1-2

Seed Mix VABCHNP02: Recommended Cool and Warm Season Forage Species and Seed Mixtures

Seeding Mix	Common Species Name	Virginia Native	Seeding Rate (lbs/acre/PLS) B:broadcast; D:drill (4-9" row)	Plant Depth (inches)	Mountain/Valley/Northern Piedmont [a]		Southern Piedmont	
					Best Dates	Possible Dates	Best Dates	Possible Dates
132	Sorghum, Forage		B: 15-20; R:5-10	1 – 1 ½	May 15-May 31	May 1 – Jun 30	May 1–May 31	Apr 25 – Jun 30
133	Sudangrass		B:30-35; D:15-20	½ - 1	May 15 -May 31	May 1 – Jun 30	May 1–May 31	Apr 25 – Jun 30
134	Triticale		B:140-180; D: 120-140	1 – 1.5	Aug 15-Aug 31	Aug 15-Oct 25	Aug 25-Sep 15	Aug 20-Oct 31
Perennial Legumes [k]								
135	Alfalfa [f]		B:20-25; D:15-20	¼	Aug 25-Sep 15; Mar 20–Apr 7	Aug 15-Sep 25; Mar 15-Apr 15	Sep 1-Sep 15; Mar 10-Mar 20	Aug 25-Oct 1; Mar 5-Apr 5
136	Alfalfa (no-till seeding into grass)		D:10-12	¼ - ½	Mar 20–Apr 7	Mar 15-Apr 15	Mar 10-Mar 20	Mar 5-Apr 5
137	Birdsfoot Trefoil (no-till into suppressed grass sod)		D:6-8	¼	Aug 15-Sep 1	Aug1-Sep 15	Not adapted	Not adapted
138	Birdsfoot Trefoil (frost seed onto pasture)		B: 8-10	0	Feb 1-Mar 1	Jan 25-Mar 10	Not adapted	Not adapted
139	Ladino or White Clover (no-till into suppressed grass sod)		D:1-2	¼	Aug 20-Sep 10; Mar 15-Apr 1	Aug 15-Sep 25; Mar 1-Apr 15	Aug 25-Sep 15; Mar 1-Mar 20	Aug 25-Oct 15; Feb 25-Apr 1
140	Ladino or White clover (frost seed onto pasture)		B:1-2	0	Feb 1-Mar 1	Jan 25-Mar 10	Jan 25-Feb 15	Jan 20-Mar 1
141	Red Clover (no-till into suppressed grass sod)		D:4-6	¼ - ½	Aug 20-Sep 10; Mar 15-Apr 1	Aug 15-Sep 25; Mar 1-Apr 15	Aug 25-Sep 15; Mar 1-Mar 20	Aug 25-Oct 15; Feb 25-Apr 1
142	Red Clover (frost seed onto pasture)		B:4-6	0	Feb 1-Mar 1	Jan 25-Mar 10	Jan 25-Feb 15	Jan 20-Mar 1
Annual Legumes [k]								
143	Crimson Clover w/Ryegrass or small grain		B:20; D:15 & reduce small grain by 1/3	¼ - ½	Aug 15-Sep 10	Aug 10-Sep 30	Aug 25-Sep 15	Aug 20-Oct 15
144	Lespedeza, Kobe (Southeast VA) (frost seeded onto pastures)		B:10-15	0	Not adapted	Not adapted	Not well adapted	Not well adapted
145	Lespedeza, Korean (frost seeded onto pastures)		B:10-15	0	Feb 1-Mar 1	Feb 1-Mar 15	Jan 25-Mar 1	Jan 25-Mar 10
146	Hairy Vetch w/ small grain		B: 15; D 10 & reduce small grain by 50%	½ - 1 ½	Aug 15-Aug 31	Aug 15-Sep 15	Aug 25-Sep 15	Aug 20-Oct 1

TABLE 2.2.1-2

Seed Mix VABCHNP02: Recommended Cool and Warm Season Forage Species and Seed Mixtures

Seeding Mix	Common Species Name	Virginia Native	Seeding Rate (lbs/acre/PLS) B:broadcast; D:drill (4-9" row)	Plant Depth (inches)	Mountain/Valley/Northern Piedmont [a]		Southern Piedmont	
					Best Dates	Possible Dates	Best Dates	Possible Dates
Other Species [k]								
147	Chicory (in mixture w/grass & legume)		B: 3-4 D: 1-2	¼ - ½	Apr 15-May5	Apr 1-May 15	Sep 1-Sep 15	Sep 1-Oct 10
148	Brassicas [j] (sow 1-2 of the following in a 50% rate mix of summer or winter annual grasses in late spring or late summer respectively) Rape Kale Turnip Turnip X Rape Radish		B: 2-3 D: 1-2	¼ - ½	May 1 - Jun 30 Aug 1 - Sep 1	May 1 - Jun 30 Aug 1 - Sep 1	Apr 20 - Jun 20 Aug 1 - Sep 10	Apr 20 - Jun 20 Aug 1 - Sep 10

Source: Jones, et. al., 2014

[a] The northern piedmont planting dates may be on the opposite end of the planting range compared to the mountains and valley in Southwest VA.

[b] Sprigged and seeded Bermudagrass have been established in the mountain and valley region of the state but are not well adapted and have a higher chance of winter kill.

[c] Native warm season grass planting date will vary within the planting window depending on dormancy of seed and expected annual grass/weed competition in the field.

[d] Eastern Gama grass can be planted with a corn planter (30" row) or with a drill on approximately 15" row centers (by blocking every other seed tube).

[e] This species tends to be a short lived perennial when planted and managed in monocultures in the piedmont and eastern regions of VA; it seems does better in the mountain and valley regions of the state especially when managed with rotational stocking in a mixed stand with other grasses and legumes.

[f] Fall planted alfalfa should not be no-tilled; alfalfa should be planted in spring 30 days prior to last killing frost and in fall 30-60 days before first killing fros.t

[g] Planting too deep is a common cause of stand failure.

[h] It is generally not recommended to plant oats in the fall west of the Blue Ridge because they will winter kill, however they are sometimes planted late summer and grazed in the fall and early winter.

[i] Not recommended for no-till planting, needs a clean firm seedbed to ensure establishment.

[j] Brassicas are not recommended in a monoculture, they are low in fiber and have highly digestible protein and can cause problems with rumen function; they should be planted mixed with summer or winter annuals to avoid problems (50 percent seeding rate of brassicas and 50 percent annuals).

[k] Add to the mixture or use Canada wild rye (*Elymus canadensis*) and/or Virginia wild rye (*Elymus virginicus*) where possible and practicable.

TABLE 2.2.1-3

Recommended Soil Amendments

Type	Application Rate
Lime	2 tons/acre
Fertilizer 10-10-10	1,000 lbs/acre

Mulching

The NRCS Conservation Practice Standard - Mulching (Code 484) (NRCS, 2014) provides a general recommendation for mulching in Virginia. Mulching materials should consist of natural/artificial materials that can provide a certain depth/thickness and durability to achieve adequate cover. Mulch should be applied evenly and, if necessary, anchored into the soil. As a minimum, apply manufactured mulches in accordance with the manufacturer's specifications. The Mulch Specifications table provides some general guidelines when using certain mulches.

TABLE 2.2.1-4

Mulch Specifications

Mulch Type	Suggested Cover
Cereal Grain/Grass Hay	70% Ground Cover
Wood Products (Wood Chips, Bark)	≤ 2-inch thickness
Gravel / Other Inorganic Materials	0.75 to 2-inch diameter / 2-inch thickness

Mulch should be applied to provide adequate protection from erosion, yet allow light and moisture to penetrate into the seedbed. Typical mulching provides 70 percent cover (approximately 2,000 pounds of straw per acre) with the appropriate erosion control measure to hold the seed and straw in place during establishment, depending on slope (NRCS Code 342) (NRCS, 2011). There are several types of mulches that can be used to conserve soil moisture, promote plant growth, and reduce erosion; however, there are also mulches that can have the reverse affect. Consider potential benefit or detrimental effects of mulching to the impacted and surrounding areas.

An operation and maintenance plan should clearly document:

- Purpose of mulch and type;
- Percent cover and/or thickness of mulch material;
- Timing of application;
- Site preparation; and
- Method of anchoring (i.e., netting, tackifiers, etc.).

Recommended Perennial Grasses and Pollinator Seed mixtures, Species, and Rates for Mountainous and Piedmont Regions

The following seed mixtures are for the Mountainous and Piedmont Regions of Virginia. These recommendations are based on discussions and information provided by Robert Glennon, private lands biologist from the Conservation Management Institute, Virginia Tech and NRCS, and the Xerces Society.

TABLE 2.2.1-5

Seed Mix P-VABCHNP01: Recommended Mountain and Piedmont Physiographic Regions
Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia

Common Name	Scientific Name	Cultivar or Germplasm	Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Little Bluestem	*Schizachyrium scoparium*	Piedmont (NC) or Suther Germplasm (NC)	8 ounces	3
Broomsedge	*Andropogon virginicus*	—	8 ounces	3
Purple Top	*Tridens flavus*	North Carolina or Kentucky Ecotype	3 ounces	3
Common milkweed	*Asclepias syriaca*	—	3 ounces	0.210

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 2.2.1-6

Seed Mix P-VABCHNP01: Recommended Mountain and Piedmont Physiographic Regions
Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia

Common Name [a]	Scientific Name	Flowering Season	Drilled Seeding Rate [b] (ounces/acre - weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Showy Tickseed	*Bidens aristosa*	Late Summer	11	3
Pea, Partridge (A)	*Chamaecrista fasciculata*	Mid-Summer	32	3
Susan, Black-eyed (B)	*Rudbeckia hirta*	Early Summer	2	3
Bergamot, Spotted (P)	*Monarda punctata*	Summer	2	3
Bergamot, Wild (P)	*Monarda fistulosa*	Summer	2	3
Beardtongue, Eastern Smooth (P)	*Penstemon laevigatus*	Late Spring	7	3
Penstemon, Talus Slope (P)	*Penstemon digitalis*	Late Spring	5	3
Slender Mountain Mint (P)	*Pycnanthemum tenuifolium*	Late Summer	1	3
New England Aster	*Aster novae-angliae*	Late Summer	2	3
Total	**—**	**—**	**64.0 ounces/acre (4.0 lbs/acre)**	**27**

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

[b] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 2.2.1-7

Seed Mix P-VABCHNP02: Recommended Mountain and Piedmont Physiographic Regions
Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia

Common Name	Scientific Name	Cultivar or Germplasm	Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Beaked Panicum	*Panicum anceps*	SC or MD Ecotype	4 ounces	3
Redtop Panicum	*Panicum rigidulum*	NC Ecotype	3 ounces	3
Slender Rush	*Juncus tenuis*	—	1 ounce	3

Source: Glennon, 2015; Roundstone Native Seed, 2017.

[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 2.2.1-8

Seed Mix P-VABCHNP02: Recommended Mountain and Piedmont Physiographic Regions
Forb Seed Mix and Application Rates Somewhat Poorly to Very Poorly Drained Sites in Virginia

Common Name [a]	Scientific Name	Flowering Season	Drilled Seeding Rate [b] (ounces/acre - weight of pure live seed (PLS) per acre	Seeds per Square Foot
New England Aster	*Symphyotrichum puniceum*	Fall	3	3
Bergamot, Wild (P)	*Monarda fistulosa*	Summer	1	3
Ironweed, New York (P)	*Vernonia novaboracensis*	Late Summer	7	3
Rough-stemmed goldenrod	*Solidago rugosa*	Late Summer	3	3
Joe Pye Weed, Spotted (P)	*Eutrochium fistulosus*	Late Summer	2	3
Pea, Partridge (A)	*Chamaecrista fasciculata*	Mid-Summer	32	3
Rosemallow (P)	*Hibiscus moscheutos*	Summer	2	3
Showy Tickseed	*Bidens aristosa*	Late Summer	11	3
Total	**—**	**—**	**61.0 ounces/ acre (3.8 lbs/acre)**	**24**

Source: Glennon, 2017. ; Roundstone Native Seed, 2017.

[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers. Add New York Aster (Symphyotrichum novi-belgii) and narrow- leaf mountain mint (Pycnanthemum tenuifolium) to seed mix in coastal plain sites

[b] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

2.2.2 **Federal Lands**

George Washington National Forest – Augusta, Bath, and Highland Counties

This section is pending additional consultation with the U.S. Forest Service.

2.2.3 **State Lands**

James River Wildlife Management Area – Nelson County

The following seed mixtures and application rates recommendations are for the James River WWA in Nelson County, Virginia. The recommendations are based on correspondence and discussions with Virginia Department of Game and Inland Fisheries regional specialist staff (Amy Ewing, environmental services biologist/FWIS Manager, Virginia Department of Game and Inland Fisheries). These seed mixes are considered suitable for planting of the ACP pipeline.

The specialist staff is supportive of the use of native vegetation mixes that stabilize the corridor while providing food and cover for a variety of wildlife.

James River Wildlife Management Area (WMA) Excessively to Moderately Well Drained – Partially Shade Sites

TABLE 2.2.3-1

Seed Mix VJRWMA01: Recommended Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained – Partially Shade Sites [a]

Common Name	Scientific Name	Seed Mix Rate (lbs/acre/PLS)[b]
Autumn bentgrass	*Agrostis perennans*	0.012
Canada Wild Rye	*Elymus canadensis*	0.083
Virginia Wild Rye	*Elymus virginicus*	0.208
Creeping Red Fescue	*Festuca rubra*	0.167
Purple Top	*Tridens flavus*	0.083
Upland Bentgrass	*Agrostis perennans*	0.005
Little Bluestem	*Schizachyrium scoparium*	0.208
Broomsedge	*Andropogon virginicus*	0.033
Beaked Panicum	*Panicum anceps*	0.167
Nimblewill	*Muhlenbergia schreberii*	0.033
Total	**—**	**1.0**

Source: Recommendations provided by the Virginia Department of Game and Inland Forest.
a Recommended seeding application rate is 6.3 to 9.0 pounds per acre.
b lbs/acre/PLS = pounds per acre of pure live seed

James River WMA Excessively to Moderately Well Drained – Wildlife Sites

TABLE 2.2.3-2

Seed Mix VJRWMA02: Recommended Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained – Wildlife Sites [a]

Common Name	Scientific Name	Seed Mix Rate (lbs/acre/PLS)[b]
Big Bluestem	*Andropogon gerardii*	0.070
Indian Grass	*Sorghastrum nutans*	0.070
Little Bluestem	*Schizachyrium scoparium*	0.141
Switchgrass (Blackwell)	*Panicum virgatum*	0.070
Canada Wild Rye	*Elymus canadensis*	0.106
Tall Dropseed	*Sporobolus compositus*	0.070
Purple Top	*Tridens flavus*	0.035
Plains Coreopsis	*Coreopsis tinctoria*	0.019
Violet lespedeza	*Lespedeza frutescen*	0.057
Blackeyed Susan	*Rudbeckia hirta*	0.033
Virginia lespedeza	*Lespedeza virginica*	0.077
Partridge Pea	*Cassia fasciculata*	0.120
Browneyed Susan	*Rudbeckia triloba*	0.025
Maximilian Sunflower	*Helianthus maximiliani*	0.060
Roundhead Lespedeza	*Lespedeza capitata*	0.033
New England Aster	*Aster novae-angliae*	0.012
Total	—	1.0

Source: Recommendations provided by the Virginia Department of Game and Inland Forest.
a Recommended seeding application rate is 6.3 to 9.0 pounds per acre.
b lbs/acre/PLS = pounds per acre of pure live seed.

James River WMA Steep Slope Stabilization Sites

TABLE 2.2.3-3

Seed Mix VJRWMA03: Recommended Grass Seed Mixes and Application Rates for Steep Slopes Stabilization – Sites

Common Name	Scientific Name	Seed Mix Rate (lbs/acre/PLS)[b]
Seed Mix [a]		
Creeping Red Fescue	*Festuca rubra*	0.050
Virginia Wild Rye	*Elymus virginicus*	0.083
Fall Panicum	*Panicum anceps*	0.083
Side Oats Grama	*Bouteloua curtipendula*	0.083
Big Bluestem	*Andropogon gerardii*	0.083
Indian Grass	*Sorghastrum nutans*	0.083
Purple Top	*Tridens flavus*	0.033
Switchgrass	*Panicum virgatum*	0.083
Little Bluestem	*Schizachyrium scoparium*	0.083
Virginia lespedeza	*Lespedeza virginica*	0.025
Lance Leaved Coreopsis	*Coreopsis lanceolata*	0.042
Blackeyed Susan	*Rudbeckia hirta*	0.008
Partridge Pea	*Cassia fasciculata*	0.058
Violet lespedeza	*(Lespedeza frutescens*	0.033
False Sunflower	*Heliopsis helianthoides*	0.042
Showy Tickseed	*Bidens aristosa*	0.042
Maximilian Sunflower	*Helianthus maximiliani*	0.042
Iron Weed	*Vernonia altissima*	0.025
Common Milkweed	*Asclepias syriaca*	0.021
Hairy Mountain Mint	*Pycnanthemum pilosum*	0.003
Gray Goldenrod	*Solidago nemoralis*	0.013
Total	—	1.0
Common Name		Seed Application Rate (lbs/acre/PLS)[b]
Seed Mix		
Buckwheat[c]		15-20
Millet		5-7
Korean lespedeza		5-7
Perennial Ryegrass		5-8
Blackwell switchgrass		3-4

Source: Recommendations provided by the Virginia Department of Game and Inland Forest.

[a] Recommended seeding application rate is 7.4 to 10.7 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed.

[c] Buckwheat is somewhat frost sensitive and deepening on the planting date, increase the application rate Korean lespedeza to compensate and decrease or remove the application of buckwheat.

2.2.4 Dinwiddie, Greensville, and Southampton Counties, and Chesapeake and Suffolk Cities (Coastal Plain Region)

The following seed mixtures, site preparation, seeding techniques, and amendments recommendations are for Dinwiddie, Greensville, Suffolk, Southampton, and Chesapeake Counties. These recommendations are based on information provided by Mr. Robert Glennon. NRCS Conservationists in these counties referred to Mr. Robert Glennon's recommendations.

2.2.4.1 Recommended Grass Seed Mixtures, Application Rates, and Planting Dates

Seeding species, cultivars, rates, and planting dates are contained in the table below. The materials identified as "common" do not require a specific cultivar for successful establishment and performance. Nurse crops must be sown at the same time as the perennial cover species to ensure that the site will have quick cover. The temporary cover specifications are intended for use when the site will not be sown to a perennial cover immediately after construction and a temporary cover is needed until the seed can be sown during the proper seeding season.

TABLE 2.2.4-1

Seed Mix VACSDGS01: Recommended Cool and Warm Season Species, Cultivars, Seeding Rates, Seeding Dates, and Temporary Cover

Species	Cultivars	Seeding Application Rate (lbs/acre)	Seeding Dates
Wild rye and lespedeza			
Canada wild rye (Elymus canadensis), and Virginia wild rye (Elymus virginicus)	—	60 pounds broadcast	September 1 – October 31; February 1 – March 31
Canada wild rye and Virginia wild rye Tall Fescue + Virginia lespedeza (Lespedeza virginica), + hairy lespedeza (Lespedeza hirta)	—	40 pounds broadcast	September 1 – October 31; February 1 – March 31
Bermudagrass and Japanese Lespedeza			
Bermudagrass	Common Cheyenne II Pasto Rico Ranchero Frio	10-12 pounds broadcast; 8-10 pounds drilled	April 1 – June 10
Japanese Lespedeza	Kobe	10-12 pounds broadcast or drilled	April 1 – June 10
Nurse Crops (Sow with the Perennial Seed Mixtures for Quick Cover)			
Oats	Common	25-30 pounds broadcast; 20-25 drilled	September 1 – November 15; February 1 – April 20
Rye	Common	35-50 broadcast; 25-40 drilled	September 1 – November 15; February 1 – April 20
Wheat	Common	40-50 broadcast; 30-40 drilled	September 1 – November 15; February 1 – April 20
Millet (Browntop, German, Italian, Foxtail, Proso)	Common	10-15 broadcast; 7-10 drilled	April 20 – August 1
Temporary Crops (Sow on Areas that will not be Seeded Immediately)			
Oats	Common	80-95 broadcast; 65-80 drilled	September 1 – November 15; February 1 – April 20
Rye	Common	120 broadcast; 100 drilled	September 1 – November 15; February 1 – April 20
Wheat	Common	120 broadcast; 100 drilled	September 1 – November 15; February 1 – April 20
Millet (Browntop, German, Italian, Foxtail, Proso	Common	20-30 broadcast; 15-20 drilled	April 20 – August 31

Note: Seeding Rates in Bulk Pounds per Acre – Non-Native Seed Must Have a minimum Germination and Purity to be Sold.

Site Preparation

The soils on the Coastal Plain of Virginia in Dinwiddie, Greensville, Suffolk, and Southampton counties typically have sandy topsoil but have a heavy clay subsoil close to the soil surface. The sandy topsoil must be kept separate during construction to prevent mixing with the subsoil, which will ensure easy till-ability and compaction and allow seeds to sow without restriction. To ensure optimum conditions in the soil for germination and early growth for soils

sown to non-native species, the species should be tested, limed, and fertilized according to the soil test recommendations.

Seeding Technique

Seed may be established by broadcasting on a firm seedbed and packing the seed, or by drilling the seed into a firm seedbed and packing the seed. Drilled seed of the perennial seed grass species, legumes, and annual millets should only be placed at a depth of ¼ inch. The nurse crops and temporary cover species oats, rye, and wheat may be broadcast but will perform best if drilled at a one-inch depth.

Mulching

To ensure that the seed will remain in place through germination and growth, seedlings must be mulched. Synthetic or processed mulch must be applied and anchored according to the manufacturer's recommendations. Straw (seed stalks of small grains – usually wheat) may be used as mulch at a rate of 75 to 100 pounds per acre (1.5 to 2.5 tons per acre). The mulch must be anchored with a sprayed on product or netting applied according to the manufacturer's recommendations. It should be noted that hay must not be used as mulch, as hay typically contains weeds that would negatively impact the restoration of the area.

2.2.4.2 Recommended Perennial Grasses and Pollinator Seed Mixtures, Species, and Application Rates for the Coastal Plain Region

The following seed mixtures are for the Coastal Plain Region of Virginia. These recommendations are based on discussions and information provided by Robert Glennon.

TABLE 2.2.4-2

Seed Mix P-VACSDGS01: Recommended Coastal Plain Physiographic Region Grass Mixture for Excessively to Moderately Well Drained Sites In Virginia

Common Name	Scientific Name	Cultivar or Germplasm	Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Little Bluestem	*Schizachyrium scoparium*	Piedmont (NC) or Suther Germplasm (NC)	8 ounces	3
Splitbeard Bluestem	*Andropogon ternarius*	Virginia Ecotype	8 ounces	3
Common milkweed	*Asclepias syriaca*	—	3 ounces	0.21

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 2.2.4-3

Seed Mix P-VACSDGS01: Recommended Coastal Plain Physiographic Region
Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in Virginia

Common Name [a]	Scientific Name	Flowering Season	Drilled Seeding Rate [b] (ounces/acre - weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Mountain Mint, Narrowleaf (P)	*Pycnanthemum tenuifolium*	Late Summer	1	3
Showy Tickseed	*Bidens aristosa*	Late Summer	11	3
Pea, Partridge (A)	*Chamaecrista fasciculata*	Mid-Summer	32	3
Susan, Black-eyed (B)	*Rudbeckia hirta*	Early Summer	2	3
Bergamot, Spotted (P)	*Monarda punctata*	Summer	2	3
Beardtongue, Eastern Smooth (P)	*Penstemon laevigatus*	Late Spring	7	3
Penstemon, Talus Slope (P)	*Penstemon digitalis*	Late Spring	5	3
Bergamot, Wild (P)	*Monarda fistulosa*	Summer	2	3
Total	**—**	**—**	**65.0 ounces/acre (4.4 lbs/acre)**	**24**

Source: Glennon, 2017; Roundstone Native Seed, 2017.

[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

[b] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 2.2.4-4

Seed Mix P-VACSDGS02: Recommended Coastal Plain Physiographic Region
Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in Virginia

Common Name	Scientific Name	Cultivar or Germplasm	Drilled Seeding Rate [a] (weight of pure live seed (PLS) per acre)	Seeds per Square Foot
Panicum, Beaked	*Panicum anceps*	SC or MD Ecotype	4 ounces	3
Panicum, Redtop	*Panicum rigidulum*	NC Ecotype	3 ounces	3

Source: Glennon, 2017
; Roundstone Native Seed, 2017.

[a] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

TABLE 2.2.4-5

Seed Mix P-VACSDGS02: Recommended Coastal Plain Physiographic Region
Forb Seed Mix Seed and Application Rate Mix for Somewhat Poorly to Very Poorly Drained Sites in Virginia

Common Name [a]	Scientific Name	Flowering Season	Drilled Seeding Rate [b] (ounces/acre - weight of pure live seed (PLS) per acre)	Seeds per Square Foot
New England Aster	*Aster novae-angliae*	Fall	3	3
Sneezeweed, Common (P)	*Helenium autumnale*	Fall	2	3
Showy Tickseed	*Bidens aristosa*	Late Summer	11	3
New York Ironweed (P)	*Vernonia nova boracensis*	Late Summer	7	3
Goldenrod, Wrinkleleaf (P)	*Solidago rugosa*	Late Summer	2	3
Joe Pye Weed, Spotted (P)	*Eutrochium fistulosus*	Late Summer	2	3
Partridge Pea (A)	*Chamaecrista fasciculata*	Mid-Summer	32	3
Rosemallow (P)	*Hibiscus moscheutos*	Summer	2	3
Narrowleaf Sunflower (P)	*Helianthus angustifolius*	Late Summer	4	3
Total	**—**	**—**	**65.0 ounces/acre (4.1 lbs/acre**	**27**

Source: Glennon, 2015; Roundstone Native Seed, 2017.

[a] Forb types include (A) for annual flowers, (B) for biennial flowers, and (P) for perennial flowers.

[b] If the broadcast method is more feasible, increase the perennial grasses in the mixture by 50 percent.

2.3 NORTH CAROLINA

2.3.1 Northampton County

The following recommendations of seed mixtures, rates, planting dates, and amendments are for Northampton County, North Carolina. The recommendation is from Paul Boone (NRCS District Conservationist).

Recommended Grass Seed Mixtures, Application Rates, Planting Dates, and Amendments

TABLE 2.3.1-1

Seed Mix NCNO01: Recommended Cool Season Seed Mixture

Common Species Name [a]	Seed Application Rate (lbs/acre/PLS)[b]	Planting Date
Spring (February - March) and Fall (September - November) Seeding		
Tall Fescue mixed with any of the following grains:	60	Feb - Nov
Wheat	60	Oct 25 - Nov 15
Oats and Barley	60	Sept 1 - Oct 15
Rye	60	Sept 15 - Nov 1
Korean Lespedeza	20	March - May
Sercia Lespedeza	20	Oct - May

[a] Recommendations provided by the Northampton County NRCS office District Conservationist.

[b] lbs/acre/PLS = pounds per acre of pure live seed

Note: Apply small grain mulch at 2 tons/acre or check with the NRCS office for alternatives mulches.

TABLE 2.3.1-2

Seed Mix NCNO02: Recommended Warm Season Seed Mixture

Common Species Name [a]	Seed Application Rate (lbs/acre/PLS)	Planting Date
Temporary Cover		
Brown Top Miller	30-40	May 5 – July 5
Japanese Millet	25	May 5 – July 5
Permanent Cover		
Pensacola Bahia	25	March 15 – June 15
Pensacola Bahia mixed with any of the following:	20	March - May
Annual Lespedeza	20	March - May
Kolb Lespedeza	20	March - May
Common Lespedeza	20	March - May
Korean Lespedeza	20	March - May
Bermuda Grass (Hulled)	8-10	April - July
Bermuda Grass		
Hulled Bermunda (up June)	6-10	April – July
Unhulled Bermuda	15-18	January - March

[a] Recommendations provided by the Northampton County NRCS office District Conservationist.

TABLE 2.3.1-3

Recommended Soil Amendments

Type	Application Rate
Lime	2 tons/acre
Fertilizer 10-10-10	1,000 lbs/acre

2.3.2 **Halifax and Wilson Counties**

The following seed mixture, planting dates, and cover crop recommendations are primarily for Wilson County, but are also applicable for Halifax County. The recommendation is from David Little (NRCS District Conservationist).

Recommended Grass Seed Mixtures, Application Rates, Planting Dates, and Cover Crops

TABLE 2.3.2-1

Seed Mix NCHW01: Recommended Cool Season Seed Mixture

Common Species Name [a]	Seed Application Rate (lbs/acre/PLS) [b]	Planting Date
Tall Fescue and White Clover	30-50	Sept 1 – Sept 30 (Coastal Plain)
Cover Crop [a]		
Buckwheat	80	Late Winter-Spring
Oats	180	Late Winter-Spring
Rye	120-180	Late Winter-Spring
Ryegrass	30-40	Late Winter-Spring
Oats and Ryegrass	90	Late Winter-Spring
Oats and Korean Lespedeza	20	Late Winter-Spring
Browntop Miller	30-40	Summer
Rye	120-180	Late Summer/Early Winter
Ryegrass	30-40	Late Summer/Early Winter
Oats (Before Oct 1)	120-180	Late Summer/Early Winter
Barley (Before Oct 15)	120-180	Late Summer/Early Winter
Wheat (After Oct 1)	120-180	Late Summer/Early Winter
Rye and Ryegrass mixture	60 Rye + 20 Ryegrass	Late Summer/Early Winter
Little barley	75-80	Late Summer/Early Winter

[a] Temporary cover vegetation is desirable to minimize erosion and pollution and permanent vegetation cannot be established due to seasons of the year, and where a temporary seeding is needed to control erosion and water pollution prior to the establishment of finished grade or perennial vegetation. The temporary measures should be coordinated with the permanent erosion control measures planned, to assure economical and effective control.

[b] lbs/acre/PLS = pounds per acre of pure live seed

2.3.3 Nash and Johnston Counties

The following species and cover crop seeding application rates, planting dates, and amendments recommendations are for Nash and Johnston counties. The seed mixture recommendations are from correspondence with Patrick Evans (NRCS District Conservationist Nash County) and Brian Loaholt (NRCS District Conservationist). Seed Mix NCNJ01 provides seeding specifications for conservation work.

Recommended Grass Seeding Species, Application Rates, Planting Dates, Cover Crops, and Amendments

TABLE 2.3.3-1

Seed Mix NCNJ01: Recommended Cool Season Grass Seed Mixture

Common Species Name [a]	Seed Application Rate (lbs/acre/PLS)[b]	Planting Date
Tall Fescue	30-40	Sept 1 – Sept 30 (Coastal Plain)
Sorghum (Cover crop) [c]	60-120	—

[a] Recommendations provided by the Nash County NRCS office District Conservationist.

[b] lbs/acre/PLS = pounds per acre of pure live seed

[c] Temporary cover vegetation is desirable to minimize erosion and pollution and permanent vegetation cannot be established due to seasons of the year, and where a temporary seeding is needed to control erosion and water pollution prior to the establishment of finished grade or perennial vegetation. The temporary measures should be coordinated with the permanent erosion control measures planned, to assure economical and effective control.

Notes: Mulch seeded area with small grain straw. Spread evenly over the area at the rate of 1-2 tons/acre. Apply mulch so that about 25 percent of the ground is visible.

TABLE 2.3.3-2

Recommended Lime and Fertilizer Application

Type	Application Rate
Lime	2 tons/acre
Fertilizer - 10-10-10	500 - 700 lbs/acre

2.3.4 Sampson County

The following recommendations for seed mixtures, rates, planting dates, and amendments are for Sampson County. The recommendations are based on correspondence with Gavin Thompson (NRCS District Conservationist) and Susan Davis (West Virginia Department of Natural Resources). Seed Mixes NCSA01 and NCSA02 are NRCS recommended cool and warm season mixtures for disturbed areas. No pollinator species specific to the County were recommended by the Conservationist.

2.3.4.1 Recommended Grass Seed Mixtures, Application Rates, and Planting Dates

TABLE 2.3.4-1

Seed Mix NCSA01: Recommended Cool Season Seed Mixture

Common Species Name [a]	Seeding Application Rate (lbs/acre/PLS)[b]	Planting Date
Tall Fescue or	40-50	Sept - March
Bermudagrass (hull attached)	15	January - March

[a] Recommendations provided by the Sampson County NRCS office District Conservationist. Used Tall Fescue to seed wet spots along the pipeline.

[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.4-2

Seed Mix NCSA02: Recommended Warm Season Seed Mixture

Common Species Name	Seeding Application Rate (lbs/acre/PLS)	Planting Date
Bermudagrass (hull removed)	8-10	April – August

[a] Recommendations provided by the Sampson County NRCS office District Conservationist.
[b] lbs/acre/PLS = pounds per acre of pure live seed

2.3.4.2 Recommended Lime and Fertilizer Application

Where soils are relatively uniform and amendments can be incorporated, use appropriate lime and fertilize according to a soils test. In the absence of a soil test, use the recommended lime and fertilizers application rates in the table below.

TABLE 2.3.4-3

Recommended Lime and Fertilizer Application

Type	Application Rate
Lime (dolomite)	1-2 tons/acre
Fertilizer 10-10-10	500 - 800 lbs/acre [a]

Notes: Any seeding should also be mulched with small grain straw or equivalent at a rate of 1 to 2 tons per acre. When mulching, be sure to eave approximately 25 percent of the ground exposed to allow light to penetrate. Mulch should be anchored to prevent loss.

2.3.4.3 Planting Recommendations

Where conventional equipment is used for planting, seed shall be applied uniformly with cultipacker-seeders, drills, seeders or other mechanical seeders. Any equipment that will apply seed uniformly is acceptable. Seeding may be done by hand where it is not practical or feasible to use equipment.

2.3.4.4 Mulching Recommendations

- Mulching is essential on all sites, especially steep, erosive sites where plant establishment may be expected to be difficult.
- Use of dry, unchopped, and unweathered small grain straw or hay-free-seeds (from completing plant species). Spread at the rate of 1-2 tons per acre depending upon the site and season.
- Apply mulch uniformly so that about 25 percent of the ground surface is visible.
- Anchor mulch immediately after placement to minimize loss by water and/or wind.

2.3.5 **Cumberland County**

The following recommended seed mixture, rates, planting dates, cover crop, and amendments are for Cumberland County. The recommendations are from correspondence with Renessa Brown (NRCS District Conservationist). No pollinator species recommendations specific to the County were provided.

2.3.5.1 Recommended Seed Mixtures, Application Rates, and Planting Dates

TABLE 2.3.5-1

Seed Mix NCCU01: Recommended Cool and Warm Season Seed Mixture

Common Species Name [a]	Seeding Application Rate (lbs/acre/PLS)[b]	Planting Date
Common or Hybrid Bernudagrass (hull removed or scarified)	5-7 (drill) 6-8 (broadcast)	April 1 – May 15 (best); April 1 – June 7 (possible)
Cover Crop [c]		
Buckwheat	80	Late Winter-Spring
Oats	180	Late Winter-Spring
Rye	120-180	Late Winter-Spring
Ryegrass	30-40	Late Winter-Spring
Oats and Ryegrass	20 and 90	Late Winter-Spring
Oats and Korean Lespedeza	20 and 90	Late Winter-Spring
Browntop Miller	30-40	Summer
Rye	120-180	Late Summer/Early Winter
Ryegrass	30-40	Late Summer/Early Winter
Oats (Before Oct 1)	180	Late Summer/Early Winter
Barley (Before Oct 15)	120-180	Late Summer/Early Winter
Wheat (After Oct 1)	120-180	Late Summer/Early Winter
Rye and Ryegrass mixture	60 Rye + 20 Ryegrass	Late Summer/Early Winter
Little barley	75-80	Late Summer/Early Winter

[a] Recommendations provided by the Cumberland County NRCS office District Conservationist.

[b] lbs/acre/PLS = pounds per acre of pure live seed

[c] Select from the following table a quick growing grass with high seedling vigor that is suited to the area, When temporary vegetation is desirable to minimize erosion and pollution and permanent vegetation cannot be established due to seasons of the year, and where a temporary seeding is needed to control erosion and water pollution prior to the establishment of finished grade or perennial vegetation. The temporary measures should be coordinated with the permanent erosion control measures planned, to assure economical and effective control.

TABLE 2.3.5-2

Recommended Lime and Fertilizer Application

Planting	Fertilizer Analysis	Fertilizer Rate (lbs/acre)	Lime Rate (lbs/acre)
Perennial Grasses with or without Legumes, Fertilizer no incorporated	10-10-10	10 lbs / 1,000 sq. ft.	46 lbs / 1,000 sq. ft.
Temporary Cover, Fertilizer not incorporated	10-10-10	12 – 16 lbs / 1,000 sq. ft.	92 lbs / 1,000 sq. ft.

TABLE 2.3.5-3

Recommended Mulch Material Rates and Uses

Material	Minimum Rates Per Acre	Coverage	Remarks
Dry unchopped, unweathered small grain straw or hay-free-seeds (of competing plants)	1 – 2 tons/acre	75% (25% of ground is visible)	Evenly spread mulch over the area by hand or blower-type spreading equipment
burlap and pine boughs	—	100%	Secure in place if flowing water is involved
Jute matting	—	100%	May be used in the place of mulch or sod; has the strength to withstand water flow. It is an accepted practice to sow half the seed before placing the matting. Sow the remaining half after the matting is laid.
Barnyard manure and bedding	—	75% (25% of ground is visible)	Do not apply within 50 feet of surface waters
Wood fiber (excelsior)	—	—	Available as mulch material to be blown on after seeding or as a matting to be stapled on steep slopes, waterways, etc.

Source: WVDEP, 2012

2.3.5.2 Planting Recommendations

Mulching should be specified to reduce damage from water run-off and improve moisture conditions for seedlings. Temporary vegetation can be satisfactorily established without the use of mulch.

2.3.6 Robeson County

The following seed mixture, rates, and planting date recommendations are for Robeson County. The recommendation comes from Jeremy Ruston (NRCS District Conservationist).

Recommended Grass Seed Mixtures

TABLE 2.3.6-1

Seed Mix NCRO01: Recommended Warm Season Seed Mixture

Common Species Name [a]	Seeding Rate (lbs/acre/PLS)[b]	Planting Date
Switchgrass (Carthage or Cave-In-Rock cultivars)	1	April 1 – May 15
Little Bluestem	1.5	April 1 – May 15
Indian Grass	1	April 1 – May 15

[a] Recommendations provided by the Roberson County NRCS office District Conservationist.
[b] lbs/acre/PLS = pounds per acre of pure live seed

Recommended Pollinator Seed Mixtures

TABLE 2.3.6-2

Seed Mix P-NCRO01: Recommended Pollinator Seed Mixture

Common Name	Scientific Name	Bloom Period	Sun	Soil	Seeding Application Seed Rate (lbs/acre/PLS)[a]
Lanceleaf coreopsis	*Coreopsis lanceolata*	April – June	Full – Shade	Dry – Moist	0.3
Wrinkleleaf goldenrod	*Solidago rugosa*	Late Summer	Full to Partial shade	Moist	
Purple coneflower	*Echinacea purpurea*	April – September	Full to Partial shade	Dry	

Source: Recommendations provided by the Roberson County NRCS office District Conservationist.
[a] lbs/acre/PLS = pounds per acre of pure live seed

2.3.7 Recommended Native Grass and Pollinator Seed Mixtures, Application Rates, and Non-Native Cover Crop by Physiographical Region (Coastal Plain)

The following seed mixtures are for the Coastal Plan Region. These recommendations are from discussions with Roundstone Native Seed and Robert Glennon.

Recommended Seed Mixtures by Geographical Region (Coastal Plain) and Drainage Class

TABLE 2.3.7-1

Seed Mix P-CPDW01: Recommended Coastal Plain Physiographic Region
Grass Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in North Carolina [a]

Common Name	Scientific Name	Height (Inches)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Little Bluestem	*Schizachyrium scoparium*	2- 4	Full Sun	0.250
Virginia Wild Rye	*Elymus virginicus*	2 - 4	Full Sun	0.250
Tall Dropseed	*Sporobolus compositus*	2 - 3	Full Sun	0.050
Purple Top	*Tridens flavus*	3 - 5	Part Shade	0.058
Indian Grass	*Sorghastrum nutans*	3 - 6	Full Sun	0.167
Switchgrass	*Panicum virgatum*	3 - 7	Full Sun	0.183
Fall Panicum	*Panicum anceps*	2 - 4	Part Shade	0.042
Total	**—**	**—**	**—**	**1.0**

Sources: Roundstone Native Seed, 2017; Glennon, 2017.
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.7-2

Seed Mix P-CPDW01: Recommended Coastal Plain Physiographic Region
Forb Seed Mix and Application Rates for Excessively to Moderately Well Drained Sites in North Carolina

Common Name	Scientific Name	Color	Bloom Period	Seed Application Rate (lbs/acre/PLS)[b]
Lance Leaved Coreopsis	*Coreopsis lanceolata*	Yellow	Spring, Summer	0.266
Spotted Beebalm	*Monarda punctata*	Pink	Spring, Summer	0.124
Common Milkweed	*Asclepias syriaca*	Pink	Spring, Summer	0.107
Smooth Beardtongue	*Penstemon digitalis*	White	Spring	0.107
Bergamot	*Monarda fistulosa*	Lavender	Summer	0.124
Partridge Pea	*Cassia fasciculata*	Yellow	Summer	0.621
Spiked Blazing Star	*Liatris spicata*	Pink	Summer	0.222
Lupine	*Lupinus perennis*	Blue	Summer	0.497
Early Goldenrod	*Solidago juncea*	Yellow	Summer	0.160
Starry Silphium	*Silphium asteriscus*	Yellow	Summer, Fall	0.178
Iron Weed	*Vernonia altissima*	Purple	Summer, Fall	0.222
Sneezeweed	*Helenium autumnale*	Yellow	Summer, Fall	0.124
Hairy Mountain Mint	*Pycnanthemum pilosum*	White	Summer, Fall	0.089
Total	—	—	—	**2.84**

Sources: Roundstone Native Seed, 2017; Glennon, 2017.
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.7-3

Seed Mix P-CPDW02: Recommended Coastal Plain Physiographic Region
Grass Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in North Carolina [a]

Common Name	Scientific Name	Height (Inches)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Switchgrass	*Panicum virgatum*	3 - 7	Full Sun	0.233
Red Top Panicum	*Panicum rigidulum*	2 - 4	Full Sun	0.017
Fowl Manna Grass	*Glyceria striata*	3 - 5	Part Shade	0.008
Virginia Wild Rye	*Elymus virginicus*	2 - 4	Full Sun	0.217
Deer Tongue Grass	*Panicum clandestinum*	2 - 4	Full Sun	0.058
Big Bluestem	*Andropogon gerardii*	4 - 10	Full Sun	0.167
Frank's Sedge	*Carex frankii*	1 - 2	Part Shade	0.042
Fox Sedge	*Carex vulpinoidea*	2 - 3	Part Shade	0.025
Fall Panicum	*Panicum anceps*	2 - 4	Part Shade	0.067
Total	—	—	—	**0.83**

Sources: Roundstone Native Seed, 2017; Glennon, 2017.
[a] Recommended seeding application rate is 8 to 18 pounds per acre.
[b] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.7-4

Seed Mix P-CPDW02: Recommended Coastal Plain Physiographic Region
Forb Seed Mix and Application Rates for Somewhat Poorly to Very Poorly Drained Sites in North Carolina

Common Name	Scientific Name	Color	Bloom Period	Seed Application Rate (lbs/acre/PLS)[a]
Smooth Beardtongue	*Penstemon digitalis*	White	Spring	0.169
Butterfly Milkweed	*Asclepias tuberosa*	Orange	Spring, Summer	0.056
Ohio Spiderwort	*Tradescantia ohiensis*	Blue	Spring, Summer	0.084
Blackeyed Susan	*Rudbeckia hirta*	Yellow	Spring, Summer	0.180
Spiked Blazing Star	*Liatris spicata*	Pink	Summer	0.264
Hoary Mountain Mint	*Pycnanthemum incanum*	White	Summer	0.034
Early Goldenrod	*Solidago juncea*	Yellow	Summer	0.113
Bergamot	*Monarda fistulosa*	Lavender	Summer	0.169
Showy Tickseed	*Bidens aristosa*	Yellow	Summer, Fall	0.366
Starry Silphium	*Silphium asteriscus*	Yellow	Summer, Fall	0.113
Narrow-Leaved Sunflower	*Helianthus angustifolius*	Yellow	Summer, Fall	0.113
Joe-Pye Weed	*Eupatorium fistulosum*	Pink	Summer, Fall	0.141
Total	—	—	—	**1.80**

Sources: Roundstone Native Seed, 2017; Glennon, 2017.
[a] lbs/acre/PLS = pounds per acre of pure live seed

Recommended Non-native Temporary Cover Crop Species and Non-native Grass Cover

Use of non-native temporary cover species (P-NNTC) on all plantings where erosion potential is high or where the site must be vegetated within 30 days is recommended. Furthermore, use the non-native grass mixes (P-NNGC) with the forb mixes where slope is steep for native species to germinate and where erosion potential is high.

TABLE 2.3.7-5

Seed Mix P-NNTC: Recommended Non-native Temporary Cover Crop Species

Common Name	Scientific Name	Height (Inches)	Sun Exposure	Seeding Application Rate (lbs/acre/PLS)[a]
For Summer Use in Native Mixes				
Brown Top Millet	*Panicum ramosum*	3 - 3.5	Full sun	5.0
For Spring and Fall Use in Native Mixes				
Spring Oats	*Avena sativa*	2 – 2.5	Full sun	30.0
For Fall and Winter Use in Native Mixes				
Annual Rye Grass	*Lolium multiflorum*	2 – 2.5	Part shade	6.0

Source: Roundstone Native Seed, 2015
[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 2.3.7-6

Seed Mix P-NNGC: Recommended Non-native Grass Cover Mix [a]

Common Name	Scientific Name	Height (Inches)	Sun Exposure	Seed Mix Rate (lbs/acre/PLS)[b]
Fescue	*Festuca arundinacea*	2 - 3	Part Shade	0.300
Timothy	*Phleum pratense*	2 - 4	Part Shade	0.100
Orchard Grass	*Dactylis glomerata*	2 - 3	Part Shade	0.100
Red Top	*Agrostis alba*	2 - 3	Full Sun	0.020
Ladino Clover	*Trifolium repens*	1 - 1.5	Part Shade	0.040
Annual Rye Grass	*Lolium multiflorum*	2 - 2.5	Part Shade	0.170
Creeping Red Fescue	*Festuca rubra*	1 - 2	Full Sun	0.250
Kentucky Bluegrass	*Poa pratensis*	1-2	Full Sun	0.020
Total	**—**	**—**	**—**	**1.0**

Source: Roundstone Native Seed, 2015

[a] Recommended seeding application rate is 30 to 50 pounds per acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

3.0 SUPPLY HEADER PROJECT

3.1 WEST VIRGINIA

3.1.1 Wetzel and Tyler Counties

The following recommended seed mixtures, rates, and amendments are primarily for Tyler County but also include a portion of Wetzel County, West Virginia. The recommendation is from correspondence with Dustin Adkins (NRCS District Conservationist). The recommendation is for the area starting at Mile 23 (estimated portion in Tyler County) through Mockingbird Hill (Wetzel County). No pollinator species specific to the County were recommended by the Conservationist.

Recommended Seed Mixtures, Application Rates, Planting Dates, and Amendments

TABLE 3.1.1-1

Seed Mix WVWE01: Recommended Cool Season Seed Mixture

Seed Mixture	Common Species Name	Seed Rate (lbs/acre/PLS)[a]
1	Orchard Grass	8
	Ladino Clover	2
2	White Clover	2
	Orchardgrass	5
	Kentucky Bluegrass	5
3	Red Clover	4
	Alsike Clover	2
	Orchardgrass	4

[a] lbs/acre/PLS = pounds per acre of pure live seed

TABLE 3.1.1-2

Recommended Seeding Dates for Permanent Cover

Planting Dates	Suitability
March 1 to April 15	Best seeding periods.
August 1 to October 1	
December 1 to March 1	Good seeding period. Dormant seeding.
April 15 to August 1	**HIGH RISK** – moisture stress likely.
October 1 to December 1	**HIGH RISK** – freeze damage to young seedlings.

Source: WVDEP, 2012

TABLE 3.1.1-3

Recommended Lime and Fertilizer Application for Permanent Seeding

pH of Soil	Lime (tons/ acre)	Fertilizer (10-20-20 or equivalent) (lbs/acre)
> 6.0	2	500
5.0 to 6.0	3	
< 5.0	4	

Recommended Lime and Fertilizer Application

Lime should be applied to all permanent seedlings. Once pH is known, use the information in the above Table to determine the amount (tons) of lime to use onsite. For the best results, apply the lime and fertilizer at the time of the seedbed preparation. The recommended lime and fertilizer application for temporary seeding in the absence of a soil test is provided in the below table.

TABLE 3.1.1-4

Recommended Lime and Fertilizer Application for Temporary Seeding (Absent of a Soil Test)

Species	Nitrogen (N) (lbs/acre)	Phosphorus ($P_2O_{5)}$ (lbs/acre)	Potassium (K_2O) (lbs/acre)	Recommendations (per acre)
Cool Season Grass	40	80	80	400 lbs 10-20-20
Cool Season Grass & Legume	30	60	60	300 lbs 10-20-20
Temporary Cover	40	40	40	200 lbs 19-19-19

Source: WVDEP, 2012

3.1.2 State Lands

Lewis Wetzel Wildlife Management Area – Wetzel County

The following seed mixtures, application rates, and soil amendments recommendations are for the Lewis Wetzel WMA in Wetzel County, West Virginia. The recommendations are based on correspondence and discussions with the West Virginia Department of Natural Resources (Steve Rauch, District Wildlife Biologist), which recommended the use of the seed mixtures and soil amendments discussed in the West Virginia Enhancing Wildlife Habitat on Oil and Gas Infrastructure booklet (West Virginia Department of Natural Resources, 2015).

Recommended Seed Mixtures and Application Rates

The following planting recommendations are intended to enhance early successional stage habitat found along access roads and pipelines.

TABLE 3.1.2-1

Seed Mix WVLWWMA01: Recommended Grass Seed Mixes and Application Rates

Common Species Name	Scientific Name	Seeding Application Rate (lbs/acre/PLS)[a]
Perennial, Cool Season Seed Mix [b]		
Ladino White Clover [c]	*Trifolium repens*	4
Mammoth Red Clover [c]	*Trifolium pratense*	5
Forage Clover	*Cichorium intybus*	2
Winter Wheat [d]	*Triticum aestivum*	50
Perennial, Cool Season, Slopes Seed Mix [e]		
Ladino White Clover [c]	*Trifolium repens*	8
Red Clover [c]	*Trifolium pratense*	5
Birdsfoot Trefoil [c]	*Lotus corniculatus*	8
Orchardgrass	*Dactylis glomerata*	15
Winter Wheat [d]	*Triticum aestivum*	50

Source: WVDRN, 2015

[a] lbs/acre/PLS = pounds per acre of pure live seed

[b] Ideal for use in areas where the landscape is generally flat and where the objective is to have vegetative cover for pollinator species and wildlife habitat for turkey/grouse broods, and forage for deer

[b] Herbaceous legumes must be treated with the appropriate inoculant before seeding.

[d] Autumn planting: September 1 through October 15 or substitute annual rye. Spring planting: substitute oats at the same rate between February 15 and March 15, and retain the other species as listed.

[e] Ideal for sloped areas, as grasses are typically added to cool season mixes to provide habitat and erosion control measures.

Recommended Lime and Fertilizer Application

Application of soil amendments should be based on soil test recommendations. In the absence of a soil test, fertilizer and lime should be applied at the rates shown in Table 3.1.2-2.

TABLE 3.1.2-2

Recommended Lime and Fertilizer Application

Type	Application Rate
Lime	3 tons/acre
Fertilizer - 10-20-20	600 lbs/acre

Source: WVDRN, 2015

3.1.3 **Doddridge and Harrison Counties**

The following recommended seed mixtures, planting dates, and amendments are for Doddridge and Harrison counties. These recommendations are based on the collection of correspondences with federal and state agencies, including Greg Stone (NRCS Acting State Resource Conservationist), Jeff Griffith (NRCS District Conservationist). No pollinator species specific to the County were recommended by the Conservationists.

Recommended Seed Mixtures and Application Rates

TABLE 3.1.3-1

Seed Mix WVDH01: Recommended Cool Season Seed Mixtures

Seed Mixture	Common Species Name [a]	Seed Application Rate (lbs/acre/PLS)[b]	Suitable Land Use
1	Orchardgrass	10	Pasture or Hay
	Ladino Clover	2	
	Red Clover	3	
	Redtop	3	
2	**Kentucky Bluegrass**	20	Pasture
	Ladino Clover	2	
	Red Clover	3	
	Redtop	3	Pasture or Hay
3	Orchardgrass	20	
	Redtop	5	
	Birdsfoot Trefoil	10	

[a] Species in bold are more wildlife-friendly; species in italics are suitable for use in filter strips.

[b] lbs/acre/PLS = pounds per acre of pure live seed

Recommended Seeding Dates for Permanent Cover and Amendments

TABLE 3.1.3-2

Recommended Seeding Dates for Permanent Cover

Planting Dates	Suitability
March 1 to April 15	Best seeding periods.
August 1 to October 1	
December 1 to March 1	Good seeding period. Dormant seeding.
April 15 to August 1	**HIGH RISK** – moisture stress likely.
October 1 to December 1	**HIGH RISK** – freeze damage to young seedlings.

TABLE 3.1.3-3

Recommended Lime and Fertilizer Application

Type	Application Rate
Lime	3 tons/acre
Fertilizer - 10-20-20	400 lbs/acre

Planting Recommendations

- Certified seed is preferred.
- All legumes should be planted with proper inoculants prior to seeding.
- Soil fertility and pH level will be amended to satisfy the needs of the plant species planned.
- For unprepared seedbeds or seeding outside the optimum timeframes:

- Add 50 percent more seed to the specified rate, particularly during the periods of April 15 – August 1, and October 1 – March 1.
- Double the seeding rate and consider planning an annual small grain like wheat (2 bushels [120 pounds] per acre) to act as a nurse crop.

3.1.4 Recommended Native Grasses and Pollinators Seed Mixtures, Application Rates, and Non-Native Cover Crop by Physiographical Region

Use the same recommended pollinator seed mixtures, non-native temporary cover, and non-native grass cover as indicted in Section 2.1.5 for the ACP in West Virginia.

3.2 PENNSYLVANIA

3.2.1 Westmoreland County

Seed mixtures, rates, and amendments were selected based on appropriate site conditions and recommendations from Christopher Droste (Conservation District) and adapted from the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual. No pollinator species specific to the County were recommended by the Conservationist.

Recommended Seed Mixtures and Application Rates

TABLE 3.2.1-1

Seed Mix PAWE01: Recommended Cool Season Seed Mixture

	Seeding Application Rate (lbs/acre/PLS)[b]	
Common Species Name	Most Sites	Adverse Sites
Birdsfoot trefoil [a], plus	6	10
-Tall fescue	30	35

[a] For Birdsfoot trefoil use empire variety. For slopes > 33 percent (3H:1V), add perennial rye at 20 lbs/acre. For planting outside March 1 - October 15, use winter oats at 90 lbs/acre and winter rye at 56 lbs/acre.

[b] lbs/acre/PLS = pounds per acre of pure live seed

Recommended Soil Amendments

TABLE 3.2.1-2

Soil Amendment Application Rate Equivalents [a]

Soil Amendment	Per Acre	Per 1,000 Square feet (lbs)	Per 1,000 square Yard (lbs)	Notes
Agricultural lime	7.5 tons	300	3100	Or as per soil test; may not be required in agricultural fields
20-20-20 fertilizer	1,000 lbs	25	210	Or as per soil test; may not be required in agricultural fields

[a] For agricultural or private lands, contractor will use rates above unless otherwise specified by landowner.

TABLE 3.2.1-3

Recommended Mulch Type and Rates

Mulch Type	Per Acre (tons)	Per 1000 Square Feet (lbs)	Per 1000 Square Yard (lbs)	Notes
Straw	3	140	1240	Either wheat or oat straw, free of weeds, not chopped or finely broken
Hay	3	140	1240	Timothy, mixed clover and timothy or other native forage grasses
Wood Chips	4-6	185-275	1650-2500	May prevent germination of grasses and legumes
Hydromulch	1	47	415	See limitations below

Shredded paper hydromulch should not be used in slopes steeper than 5 percent. Wood fiber hydromulch may be applied on steeper slopes provided a tackifier is used. The application rate for any hydromulch should be 2,000 pounds per acre at a minimum.

4.0 REFERENCES

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West Virginia Department of Natural Resources. 2015. Enhancing Wildlife Habitat on Oil and Gas Infrastructure. Available online at: http://www.wvdnr.gov/Publications/OilGasAndWildlife.pdf

Attachment A
Summary of Seed Mixes by County for the Atlantic Coast Pipeline and Supply Header Project

ATTACHMENT A

Summary of Seed Mixtures by County for the Atlantic Coast Pipeline and Supply Header Project

Approximate Milepost Range	County and State	Suggested Cool Season Seed Mix Number [a]	Suggested Warm Season Seed Mix Number [a]	Suggested Pollinator Seed Mix Number [a]	Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information
Atlantic Coast Pipeline					
Spread 1 (AP-1)					
0.0–29.1	Harrison, WV	WVHLRU01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	District Conservationist - Jeff Griffith (304) 624-9232 ext. 11; jeff.griffith@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Lewis, WV	WVHLRU01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	District Conservationist - Jeff Griffith (304) 624-9232 ext. 110; jeff.griffith@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Upshur, WV	WVHLRU01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	Acting State Conservationist - Greg Stone (304) 284-7579; greg.stone@wv.usda.gov. Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
Spread 2 (AP-1)					
29.1–50.6	Upshur, WV	WVHLRU01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	Acting State Conservationist - Greg Stone (304) 284-7579; greg.stone@wv.usda.gov,Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Randolph, WV	WVHLRU01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	District (1) Wildlife Biologist - Steve Rauch (304) 825-6787; Steven.E.Rauch@wv.gov.
Spread 2 A (AP-1)					
50.6-65.3	Randolph, WV	WVHLRU01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	District (1) Wildlife Biologist - Steve Rauch (304) 825-6787; Steven.E.Rauch@wv.gov
Spread 3 (AP-1)					
65.3-79.2	Randolph, WV	WVHLRU01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	District (1) Wildlife Biologist - Steve Rauch (304) 825-6787; Steven.E.Rauch@wv.gov
	Pocahontas, WV	WVPO01	WVPO01; P-MUDW01 or MUMP02; P-NNTC or P-NNGC	P-MUDW01 or MUMP02; P-NNTC or P-NNGC	District Conservationist - Iden Gunther (304) 255-9225; idun.guenther@wv.usda.gov. Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
Spread 3A (AP-1) 79.2-91.3					
	Pocahontas, WV	WVPO01	WVPO01; P-MUDW01 or MUMP02; P-NNTC or P-NNGC	P-MUDW01 or MUMP02; P-NNTC or P-NNGC	District Conservationist - Iden Gunther (304) 255-9225; idun.guenther@wv.usda.gov. Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.

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Approximate Milepost Range	County and State	Suggested Cool Season Seed Mix Number [a]	Suggested Warm Season Seed Mix Number [a]	Suggested Pollinator Seed Mix Number [a]	Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information
	Highland, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist - Charles Ivins (540) 248-6218 ext. 122; charles.ivins@va.usda.gov, Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov.
Spread 4 (AP-1)					
91.3–125.9	Highland, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist - Charles Ivins (540) 248-6218 ext. 122; charles.ivins@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov.
	Bath, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist – Charles Simmons; charles.simmons@va.usda.gov, Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov.
	Augusta, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist - Charles Ivins (540) 248-6218 ext. 122; charles.ivins@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
Spread 5 (AP-1)					
125.9–183.3	Augusta, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist - Charles Ivins (540) 248-6218 ext. 122; charles.ivins@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Nelson, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	State Biologist - Jeffray Jones (804) 287-1691; Jeffray.Jones@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
Spread 6 (AP-1)					
183.3–239.6	Nelson, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	State Biologist - Jeffray Jones (804) 287-1691; Jeffray.Jones@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Nelson, VA; James River WWA	VJRWMA01; VJRWMA02; or VJRWMA03	VJRWMA01; VJRWMA02; or VJRWMA03		Environmental Services Biologists – Amy Ewing (804) 367-2211; Amy.Ewing@dgif.virginia.gov
	Buckingham, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist - David Harris (434) 983-4757 x 101; david.harris@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Cumberland. VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist - David Harris (434) 983-4757 x 101; david.harris@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Prince Edward, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist - J.B. Daniel (434) 392-4171; j.b.daniel@va.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Nottoway, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov

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Approximate Milepost Range	County and State	Suggested Cool Season Seed Mix Number [a]	Suggested Warm Season Seed Mix Number [a]	Suggested Pollinator Seed Mix Number [a]	Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information
Spread 7 (AP-1)					
239.6–300.1	Nottoway, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Dinwiddie, VA	VACSDGS01	VACSDGS01	P-VACSDGS01 or P-VACSDGS02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Brunswick, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Greensville, VA	VACSDGS01	VACSDGS01	P-VACSDGS01 or P-VACSDGS02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Northampton, NC	NCNO01	NCNO02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Paul Boone (252) 534-2591; paul.boone@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
Spread 8 (AP-2)					
0.0–61.6	Northampton, NC	NCNO01	NCNO02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Paul Boone (252) 534-2591; paul.boone@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Halifax, NC	NCHW01	P-CPDW01 or P-CPMP02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist -David Little (252) 237-2711; David.Little@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Nash, NC	NCNJ01	P-CDW01 or P-CPMP02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Patrick Evans (252) 459-4116; patrick.evans@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
Spread 9 (AP-2)					
61.6–61.6	Nash, NC	NCNJ01	P-CPDW01 or P-CPMP02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Patrick Evans (252) 459-4116; patrick.evans@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Roundstone Native Seed (270) 234-7160.
	Wilson, NC	NCHW01	P-CPDW01 or P-CPMP02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist -David Little (252) 237-2711; David.Little@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Johnston, NC	NCNJ01	P-CDW01 or P-CPMP02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Brian Loadholt (919) 934-7156; brian.loadholt@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.

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Approximate Milepost Range	County and State	Suggested Cool Season Seed Mix Number [a]	Suggested Warm Season Seed Mix Number [a]	Suggested Pollinator Seed Mix Number [a]	Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information
	Sampson, NC	NCSA01	NCSA02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Gavin Thompson (910) 592-7963; gavin.thompson@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Cumberland, NC	NCCU01	NCCU01	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Renessa Hardy-Brown (910) 484-8479; renessa.brown@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
Spread 10 (AP-2)					
61.5–183.0	Cumberland, NC	NCCU01	NCCU01	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Renessa Hardy-Brown (910) 484-8479; renessa.brown@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Robeson, NC	P-CPDW01 or P-CPMP02	NCRO01	P-CPDW01, P-CPMP02, or P-NCRO01; P-NNTC or P-NNGC	District Conservationist - Jeremy Roston (910) 739-5478; jeremy.roston@usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
Spread 11 (AP-3)					
0.0–83.0	Northampton, NC	NCNO01	NCNO02	P-CPDW01 or P-CPMP02; P-NNTC or P-NNGC	District Conservationist - Paul Boone (252) 534-2591; paul.boone@nc.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Greensville, VA	VACSDGS01	VACSDGS01	P-VACSDGS01 or P-VACSDGS02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Southampton, VA	VACSDGS01	VACSDGS01	P-VACSDGS01 or P-VACSDGS02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
	Suffolk, VA	VACSDGS01	VACSDGS01	P-VACSDGS01 or P-VACSDGS02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov
Spread 12 (AP-4; AP-5)					
0.0–0.4; 0.0-1.1	Brunswick, VA	VABCHNP01	VABCHNP02	P-VABCHNP01 or P-VABCHNP02	District Conservationist - Davie Wade Harris (434) 848-2145 ext. 102; davie.harris@va.usda.gov
	Greensville, VA	VACSDGS01	VACSDGS01	P-VACSDGS01 or P-VACSDGS02	Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov

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Approximate Milepost Range	County and State	Suggested Cool Season Seed Mix Number [a]	Suggested Warm Season Seed Mix Number [a]	Suggested Pollinator Seed Mix Number [a]	Federal, State/Commonwealth, or local Agency/ Subject Matter Expert Contact Information
Supply Header Project					
Spread 13 (TL-635)					
0.0–33.6	Wetzel, WV	WVWE01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	District Conservationist - Dustin Adkins (304) 758-2173; dustin.adkins@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Wetzel, WV; Lewis Wetzel WMA	WVLWWMA01			District Wildlife Biologist - Steve Rauch (304)825-6787; steven.e.rauch@wv.gov
	Doddridge, WV	WVDH01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	Acting State Conservationist - Greg Stone (304) 284-7579; greg.stone@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Tyler, WV	WVWE01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	District Conservationist - Dustin Adkins (304) 758-2173; dustin.adkins@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
	Harrison, WV	WVDH01	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	P-MUDW01 or P-MUMP02; P-NNTC or P-NNGC	Acting State Conservationist - Greg Stone (304) 284-7579; greg.stone@wv.usda.gov. Private Lands Biologist - Bob Glennon (757) 357-7004, ext. 126; Robert.Glennon@va.usda.gov. Roundstone Native Seed (270) 234-7160.
Spread 14 (TL-636)					
0.0–3.9	Westmoreland, PA	PAWE01	None Recommended	None Recommended	Westmoreland Conservation District, Christopher Droste, Senior Erosion Control Specialist (724) 837-5271; chris@wcdpa.com.

[a] Tables describing each seed mix are located within the text of Appendix A.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT

Restoration and Rehabilitation Plan

Appendix C
Recommended Seed Mixes by Milepost
(to be provided prior to construction)