

APPENDIX H Restoration Plan

Appendix H

Restoration Plan

Mountain Valley Pipeline Project

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Mountain Valley Pipeline Project Restoration Plan

1.0 INTRODUCTION

Mountain Valley Pipeline, LLC (MVP), a joint venture between EQT Midstream Partners, LP and affiliates of NextEra Energy, Inc.; Con Edison Gas Midstream LLC; WGL Holdings, Inc.; and RGC Midstream, LLC (collectively referred to as MVP), is seeking a Certificate of Public Convenience and Necessity (Certificate) from the Federal Energy Regulatory Commission (FERC) pursuant to Section 7(c) of the Natural Gas Act authorizing it to construct and operate the proposed Mountain Valley Pipeline Project (Project) located in 17 counties in West Virginia and Virginia. MVP plans to construct an approximately 303-mile, 42-inch-diameter natural gas pipeline to provide timely, cost-effective access to the growing demand for natural gas for use by local distribution companies, industrial users, and power generation in the Mid-Atlantic and southeastern markets, as well as potential markets in the Appalachian region. Construction is anticipated to begin in 2017 and conclude in the fourth quarter of 2018. Construction on National Forest System lands will occur in 2018.

The proposed pipeline will extend from the existing Equitrans, L.P. transmission system and other natural gas facilities in Wetzel County, West Virginia to Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 compressor station 165 in Pittsylvania County, Virginia. In addition to the pipeline, the Project will include approximately 171,600 horsepower of compression at three compressor stations currently planned along the route, as well as measurement, regulation, and other ancillary facilities required for the safe and reliable operation of the pipeline. The pipeline is designed to transport up to 2.0 million dekatherms per day of natural gas.

A 3.6-mile long segment of the Project will cross portions of the Jefferson National Forest (JNF) in Monroe County in southern West Virginia and in Giles, Craig, and Montgomery counties in southwestern Virginia. The JNF is managed by the U.S. Forest Service (FS) of the U.S. Department of Agriculture. Another 60-foot segment of the Project will cross the Weston and Gauley Bridge Turnpike Trail (Weston and Gauley Turnpike) in Braxton County, West Virginia, which is administered by the U.S. Army Corps of Engineers (USACE). Approval to cross land managed by two or more federal agencies is the responsibility of the U.S. Department of the Interior, Bureau of Land Management (BLM) through issuance of a Right-of-Way Grant. Project-wide construction environmental compliance will be the responsibility of the FERC. The FS and USACE will also ensure compliance across lands managed or administered by those agencies. Because the majority of federal lands crossed are managed by the FS, this plan focuses on the JNF, noting any additional or different requirements that are specific to the crossing of the Weston and Gauley Turnpike.

The FS will be responsible for enforcement of the terms and conditions of the BLM's right-of-way Grant on National Forest System lands during the term of the right-of-way Grant for the Mountain Valley Pipeline project. Compliance will be monitored on the JNF portion of this project by the FS Project Manager and the Authorized Officer's designated

compliance monitors. FS will have stop work authority per terms outlined in the BLM right-of-way grant. FS will also have stop work authority if unsafe work conditions are encountered during construction.

The Project has potential to impact sensitive environmental resources and, as a result, environmental protection measures have been developed to minimize potential impacts on these resources and will be applied, as applicable, to the Project.

2.0 RESTORATION GOALS AND OBJECTIVES

This Restoration Plan focuses on the stabilization and protection of existing vegetation and soils; minimizing disturbance of the environment to the extent practical; and establishing vegetation communities that are consistent and compatible with adjacent land uses. The goal of this plan is to provide a structure for developing and implementing the Project's restoration process on the JNF, which will be designed to restore impacted areas to meet the following objectives:

- Topsoil segregation and stockpiling;
- Right-of-way stabilization and restoration;
- Seedbed preparation and re-seeding;
- Noxious- and invasive-weed control;
- Revegetation to meet Scenic Integrity Objectives within five years; and
- Road reclamation.

Restoration of disturbed habitats can be achieved through short- and long-term objectives. The short-term objectives are to stabilize disturbed areas to minimize potential erosion and sedimentation, establish temporary vegetation cover, prevent or minimize the introduction and spread of noxious- and invasive-weed species, and conserve suitable topsoil for long-term reclamation activities. The long-term objective is to establish permanent vegetation cover that is suitable for the land use, is self-sustaining, and, where applicable, is resistant to the introduction or spread of noxious- and invasive-weed species.

Measures to achieve these goals include the following:

- Use proper soil-management techniques, including stripping, stockpiling, and re-applying topsoil material at temporarily disturbed areas to restore soil horizons; use appropriate seed mixes; and establish surface conditions that would allow for the rapid re-establishment of vegetative cover;
- Establish stable soil surface and drainage conditions and use applicable best-management practices (BMPs) that would minimize surface erosion and sedimentation as well as facilitate plant establishment;
- Re-establish topography to pre-construction conditions to the extent practical;
- Conduct appropriate weed treatment methods: pre-construction weed surveys; pre-construction weed-control treatments at locations identified by pre construction weed surveys (areas with large weed infestations within or adjacent to the Project right-of-way); and post-construction weed treatment (e.g., re-seeding and/or site

restoration) to pre-disturbance conditions as documented by pre-construction surveys;

- Conduct post-construction monitoring; and
- Ensure that all restoration measures and the Restoration Plan comply with the FS needs and requirements on the JNF and incorporates all requirements found in the federal Right-of-Way Grant.

3.0 DEVELOPMENT AND IMPLEMENTATION OF THE PLAN

In general, MVP will follow the directions and requirements in the FERC *Upland Erosion Control Revegetation and Maintenance Plan* (Plan) as well as the FERC *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) during restoration efforts. However, MVP will also follow any requirements of the FS that exceed those of the FERC Plan and Procedures when conducting restoration efforts on the JNF including the Suggested Seeding Techniques for Pipeline Rights-of-Way and Associated Disturbances on the Monongahela and George Washington-Jefferson National Forests and the FS Tree and Shrub Planting Guidelines for Pipeline Rights-of-Way and Associated Disturbances. The additional FS requirements and measures that have been identified to-date have been incorporated into this plan. The FERC Plan and Procedures can be found in Attachments H-1 and H-2 of this document. The FS recommendations for seeding techniques and seed mixes can be found in Attachment H-3. Finally, the FS Tree and Shrub Planting Guidelines for Pipeline Rights-of-Way and Associated Disturbances can be found in Attachment H-4.

If any variances from the FERC Plan and Procedures or the FS's restoration requirements are necessary on the JNF, MVP would be required to file for a variance request and this request would need to be approved by the FERC and FS before it could be implemented. These variance requests would need to be filed for and approved on a case-by-case basis.

3.1 Topsoil and Spoil Treatment

As requested by the FS, MVP will prevent the mixing of topsoil and subsoil during construction by stripping topsoil from the permanent and temporary right-of-way during construction on the JNF. The stockpiled topsoil and subsoil will be stored separately within the 125-foot construction right-of-way, and will be replaced in the proper order during backfilling and final grading in order to prevent mixing of the soil horizons. MVP will identify and segregate the topsoil layer from the subsoil layer as described in the FERC Plan and Procedure (Attachments H-1 and H-2) and as indicated in Figure 1 below. All stockpiled spoils will be stored at least 10 feet from waterbodies, and within approved construction areas (as required by the FERC Plan and Procedures). Erosion and sedimentation controls will be installed around stockpiled spoils to ensure that they do not erode and impact adjacent areas.

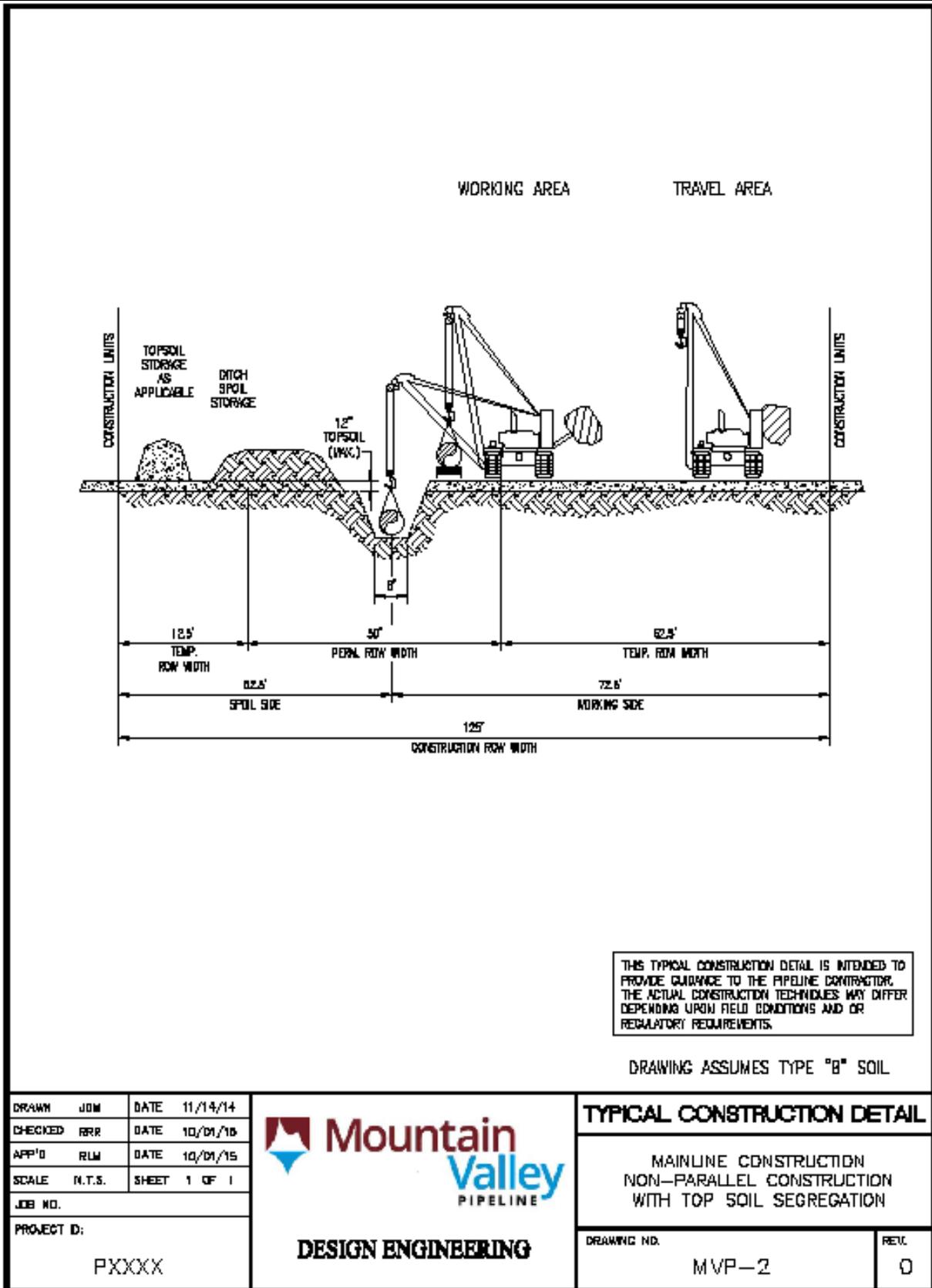


Figure 1. Top Soil Segregation.

3.2 Installation of Erosion Controls

Temporary erosion controls will be installed prior to or concurrently with construction activities that can disturb soils, and these controls will be inspected and maintained throughout the construction process. These erosion controls will be inspected on a daily basis in areas that are currently experiencing active construction or equipment operation, on a weekly basis in areas where no active construction is currently occurring, and within 24 hours in areas that have just received a rainfall event of at least 0.25-inch. Any necessary repairs that are identified during these inspections will be conducted within 24 hours. Inspection and repair of temporary erosion controls will continue until they are replaced by permanent erosion controls or until restoration efforts are completed. Temporary erosion control devices include temporary slope breakers, sediment barriers, trench plugs, and mulch. As requested by the FS for implementation on the JNF, erosion control and sediment control products will be promptly removed after soils are stable and vegetative cover is established.

Temporary slope breakers are intended to reduce runoff velocities and divert water to vegetated areas off the construction right-of-way. Temporary sediment barriers are installed to stop the movement of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive areas. As indicated in the FERC Plan, these structures can be constructed of materials such as soil (e.g., diversion ditches), sand bags, silt-fences (which are only applicable for sediment barriers, not slope breakers), or other approved materials. As requested by the FS, silt fences reinforced with metal or plastic mesh will be avoided if possible. In the case of the temporary slope breakers, water will be directed to a stable well-vegetated area or to an energy-dissipating device. The required spacing for these controls is outlined in the erosion and sedimentation control sheets in Appendix C.

Temporary trench plugs are intended to segment a continuous open trench prior to backfilling in order to prevent pooling and movement of water along the open trench. These plugs will consist of unexcavated portions of the trench (i.e., undisturbed soils), compacted subsoils, sandbags, or some functional equivalent.

Mulch will be applied to all disturbed slopes that have the potential to erode in order to stabilize the soil and to reduce wind and water erosion. All materials will be certified weed free or contain testing results from the vendor for noxious weed content. Should the selected mulch need to be mixed with water, the water source would also need to be approved by the FS. The FS requires that mulch be spread uniformly over an affected area to at least 75 percent coverage at a rate of 2-4 tons/acre. This rate can be increased or decreased on the JNF based on slope classes. However, the following describes the FS requirements regarding mulch applications, which would be followed on the JNF:

- Materials will be certified weed free or be accompanied by vendor's test results for noxious weed content. Hay will not be used on the JNF;
- Seeded areas can be mulched with weed free straw at a rate of 2-4 tons/acre (hand spread or blown), fiber mulch hydro-seeded at 1-2 tons/acre or other appropriate material;

- Natural biodegradable products will be used and materials will be demonstrated to be free of invasive species, including but not limited to plants, pests, and pathogens;
- If the use of stabilization netting is required/permitted, wildlife friendly geotextiles will be used. These products must either be free of netting or netting must be made of 100% biodegradable non-plastic materials such as jute, sisal, or coir fiber. Plastic netting (such as polypropylene, nylon, polyethylene, and polyester), even if advertised as biodegradable, is not an acceptable alternative. Any netting used must also have a loose-weave design with movable joints between horizontal and vertical twines to reduce the chance for wildlife entanglement, injury, or death; and
- Water used for any products that require mixing with water will come from a FS-approved water source. The source of water must not be contaminated with non-native invasive organisms that could spread into streams.

3.3 Re-contouring

All disturbed areas will be regraded and re-contoured to blend into the surrounding landscape and to reestablish natural drainage patterns and to be compatible with surrounding drainage patterns, except at those locations where permanent changes in drainage will be required to prevent erosion, scour, and possible exposure of the pipeline. The emphasis during re-contouring will be to return the entire right-of-way to its approximate original contours, stabilize slopes, control surface drainage, and aesthetically blend the area with the contours of adjacent lands. The re-contouring and replacement of topsoil in areas of disturbed wetlands to their original grade is especially critical so that the wetland hydrology is not altered. If existing culverts are damaged or removed during construction, they will be replaced to their original or better condition in order to maintain the original hydrology.

3.4 Construction Debris Removal

During final cleanup, all construction debris (e.g., mats, garbage, etc.) will be cleared from the construction area and disposed of in accordance with state and local regulations. Excess rock and spoil materials will be distributed along the construction right-of-way or disposed of in existing quarries or in permanent disposal sites. Hazardous materials will be handled and disposed of as described in the Project's Hazardous Materials Management Plan (Appendix Y to the POD).

All non-merchantable brush and slash will be windrowed to the edge of the right-of-way or removed from the area in accordance with FS requirements as described in the Timber Removal Plan (Appendix I to the POD). Windrowing of non-merchantable brush and slash along the right-of-way will result in habitat for many types of wildlife including: rabbits and other small mammals, ruffed grouse, song birds, and reptiles. Over time, the windrows will provide food for wildlife as insects will establish residence in the materials. The windrows can serve as escape cover from predators, locations for nesting, and shelter from inclement weather. The windrows should be restricted to 8 feet tall, 20 feet wide, and 100 feet long with a 50-foot break between piles in order to provide fire breaks and wildlife crossings. Non-merchantable brush and slash can be utilized in downslope areas of the right-of-way and access roads to aide in soil stabilization and erosion control. Layering the brush and slash at the toe of a low-side slope along an access road provides

for physical protection in the form of soil stabilization, as well as erosion and sediment control. Layering of brush and slash can promote physical protection to the downslope areas of the right-of-way. Additionally, the layering can provide long-term support for revegetation in downslope areas of the right-of-way. Any remaining non-merchantable timber that cannot be windrowed will be chipped into trucks and removed from the site.

3.5 Seedbed Preparation

Areas targeted for restoration will be prepared for reseeding prior to the implementation of revegetation efforts in order to create a seedbed that is conducive to proper seed placement and moisture retention (as described in the FERC Plan and Procedures). Permanent erosion control devices will be installed to minimize the risk of erosion, and mulch will be used to prevent soils from eroding or desiccating (as described above).

Compaction of soils can reduce the likelihood of disturbed areas being successfully revegetated following disturbance. In order to minimize soil compaction, construction activities will be timed to dry periods to the extent possible, and construction mats will be used in wetland habitats. Per the JNF Goal and Objective FW-8, no heavy equipment will be used on plastic soils when the water table is within 12 inches of the surface or when soil moisture exceeds the plastic limit. In contracts to JNF Goal and Objective FW-118, heavy equipment will have to be used during site preparation on sustained slopes over 35 percent, or on sustained slopes over 20 percent when soils have a high erosion hazard or are failure-prone. Mountain Valley will use winched construction techniques to prepare and construct the right-of-way in these areas. If compacted soils are identified within areas targeted for restoration, the compacted soils will be ripped to a depth of at least 6 to 8 inches.

As stated in Section 3.1, stockpiled topsoil and subsoil will be stored separately, and will be replaced in the proper order during backfilling and final grading, prior to seeding. Following topsoil placement, dry fertilizer and lime will be incorporated into the top two to five inches of soil by disking or other means. The following are guidelines for fertilizer and lime application rates recommended by the FS:

- Fertilizer:
 - 600 – 800 lbs/acre of 10-20-10 (Nitrogen [N], Phosphorous [P], Potassium [K]) fertilizer;
 - 400 lbs/acre of 15-30-15 (N-P-K) fertilizer; or
 - 800-1000 lbs/acre of 10-10-10 (N-P-K) fertilizer.
- Lime:
 - 1500-4000 lbs/acre (pelletized or dust); or
 - 4000 lbs/acre of Hydro Lime (2.5 gal container is equivalent to 1000 lbs limestone; 5-10 containers /acre).

Soil chemistry tests will be conducted in areas where revegetation potential is low or revegetation is unsuccessful. The fertilizer and liming rates described above will be adjusted accordingly based on the results of site-specific soil tests. Soil chemistry data

will be submitted to the FS following testing, and any modifications to the fertilizer or lime application rates described above will be provided to the FS for approval prior to use.

3.6 Streambank Stabilization and Wetlands

The stabilization of streambanks and areas adjacent to waterbodies is critical to minimize the risk of erosion and slope failure. The methods that would be implemented to stabilize and restore streambanks can be found in the POD and are summarized here. Streambanks will be restored by vegetative stabilization where site conditions warrant or by riprap where banks with a slope of 3:1 or more exist. Vegetative stabilization generally includes planting a temporary erosion control seed mix, followed by a native perennial seed mix (for slopes less than 3:1) or a permanent erosion control seed mix (for slopes 3:1 or greater; see Section 3.6 for more details). If grubbing has not been extensive, then native shrub and tree species are expected to sprout and regenerate naturally. Streambanks will be treated with lime and fertilizer then the seed will be applied and lightly covered with soil before mulch is added to the area. Rock, soil imported from outside the wetland, tree stumps, or brush riprap will not be used to stabilize the right-of-way in wetlands. A sediment barrier will be maintained at the edge of the water until revegetation is successful (see Section 3.2 for a description of erosion control devices).

3.7 Seed Mixes

MVP consulted with the FS regarding appropriate seed mixtures for use within the JNF. The FS indicated that the initial goal of seeding on the JNF is to establish vegetative cover to minimize surface erosion and sedimentation, while the secondary goal is to establish an assortment of native species congruent with local ecological communities and beneficial for wildlife and pollinators. Native plants that provide structural diversity and wildlife/pollinator benefits often do not germinate or grow fast enough to provide initial erosion control (see Attachment H-3); therefore, these goals will be accomplished through the use of seed mixes that include both fast-growing, annual/short-lived perennial non-native grass species approved by the FS, as well as some perennial native species.

The following FS recommendations regarding seeds and seed mixes will be implemented:

- Seeds shall be Virginia or West Virginia certified seed (i.e., seed certification shall meet each state's standards for certified seed classification, and bag tags will be attached) or alternative seed sourced from FS-approved distributors;
- For native species, local ecotypes for native seeds shall be used, in the following order of preference:
 - From within the state;
 - From the mountain regions of an adjoining state; and
 - From within 100 miles, as long as it is within the Appalachian mountain ecosystem; and
- All leguminous seeds shall be either pre-inoculated or mixed with inoculant¹ specified for use on that particular seed according to manufacturer's directions.

¹ Microbial inoculants are amendments that use beneficial endophytes (i.e., microbes) to promote plant health.

Inoculants shall be manually applied at double the manufacturer's rate, and inoculant shall be mixed with legume seed prior to mixing with other seeds. For hydroseeding, a minimum of five times the dry seeding rate of inoculant will be used (Flynn, 2015; Monsanto BioAg 2015).

For areas that will be seeded through drill seeding or mechanical broadcast seeding, two different seed mixes will be developed, one for use in upland areas and one mix for riparian areas. These two seed mixes are described in Tables 3.7-1 (for upland areas) and 3.7-2 (for riparian areas). Areas that are too steep or inaccessible for drill seeding or mechanical broadcast seeding will be treated with a third seed mix. This seed mix is described in Table 3.7-3 and will be applied concurrently with a temporary erosion control seed mix when possible.

Low pH levels were often encountered during soil profile surveys conducted for the Project within the JNF (MVP 2016); therefore, Tables 3.7-1 through 3.7.3 provide the pH preference for each plant species, if known (also see Section 3.5 regarding proposed applications of lime during seed bed preparation). The final species chosen for each seed mix will be based on the availability of seeds.

At least two of the non-native species for erosion control and five of the native species listed in Table 3.7-1 will be included in the final upland seed mix. At least two of the non-native species for erosion control and five of the native species listed in Table 3.7-2 will be included in the final riparian seed mix.

<i>Scientific Name</i>	Common Name	Growth Habit	pH Preference
Non-native Species for Temporary Erosion Control			
<i>Lolium perenne</i> subsp. <i>multiflorum</i>	Italian ryegrass; annual ryegrass	Graminoid	5.0 – 7.9
<i>Urochloa ramosa</i> (<i>Panicum ramosum</i>)	Browntop millet	Graminoid	5.5 – 6.9
<i>Secale cereale</i>	Cereal rye	Graminoid	5.2 – 8.0
<i>Setaria italica</i>	Foxtail millet	Graminoid	5.3 – 6.9
Native Species			
<i>Chasmanthium laxum</i> ^a	Slender woodoats	Graminoid	4.5 – 7.0
<i>Eragrostis spectabilis</i> ^a	Purple lovegrass	Graminoid	4.0 – 7.5
<i>Panicum virgatum</i>	Switchgrass	Graminoid	4.5 – 8.0
<i>Sorghastrum nutans</i>	Indiangrass	Graminoid	5.0 – 7.8
<i>Tridens flavus</i> ^a	Purpletop	Graminoid	4.5 – 6.5
<i>Apocynum cannabinum</i> ^a	Indian hemp	Forb	4.5 – 7.0
<i>Chamaecrista fasciculata</i>	Partridge pea	Forb	5.5 – 7.5
<i>Desmodium canadense</i>	Showy ticktrefoil	Forb	wide tolerance
<i>Desmodium paniculatum</i>	Panicledleaf ticktrefoil	Forb	6.0 – 7.0
<i>Elymus virginicus</i> ^b	Virginia wildrye	Graminoid	5.0 – 7.4
<i>Geum canadense</i> ^a	White avens	Forb	4.5 – 7.5
<i>Heliopsis helianthoides</i>	Oxeye sunflower; smooth oxeye	Forb	unknown
<i>Monarda fistulosa</i> ^b	Wild bergamot	Forb	6.0 – 8.0
<i>Pycnanthemum</i> spp. ^b	Mountain mint	Forb	unknown

Table 3.7-1			
Species for Upland Seed Mix			
<i>Scientific Name</i>	Common Name	Growth Habit	pH Preference
<i>Rubus allegheniensis</i> ^a	Common blackberry; Allegheny blackberry	Forb/ Subshrub	4.6 – 7.5
<i>Rudbeckia hirta</i>	Blackeyed Susan	Forb	6.0 – 7.0
<i>Solidago canadensis</i> ^a	Canada goldenrod	Forb	4.8 – 7.5
<i>Tradescantia virginiana</i> ^a	Virginia spiderwort	Forb	4.0 – 8.0
<p>^a/ This species is more tolerant of low pH soils ^b/ Species is a good choice for higher elevation (i.e., areas higher than 3,000 feet or lower sites where the presence of red spruce indicates cold conditions) areas.</p>			

Table 3.7-2			
Species for Riparian Seed Mix			
<i>Scientific Name</i>	Common Name	Habit	pH Preference
Non-native Species for Temporary Erosion Control			
<i>Lolium perenne</i> subsp. <i>multiflorum</i>	Italian ryegrass; annual ryegrass	Graminoid	5.0 – 7.9
<i>Urochloa ramosa</i> (<i>Panicum ramosum</i>)	Browntop millet	Graminoid	5.5 – 6.9
<i>Secale cereale</i>	Cereal rye	Graminoid	5.2 – 8.0
<i>Setaria italica</i>	Foxtail millet	Graminoid	5.3 – 6.9
Native Species			
<i>Agrostis perennans</i>	Autumn bentgrass; upland bentgrass	Graminoid	5.5 – 7.5
<i>Elymus virginicus</i>	Virginia Wildrye	Graminoid	5.0 - 7.4
<i>Sorghastrum nutans</i>	Indiangrass	Graminoid	5.0 – 7.8
<i>Asclepias incarnata</i>	Swamp milkweed	Forb	5.0 – 8.0
<i>Chamaecrista fasciculata</i>	Partridge pea	Forb	5.5 – 7.5
<i>Eutrochium fistulosum</i> (<i>Eupatorium fistulosum</i>)	Joe pye weed	Forb	4.5 – 7.0
<i>Eupatorium maculatum</i>	Spotted joe pye weed	Forb	5.5 – 7.0
<i>Eupatorium perfoliatum</i>	Boneset	Forb	unknown
<i>Helenium autumnale</i>	Common sneezeweed	Forb	4.0 – 7.5
<i>Senna hebecarpa</i>	Wild senna; American senna	Forb	unknown
<i>Senna marilandica</i>	Maryland senna	Forb / Subshrub	4.0 – 7.0
<i>Vernonia noveboracensis</i>	New York ironweed	Forb	4.5 -8.0

For areas that will be hydroseeded, at least one of the non-native species for temporary erosion control and five of the native species listed in Table 3.7-3 will be included in the final seed mix. A minimum of 100 pounds per acre of the hydroseed seed mix will be applied unless otherwise specified by the seed mix provider.

Table 3.7-3			
Hydroseed Seed Mix			
<i>Scientific Name</i>	Common Name	Growth Habit	pH Preference

Non-native Species for Temporary Erosion Control			
<i>Lolium perenne</i> subsp. <i>multiflorum</i>	Italian ryegrass; annual ryegrass	Graminoid	5.0 – 7.9
<i>Urochloa ramosa</i> (<i>Panicum ramosum</i>)	Browntop millet	Graminoid	5.5 – 6.9
<i>Secale cereale</i>	Cereal rye	Graminoid	5.2 – 8.0
<i>Setaria italica</i>	Foxtail millet	Graminoid	5.3 – 6.9
Native – Highly Preferred			
<i>Sorghastrum nutans</i>	Indiangrass	Graminoid	5.0 – 7.8
<i>Tridens flavus</i>	Purpletop	Graminoid	4.5 – 6.5
Native – Preferred			
<i>Agrostis perennans</i>	Autumn bentgrass; upland bentgrass	Graminoid	5.5 – 7.5
<i>Dichanthelium clandestinum</i>	Deertongue	Graminoid	4.0 – 7.5
<i>Elymus canadensis</i>	Canada wildrye	Graminoid	5.0 – 7.9
<i>Desmodium canadense</i>	Showy ticktrefoil	Forb	wide tolerance
<i>Heliopsis helianthoides</i>	Oxeye sunflower; smooth oxeye	Forb	unknown
<i>Lespedeza virginica</i>	Slender bushclover; slender lespedeza	Forb	acid tolerant
<i>Liatris spicata</i>	Dense blazing star; spiked gayfeather	Forb	5.6 - 7.5
<i>Senna hebecarpa</i>	Wild senna; American senna	Forb	unknown
Native – Moderately Preferred			
<i>Panicum virgatum</i>	Switchgrass	Graminoid	4.5 – 8.0
<i>Chamaecrista fasciculata</i>	Partridge pea	Forb	5.5 – 7.5
<i>Rudbeckia hirta</i>	Blackeyed Susan	Forb	6.0 – 7.0

Seeding with the seed mixes listed in Tables 3.7-1 through 3.7-3 must occur only during the normal seeding season (i.e., spring March 15 – June 1 or fall August 15 – October 15). If this is not possible, a temporary erosion control seed mix will be applied, followed by seeding with one of the permanent seed mixes, as described above and in Tables 3.7-1 through 3.7.3, during the next normal seeding season. A temporary erosion control seed mix will consist of at least two of the non-native species for temporary erosion control listed in the tables above.

Table 3.7-4 below provides recommendations for seed mixes and application methods, by milepost, within the JNF. These recommendations are based on the approximate slope and habitat type that may be found within these locations; however, the final decision for seed mix and application method will be based on site-specific conditions as well as accessibility of an area for planting equipment.

Table 3.7-4					
Suggested Seed Mixes and Seeding Methods for the Jefferson National Forest^a					
Approximate Milepost	Slope	Habitat	Seed Mix(es)	Application Method(s)^a	Minimum Seeding Rate^b (lbs/acre)
196.2 - 196.3	>50%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100

Table 3.7-4

Suggested Seed Mixes and Seeding Methods for the Jefferson National Forest^a

Approximate Milepost	Slope	Habitat	Seed Mix(es)	Application Method(s)^a	Minimum Seeding Rate^b (lbs/acre)
196.4 – 196.65	20-50%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
196.65 ^c	10 - 20	Riparian / Upland Forest ^c	Riparian Seed Mix – see Table 3.7-2 Upland Seed Mix – see Table 3.7-1	Drill Seed	30
196.65 – 196.7	20-40%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
196.7 – 196.95	0-30%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed	30
196.95 - 197.0	20-50%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
197.0 – 197.6 ^d	0-30%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed ^d	30
197.6 – 197.8	20-40%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
198.0 - 198.1 ^d	10-30%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed ^d	30
198.3 – 198.4 ^d	10-30%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed ^d	30
218.5 – 218.6	30- >50%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
218.6 – 218.65	10-30%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed	30
218.65 – 218.7	20-40%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
218.7 – 218.78	20-50%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
218.78 – 218.81	30-50%	Riparian	Riparian Seed Mix – see Table 3.7-2	Drill Seed or Mechanical Broadcast	30 or 60
218.81 – 219.0 ^d	10-30%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed ^d	30
219.0 – 219.1	30-50%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
219.1 – 219.15	0-20%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed	30
219.15	0-10%	Riparian	Riparian Seed Mix – See Table 3.7-2	Drill Seed	30
219.15 – 219.18	0-20%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed	30
219.18 - 219.2	0-20%	Riparian	Riparian Seed Mix – See Table 3.7-2	Drill Seed	30

Approximate Milepost	Slope	Habitat	Seed Mix(es)	Application Method(s) ^a	Minimum Seeding Rate ^b (lbs/acre)
219.2 – 219.4	0-30%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed	30
219.8 – 219.85	10-30%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed	30
219.85 – 219.9	20-50	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
219.9 – 219.92	10-30%	Riparian	Riparian Seed Mix – see Table 3.7-2	Drill Seed	30
219.92 – 220.25 ^e	20-50%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed ^e	60 or 100
220.25 – 220.4 ^d	20- >50% ^d	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed ^d	30
220.4 – 220.7	30- >50%	Upland Forest	Upland Seed Mix – see Table 3.7-1 or Hydroseed Seed Mix– see Table 3.7-3	Mechanical Broadcast or Hydroseed	60 or 100
220.7 – 220.75 ^d	0-40%	Upland Forest	Upland Seed Mix – see Table 3.7-1	Drill Seed ^d	30

^{a/} These are estimated slopes and suggested seed mixes and application methods. Conditions on the ground may result in modifications to recommendations in this table.
^{b/} This is the minimum pounds per acre of seed to be applied unless otherwise specified by the seed mix provider and approved by the FS.
^{c/} Only a portion of the right-of-way in this area may be a riparian area; both a riparian seed mix and upland seed mix will likely be required in this area.
^{d/} Some areas may exceed 30% slopes and may require mechanical broadcast or hydroseeding.
^{e/} Slopes in this area are generally greater than 30% and will likely require mechanical broadcast or hydroseeding; however, portions of this area may be less than 30% and drill seeding may be possible in these areas.

Table 3.7-5 below provides recommendations for seed mixes for wetlands within the JNF. For each habitat type (dry, high, riparian, wet): select five or more of the following species, and/or suggest an existing restoration seed mix composed primarily of local genotypes (as described above) and not containing anything that would act invasive at the site. A temporary cover crop will also likely be necessary to stabilize the site and protect overwintering seeds.

<i>Scientific Name</i>	Common Name
<i>Baptisia australis</i>	Blue False Indigo
<i>Elymus hystrix (Hystrix patula)</i>	Bottlebrush Grass
<i>Anemone canadensis</i>	Canadian Burnet
<i>Panicum clandestinum (Dichanthelium c.), 'Tioga'</i>	Deertongue, 'Tioga'
<i>Carex crinita</i>	Fringed (Nodding) Sedge
<i>Lobelia siphilitica</i>	Great Blue Lobelia
<i>Vernonia noveboracensis</i>	New York Ironweed

<i>Scientific Name</i>	<i>Common Name</i>
<i>Juncus tenuis</i>	Path Rush
<i>Eupatorium purpureum</i>	Purple Node Joe Pye Weed
<i>Panicum rigidulum (P. stipitatum)</i>	Redtop Panicgrass
<i>Juncus effusus</i>	Soft Rush
<i>Eupatorium maculatum (Eupatoriadelphus maculatus)</i>	Spotted Joe Pye Weed
<i>Carex squarrosa</i>	Squarrose Sedge
<i>Asclepias incarnata</i>	Swamp Milkweed
<i>Panicum virgatum, 'Cave-In-Rock'</i>	Switchgrass, 'Cave-In-Rock'
<i>Carex stricta</i>	Tussock Sedge
<i>Senna hebecarpa (Cassia h.)</i>	Wild Senna
<i>Scirpus cyperinus</i>	Woolgrass

3.8 Seeding Methods

Seeding will occur promptly after construction is complete; however, if ground conditions delay restoration until the following spring, the ground will be mulched and seeding will take place during the next growing season. A Winter Construction Plan (Appendix M in the POD) has been prepared to address how restoration and revegetation would proceed if seeding could not be completed before the onset of winter. Additionally, if seeding must occur outside the normal seeding season (approximately March 15 – June 1 or August 15 – October 15, depending on elevation), a temporary erosion control seed mix will be applied, and either a permanent erosion control seed mix or native seed mix will be applied during the next normal seeding season.

Seeding will be conducted using drill seeding, mechanical broadcast seeding, or hydroseeding according to the guidelines in the FERC Plan and/or specifications made by the FS. These methods are described in more detail below.

Drill seeding is a mechanical seeding method that places seed directly into the soil, which allows seeds to be directly in contact with the soil. Due to the equipment required, however, drill seeding is generally limited to areas with slopes less than 3:1 (USDA-NRCS 2005). Because native seed mixes need to be drilled or otherwise covered to enhance germination success (see Attachment H-3), drill seeding is the preferred option to be used in areas where a native seed mix will be applied (see Section 3.7).

Broadcast seeding will be the preferred seeding method used on steep slopes (i.e., slopes greater than 3:1); other areas that cannot be accessed with other seeding equipment; areas that will be covered with erosion control fabric; or other areas determined to be appropriate for broadcast seeding by the Environmental Inspector and FS. Seeds will be broadcast with a mechanical seeder immediately after the seedbed has been prepared and the soil is loose. This will allow the seeds to be lightly covered as the soil settles. The seeded area may also be disrupted by lightly dragging the area with chains or other appropriate harrows to lightly cover the seed. Broadcast seeding will occur immediately prior to installation of erosion control fabric or the application of mulch. If the use of stabilization netting is required/permitted, wildlife friendly geotextiles must be used. These

products must either not contain netting, or netting must be made of 100% biodegradable non-plastic materials such as jute, SISAL, or Coir Fiber. Plastic netting (such as Polypropylene, Nylon, Polyethylene, and Ployester), even if advertised as biodegradable, is not an acceptable alternative. Any netting used must also have a loose-weave designed with movable joints between horizontal and vertical twines to reduce the chance for wildlife entanglement, injury, or death.

Hydroseeding will be used in upland areas that can be safely accessed with hydroseeding equipment, on slopes where drill seeding is not feasible (i.e., slopes greater than 3:1), and in areas determined to be appropriate for this method by the Environmental Inspector and FS. Hydroseeding equipment shall be equipped with sufficient tanks, pumps, nozzles, and other devices required for mixing and hydraulically applying the seed, wood fiber mulch, and tackifier mix in slurry form onto the prepared ground. The hydroseeding equipment shall have built-in agitators, which will keep the seed, mulch, tackifier, and water mixed homogeneously until pumped from the tank. Hydroseeding and hydromulching will be done from two directions (e.g., left and right or up and down), where feasible, to ensure maximum coverage of the soil. The amount of tackifier will be adjusted based on the slope of area being hydroseeded. For example, typical application rates for guar (a plant-based tackifier) range from 40 lbs/acre for flat areas to 50 lbs/acre for 33 percent (3:1) slopes (California Stormwater Quality Association 2003). In addition, the following FS recommendations will be implemented in areas that are hydroseeded:

- Hydroseeding will occur during a periods of dry weather, whenever possible, as wood-fiber hydraulic mulches are generally short-lived and require a 24-hour period to dry before rainfall occurs;
- Materials or additives used as binders or emulsifiers will not be toxic to soil organisms or otherwise prevent or inhibit seed germination;
- Only products suitable for wildlife will be used;
- Tackifiers will be non-toxic and organic based (e.g., guar, psyllium, or pitch and rosin emulsions); and
- Tackifiers to be used, application rates, and methods of application will be submitted to the FS for approval prior to use.

Following application of seed mix, mulch will be applied as described in Section 3.2.

3.9 Tree and Shrub Planting

The primary method of restoration of vegetation will be the use of the seeding methods as described in Sections 3.7 and 3.8; however, replanting of sapling trees and shrubs would be conducted within the entire corridor of the JNF including the stream banks of table 3.9.1.

Table 3.9.1	
Stream Banks Designated for Replanting	
Waterbody Name	Waterbody ID
Unnamed Tributary to Craig Creek	S-PP20
Unnamed Tributary to Craig Creek	S-PP21
Unnamed Tributary to Craig Creek	S-HH18

Planting of sapling trees and shrubs would follow FS guidelines (Attachment H-4) and as exhibited in Figure 2. These guidelines include, but are not limited to:

- Planting species that are native to the state in which they are planted and come from local seed sources and ecotypes; seed source or ecotype should be verified with the vendor;
- Trees and shrubs shall be at least two-year old saplings when planted;
- Planting in early spring, whenever possible, while plants are still dormant and not planting saplings in frozen ground or during freezing weather;
- Protecting saplings from sun, wind, adverse temperatures, contamination, and damage and keeping roots moist prior to planting;
- Planting saplings in a debris-free hole in a vertical position to a depth where the groundline is approximately at root collar level;
- Planting saplings such that roots are not twisted or balled and packing soil firmly around saplings to prevent air pockets;
- Making sure saplings are not planted in standing water;
- Placing shrubs such that their crowns touch or will grow together to form large clumps or thicket in order to provide wildlife cover, refuge, and brood-rearing habitat;
- Planting a variety of species together to provide a diversity of bloom shape, bloom color, and bloom time, while making sure that no tree or shrub requiring insect or wind pollination is planted at too great a distance from another plant of the same species;
- Following planting configurations recommended for each species (as specified in Attachment H-4);
- Fencing saplings of fruit trees (apple, plum, hazelnut, and persimmon), if planted, immediately after planting to protect from deer browse;
- Monitoring survival of planted saplings annually for five growing seasons. After the annual monitoring for five growing season, monitoring will occur once every 5 years; and

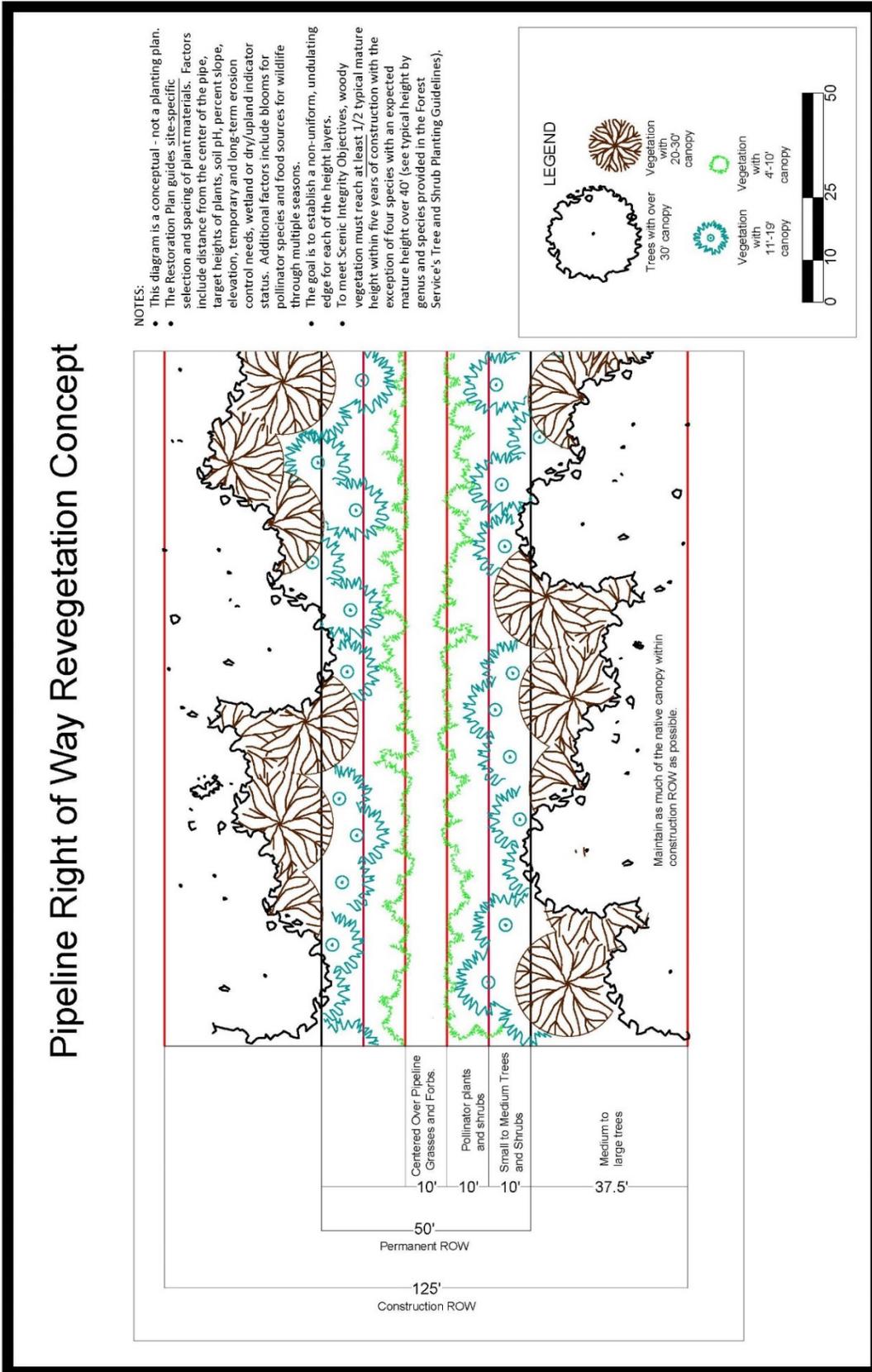


Figure 2. Concept for Revegetation of the Right-of-Way

-
- Avoiding use of herbicide on native plantings.

Trees and shrubs for replanting will be chosen based on the conditions of the area where planting will occur (e.g., upland, riparian, pH) and will be chosen from the species recommended by the FS (see Attachment H-4).

3.10 Weed Management

Management and control of invasive species is critical if disturbed areas are to be successfully revegetated and restored, as invasive species can outcompete and exclude native species. MVP will utilize techniques approved by the FERC and FS to control invasive species along the construction areas, which will include mechanical methods (e.g., pulling, mowing, disking, etc.) as well as chemical treatments (e.g., herbicides) on the JNF, as requested by the FS. MVP will comply with all local, state, and federal requirements related to the use of herbicides, including any requirements specified by the FS on the JNF. Herbicides to be used on the JNF will be approved by the FS prior to use. See the Herbicide Use Plan (Appendix T to the POD) for more details regarding the use of herbicides on the JNF.

The Project's Exotic and Invasive Species Control Plan (Appendix S to the POD) also contains details regarding the methods that will be implemented to manage and control invasive species. MVP and its construction contractor will comply with BMPs and requirements outlined in the Project's Exotic and Invasive Species Control Plan to manage and control invasive species. Implementation of the measures outlined in that plan will minimize the risk of introducing or spreading invasive plant species.

3.11 Road Reclamation

All roads upgraded and utilized on FS managed lands as part of the Project on the JNF will be left in the existing or better condition after completion of the Project's construction. No permanent Project related roads, beyond the existing Forest Service roads that would be used for the Project, will remain on the JNF following completion of the Project's construction and restoration. Existing Forest Service roads that are used during construction will be upgraded to support the Project's needs as applicable and will remain intact following construction or as otherwise specified by the Forest Service. MVP has requested ingress/egress rights on these existing Forest Service roads for pipeline operations and maintenance following construction.

3.12 Post-Construction Monitoring and Reporting

3.12.1 Maintenance

All areas disturbed by construction on the JNF will be restored. However, a 50-foot-wide permanent right-of-way will be maintained as exhibited in Figure 2 in a grassland/low-shrub state above the pipeline and small to medium tree species approximately 20 feet from the pipeline centerline. This permanent right-of-way will maintain MVP's access to the pipeline for terrestrial patrols, and emergency repairs. In upland areas, deep rooted trees or shrubs will not be allowed to grow within the 25 feet of either side of the centerline in order to maintain the integrity of the pipe. The maintained grassland permanent right-of-way (10-feet) will be subjected to mowing and will result in permanent conversion of the existing forested vegetation to herbaceous or scrub vegetation. Within wetlands or

adjacent to waterbodies, MVP will maintain vegetation in a 10-foot wide corridor centered over the pipeline by mechanical means. Trees within 15-feet of the pipeline within wetlands or adjacent to waterbodies will be selectively cut to protect the integrity of the pipeline.

3.12.2 Monitoring

Along portions of the Project that are allowed to restore to pre-construction conditions (e.g., in areas outside of the permanent right-of-way), successful restoration will be determined by monitoring reclaimed areas and comparing them to adjacent undisturbed areas and targeted conditions. MVP will monitor and record the success of revegetation on FS lands for five growing seasons or longer, until the FS has determined that revegetation has been successful and scenic integrity objectives have been met. Inspection will be completed at least annually. MVP will submit a status report to the FS following each inspection.

Success criteria will differ within the permanently maintained right-of-way on the JNF, as these areas will not be allowed to achieve a distribution and diversity similar to adjacent undisturbed areas (e.g., they will be maintained in a grassland/low-shrub condition). The permanently maintained right-of-way will be considered successfully restored when the soils have been stabilized and a native vegetation community is established that is consistent and compatible with the pipeline's permanent right-of-way (i.e., consistent with the FS's planting guidelines), and when the FS has determined that scenic integrity objectives have been met. MVP will feather the ROW as exhibited in figure 2 to ensure that vegetative openings appear more natural and conform to the natural form, line, color, and texture of the existing landscape. Temporary work spaces within forested areas would include some level of shrub plantings or shrub seed mixes to soften the hard edge formed between the existing/undisturbed forest and the maintained ROW. MVP intends to include woody seed mixes within temporary areas where forest regeneration is desired.

Following construction, MVP will monitor and record the success of revegetation on FS-managed lands annually for five growing seasons or longer, until the FS has determined that revegetation has been successful and scenic integrity objectives have been met. After the annual monitoring for five growing seasons, monitoring will occur once every five years or on a frequency determined by the FS to assure the stratified layers of vegetation are maintained, as depicted in Figure 2. MVP will submit a status report to the FS following each inspection. Should the vegetation in an area not reestablish following five growing seasons, MVP will work with FS personnel to develop a plan for re-establishment, including monitoring requirements. If after the fifth growing season, problem areas have been identified (e.g., seed germination is lower than expected or there is a prevalence of invasive plant species), the area will be re-treated and re-seeded. Treatments may include additional seedbed preparation, control of noxious weeds, use of soil amendments, and/or use of another appropriate seed mix (which would have to be approved by the FS prior to its use). Revegetation efforts will continue until the targeted areas are determined to be successfully revegetated, as defined above.

Monitoring will also be conducted in waterbodies and riparian areas that were crossed by the pipeline. Monitors will compare the waterbodies' level of aggradation, scour over the trench, lateral migration of the channel, bank erosion, and turbidity levels against the

baseline condition established following the initial stream restoration. Monitoring of riparian restoration activities will be conducted for five years, if necessary.

3.12.3 Reporting

MVP will document pre-construction observations, construction reclamation activities, and post construction monitoring on the JNF in a report that will be filed with the FS and the FERC two years after implementation of the restoration actions, as required by the FERC Plan and Procedures. This report will provide the agencies with a summary of Project reclamation activities and observations and include recommendations for additional corrective actions if monitoring determines that these actions may be necessary. In addition, MVP will alert the FS and the FERC in an annual report (prior to the second year report) if after the second growing season problem areas have been identified and corrective actions may be necessary (in order to solicit recommendations from the FS regarding potential corrective actions that could be implemented).

4.0 NATIONAL FOREST SYSTEM LANDS AFFECTED

Several forest community types will be crossed and impacted along this proposed 3.6-mile crossing, including mixed mesophytic forests, conifer-northern hardwood forests, dry-mesic oak forests, dry and dry-mesic oak-pine forests, dry and xeric oak forests, woodlands, savanna, and xeric pine and pine-oak forests and woodlands.

The following FS Management Prescriptions will be crossed by the Project: 4A (Appalachian National Scenic Trail Corridor); 4J (Urban-Suburban Interface Area); 6C (Old-Growth Forest Communities Associated with Disturbance); 8A1 (Mix of Successional Habitats in Forested Landscapes); and 11 (Riparian Corridors; embedded in the other Management Prescriptions).

Although the Forest Plan does not specifically establish restoration measures applicable to each of these areas, MVP anticipates that the FS may provide MVP with specific recommendations or requirements related to restoration in these affected Management Prescriptions and Management Areas (e.g., modifications to the proposed seeding mixes for each area). MVP will continue to work with the FS on any potential site-specific measures applicable to these affected areas and will incorporate these site-specific measures into the Restoration Plan as applicable (Attachment H-3).

5.0 REFERENCES

- California Stormwater Quality Association. 2003. Stormwater Best Management Practice Handbook – Construction. Available online at www.cabmphandbooks.com
- Flynn, R. 2015. Inoculation of Legumes. Extension Agronomist, Department of Extension Plant Sciences, New Mexico State University. Web address: http://aces.nmsu.edu/pubs/_a/A130/welcome.html
- Monsanto BioAg. 2015. Why inoculate or double inoculate? Available online at: <http://www.monsantobioag.com/global/us/Documents/Why-Inoculate-or-Double-Inoculate.pdf>
- Mountain Valley Pipeline LLC (MVP). 2016. Mountain Valley Pipeline Soil Profile Descriptions Report for Jefferson National Forest. April.

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2005. Seedbed Preparation and Seed to Soil Contact. Technical Notes, Plant
Materials – 6, Spokane, Washington.

**ATTACHMENT H-1
FERC UPLAND EROSION CONTROL, REVEGETATION, AND
MAINTENANCE PLAN**

**UPLAND EROSION CONTROL,
REVEGETATION, AND
MAINTENANCE PLAN**

Washington, DC 20426

**UPLAND EROSION CONTROL, REVEGETATION, AND
MAINTENANCE PLAN**

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UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN (PLAN)

I. APPLICABILITY

- A. The intent of this Plan is to assist project sponsors by identifying baseline mitigation measures for minimizing erosion and enhancing revegetation. Project sponsors shall specify in their applications for a new FERC authorization and in prior notice and advance notice filings, any individual measures in this Plan they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Project sponsors shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, project sponsors can request further changes as variances to the measures in this Plan (or the applicant's approved plan). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the project sponsor's written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;
2. is necessary because a portion of this Plan is infeasible or unworkable based on project-specific conditions; or
3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Sponsors of projects planned for construction under the automatic authorization provisions in the FERC's regulations must receive written approval for any variances in advance of construction.

Project-related impacts on wetland and waterbody systems are addressed in the staff's Wetland and Waterbody Construction and Mitigation Procedures (Procedures).

II. SUPERVISION AND INSPECTION

A. ENVIRONMENTAL INSPECTION

1. At least one Environmental Inspector is required for each construction spread during construction and restoration (as defined by section V). The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.
2. Environmental Inspectors shall have peer status with all other activity inspectors.
3. Environmental Inspectors shall have the authority to stop activities that violate the environmental conditions of the FERC's Orders, stipulations of other environmental permits or approvals, or landowner easement agreements; and to order appropriate corrective action.

B. RESPONSIBILITIES OF ENVIRONMENTAL INSPECTORS

At a minimum, the Environmental Inspector(s) shall be responsible for:

1. Inspecting construction activities for compliance with the requirements of this Plan, the Procedures, the environmental conditions of the FERC's Orders, the mitigation measures proposed by the project sponsor (as approved and/or modified by the Order), other environmental permits and approvals, and environmental requirements in landowner easement agreements.
2. Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;
3. Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;
4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
5. Identifying erosion/sediment control and soil stabilization needs in all areas;
6. Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive environmental resource areas, including cultural resource sites, wetlands, waterbodies, and sensitive species habitats;

7. 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 wetlands, waterbodies, cultural resource sites, and sensitive species habitats; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;
8. Ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;
9. Advising the Chief Construction Inspector when environmental conditions (such as wet weather or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;
10. Ensuring restoration of contours and topsoil;
11. Verifying that the soils imported for agricultural or residential use are certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner;
12. Ensuring that erosion control devices are properly installed to prevent sediment flow into sensitive environmental resource areas (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species habitats) and onto roads, and determining the need for additional erosion control devices;
13. Inspecting and ensuring the maintenance of temporary erosion control measures at least:
 - a. on a daily basis in areas of active construction or equipment operation;
 - b. on a weekly basis in areas with no construction or equipment operation; and
 - c. within 24 hours of each 0.5 inch of rainfall;
14. Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;
15. Keeping records of compliance with the environmental conditions of the FERC's Orders, and the mitigation measures proposed by the project sponsor in the application submitted to the FERC, and other federal or state environmental permits during active construction and restoration;

16. Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase; and
17. Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with section III.E.

III. PRECONSTRUCTION PLANNING

The project sponsor shall do the following before construction:

A. CONSTRUCTION WORK AREAS

1. Identify all construction work areas (e.g., construction right-of-way, extra work space areas, pipe storage and contractor yards, borrow and disposal areas, access roads) that would be needed for safe construction. The project sponsor must ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.
2. Project sponsors are encouraged to consider expanding any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas.
3. Plan construction sequencing to limit the amount and duration of open trench sections, as necessary, to prevent excessive erosion or sediment flow into sensitive environmental resource areas.

B. DRAIN TILE AND IRRIGATION SYSTEMS

1. Attempt to locate existing drain tiles and irrigation systems.
2. Contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within 3 years of the authorized construction.
3. Develop procedures for constructing through drain-tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction.
4. Engage qualified drain tile specialists, as needed to conduct or monitor repairs to drain tile systems affected by construction. Use drain tile specialists from the project area, if available.

C. GRAZING DEFERMENT

Develop grazing deferment plans with willing landowners, grazing permittees, and land management agencies to minimize grazing disturbance of revegetation efforts.

D. ROAD CROSSINGS AND ACCESS POINTS

Plan for safe and accessible conditions at all roadway crossings and access points during construction and restoration.

E. DISPOSAL PLANNING

Determine methods and locations for the regular collection, containment, and disposal of excess construction materials and debris (e.g., timber, slash, mats, garbage, drill cuttings and fluids, excess rock) throughout the construction process. Disposal of materials for beneficial reuse must not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner or land management agency approval, and permit requirements.

F. AGENCY COORDINATION

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in this Plan and/or required by the FERC's Orders.

1. Obtain written recommendations from the local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specifications.
2. Develop specific procedures in coordination with the appropriate agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests resulting from construction and restoration activities.
3. Develop specific procedures in coordination with the appropriate agencies and landowners, as necessary, to allow for livestock and wildlife movement and protection during construction.
4. Develop specific blasting procedures in coordination with the appropriate agencies that address pre- and post-blast inspections; advanced public notification; and mitigation measures for building foundations, groundwater wells, and springs. Use appropriate methods (e.g., blasting mats) to prevent damage to nearby structures and to prevent debris from entering sensitive environmental resource areas.

G. SPILL PREVENTION AND RESPONSE PROCEDURES

The project sponsor shall develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures. A copy must be filed with the Secretary of the FERC (Secretary) prior to construction and made available in the field on each construction spread. The filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

H. RESIDENTIAL CONSTRUCTION

For all properties with residences located within 50 feet of construction work areas, project sponsors shall: avoid removal of mature trees and landscaping within the construction work area unless necessary for safe operation of construction equipment, or as specified in landowner agreements; fence the edge of the construction work area for a distance of 100 feet on either side of the residence; and restore all lawn areas and landscaping immediately following clean up operations, or as specified in landowner agreements. If seasonal or other weather conditions prevent compliance with these time frames, maintain and monitor temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration.

I. WINTER CONSTRUCTION PLANS

If construction is planned to occur during winter weather conditions, project sponsors shall develop and file a project-specific winter construction plan with the FERC application. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

The plan shall address:

1. winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);
2. stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and
3. final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

IV. INSTALLATION

A. APPROVED AREAS OF DISTURBANCE

1. Project-related ground disturbance shall be limited to the construction right-of-way, extra work space areas, pipe storage yards, borrow and disposal areas, access roads, and other areas approved in the FERC's Orders. Any project-related ground disturbing activities outside these areas will require prior Director approval. This requirement does not apply to activities needed to comply with the Plan and Procedures (i.e., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) or minor field realignments and workspace shifts per landowner needs and requirements that do not affect other landowners or sensitive environmental resource areas. All construction or restoration activities outside of authorized areas are subject to all applicable survey and permit requirements, and landowner easement agreements.
2. The construction right-of-way width for a project shall not exceed 75 feet or that described in the FERC application unless otherwise modified by a FERC Order. However, in limited, non-wetland areas, this construction right-of-way width may be expanded by up to 25 feet without Director approval to accommodate full construction right-of-way topsoil segregation and to ensure safe construction where topographic conditions (e.g., side-slopes) or soil limitations require it. Twenty-five feet of extra construction right-of-way width may also be used in limited, non-wetland or non-forested areas for truck turn-arounds where no reasonable alternative access exists.

Project use of these additional limited areas is subject to landowner or land management agency approval and compliance with all applicable survey and permit requirements. When additional areas are used, each one shall be identified and the need explained in the weekly or biweekly construction reports to the FERC, if required. The following material shall be included in the reports:

- a. the location of each additional area by station number and reference to previously filed alignment sheets, or updated alignment sheets showing the additional areas;
- b. identification of the filing at FERC containing evidence that the additional areas were previously surveyed; and

- c. a statement that landowner approval has been obtained and is available in project files.

Prior written approval of the Director is required when the authorized construction right-of-way width would be expanded by more than 25 feet.

B. TOPSOIL SEGREGATION

1. Unless the landowner or land management agency specifically approves otherwise, prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:
 - a. cultivated or rotated croplands, and managed pastures;
 - b. residential areas;
 - c. hayfields; and
 - d. other areas at the landowner's or land managing agency's request.
2. In residential areas, importation of topsoil is an acceptable alternative to topsoil segregation.
3. Where topsoil segregation is required, the project sponsor must:
 - a. segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil); and
 - b. make every effort to segregate the entire topsoil layer in soils with less than 12 inches of topsoil.
4. Maintain separation of salvaged topsoil and subsoil throughout all construction activities.
5. Segregated topsoil may not be used for padding the pipe, constructing temporary slope breakers or trench plugs, improving or maintaining roads, or as a fill material.
6. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, tackifiers, or functional equivalents, where necessary.

C. DRAIN TILES

1. Mark locations of drain tiles damaged during construction.
2. Probe all drainage tile systems within the area of disturbance to check for damage.
3. Repair damaged drain tiles to their original or better condition. Do not use filter-covered drain tiles unless the local soil conservation authorities and the landowner agree. Use qualified specialists for testing and repairs.
4. For new pipelines in areas where drain tiles exist or are planned, ensure that the depth of cover over the pipeline is sufficient to avoid interference with drain tile systems. For adjacent pipeline loops in agricultural areas, install the new pipeline with at least the same depth of cover as the existing pipeline(s).

D. IRRIGATION

Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties.

E. ROAD CROSSINGS AND ACCESS POINTS

1. Maintain safe and accessible conditions at all road crossings and access points during construction.
2. If crushed stone access pads are used in residential or agricultural areas, place the stone on synthetic fabric to facilitate removal.
3. Minimize the use of tracked equipment on public roadways. Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions. Repair any damages to roadway surfaces, shoulders, and bar ditches.

F. TEMPORARY EROSION CONTROL

Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained throughout construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

1. Temporary Slope Breakers
 - a. Temporary slope breakers are intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope

breakers may be constructed of materials such as soil, silt fence, staked hay or straw bales, or sand bags.

- b. Install temporary slope breakers on all disturbed areas, as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings at the following spacing (closer spacing shall be used if necessary):

<u>Slope (%)</u>	<u>Spacing (feet)</u>
5 - 15	300
>15 - 30	200
>30	100

- c. Direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device at the end of the slope breaker and off the construction right-of-way.
- d. Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive environmental resource areas.

2. Temporary Trench Plugs

Temporary trench plugs are intended to segment a continuous open trench prior to backfill.

- a. Temporary trench plugs may consist of unexcavated portions of the trench, compacted subsoil, sandbags, or some functional equivalent.
- b. Position temporary trench plugs, as necessary, to reduce trenchline erosion and minimize the volume and velocity of trench water flow at the base of slopes.

3. Sediment Barriers

Sediment barriers are intended to stop the flow of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources.

- a. Sediment barriers may be constructed of materials such as silt fence, staked hay or straw bales, compacted earth (e.g., driveable berms across travelways), sand bags, or other appropriate materials.

- b. At a minimum, install and maintain temporary sediment barriers across the entire construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody, wetland, or road crossing until revegetation is successful as defined in this Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.
- c. Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

4. Mulch

- a. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the area to cover at least 75 percent of the ground surface at a rate of 2 tons/acre of straw or its equivalent, unless the local soil conservation authority, landowner, or land managing agency approves otherwise in writing.
- b. Mulch can consist of weed-free straw or hay, wood fiber hydromulch, erosion control fabric, or some functional equivalent.
- c. Mulch all disturbed upland areas (except cultivated cropland) before seeding if:
 - (1) final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas), as required in section V.A.1; or
 - (2) construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.
- d. If mulching before seeding, increase mulch application on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.
- e. If wood chips are used as mulch, do not use more than 1 ton/acre and add the equivalent of 11 lbs/acre available nitrogen (at least 50 percent of which is slow release).

- f. Ensure that mulch is adequately anchored to minimize loss due to wind and water.
- g. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.
- h. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

V. RESTORATION

A. CLEANUP

1. Commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.

If construction or restoration unexpectedly continues into the winter season when conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring, file with the Secretary for the review and written approval of the Director, a winter construction plan (as specified in section III.I). This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

2. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed as specified in section IV.F. and inspected and maintained as specified in sections II.B.12 through 14. When access is no longer required the travel lane must be removed and the right-of-way restored.
3. Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench shall be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency.

4. Remove excess rock from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing.
5. Grade the construction right-of-way to restore pre-construction contours and leave the soil in the proper condition for planting.
6. Remove construction debris from all construction work areas unless the landowner or land managing agency approves leaving materials onsite for beneficial reuse, stabilization, or habitat restoration.
7. Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful.

B. PERMANENT EROSION CONTROL DEVICES

1. Trench Breakers
 - a. Trench breakers are intended to slow the flow of subsurface water along the trench. Trench breakers may be constructed of materials such as sand bags or polyurethane foam. Do not use topsoil in trench breakers.
 - b. An engineer or similarly qualified professional shall determine the need for and spacing of trench breakers. Otherwise, trench breakers shall be installed at the same spacing as and upslope of permanent slope breakers.
 - c. In agricultural fields and residential areas where slope breakers are not typically required, install trench breakers at the same spacing as if permanent slope breakers were required.
 - d. At a minimum, install a trench breaker at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody or wetland and where needed to avoid draining a waterbody or wetland. Install trench breakers at wetland boundaries, as specified in the Procedures. Do not install trench breakers within a wetland.

2. Permanent Slope Breakers

- a. Permanent slope breakers are intended to reduce runoff velocity, divert water off the construction right-of-way, and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone, or some functional equivalent.
- b. Construct and maintain permanent slope breakers in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing recommendations obtained from the local soil conservation authority or land managing agency.

In the absence of written recommendations, use the following spacing unless closer spacing is necessary to avoid excessive erosion on the construction right-of-way:

<u>Slope (%)</u>	<u>Spacing (feet)</u>
5 - 15	300
>15 - 30	200
>30	100

- c. Construct slope breakers to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, construct appropriate energy-dissipating devices at the end of the breaker.
- d. Slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. Where slope breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey requirements.

C. SOIL COMPACTION MITIGATION

1. Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests.
2. Plow severely compacted agricultural areas with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil.

If subsequent construction and cleanup activities result in further compaction, conduct additional tilling.

3. Perform appropriate soil compaction mitigation in severely compacted residential areas.

D. REVEGETATION

1. General

- a. The project sponsor is responsible for ensuring successful revegetation of soils disturbed by project-related activities, except as noted in section V.D.1.b.
- b. Restore all turf, ornamental shrubs, and specialized landscaping in accordance with the landowner's request, or compensate the landowner. Restoration work must be performed by personnel familiar with local horticultural and turf establishment practices.

2. Soil Additives

Fertilize and add soil pH modifiers in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practicable after application.

3. Seeding Requirements

- a. Prepare a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed.
- b. Seed disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the landowner or land management agency. Seeding is not required in cultivated croplands unless requested by the landowner.
- c. Perform seeding of permanent vegetation within the recommended seeding dates. If seeding cannot be done within those dates, use appropriate temporary erosion control measures discussed in section IV.F and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary

seeding of annual species may also be used, if necessary, to establish cover, as approved by the Environmental Inspector. Lawns may be seeded on a schedule established with the landowner.

- d. In the absence of written recommendations from the local soil conservation authorities, seed all disturbed soils within 6 working days of final grading, weather and soil conditions permitting, subject to the specifications in section V.D.3.a through V.D.3.c.
- e. Base seeding rates on Pure Live Seed. Use seed within 12 months of seed testing.
- f. Treat legume seed with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydro).
- g. In the absence of written recommendations from the local soil conservation authorities, landowner, or land managing agency to the contrary, a seed drill equipped with a cultipacker is preferred for seed application.

Broadcast or hydroseeding can be used in lieu of drilling at double the recommended seeding rates. Where seed is broadcast, firm the seedbed with a cultipacker or roller after seeding. 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 the Environmental Inspector.

VI. OFF-ROAD VEHICLE CONTROL

To each owner or manager of forested lands, offer to install and maintain measures to control unauthorized vehicle access to the right-of-way. These measures may include:

- A. signs;
- B. fences with locking gates;
- C. slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and
- D. conifers or other appropriate trees or shrubs across the right-of-way.

VII. POST-CONSTRUCTION ACTIVITIES AND REPORTING

A. MONITORING AND MAINTENANCE

1. Conduct follow-up inspections of all disturbed areas, as necessary, to determine the success of revegetation and address landowner concerns. At a minimum, conduct inspections after the first and second growing seasons.
2. Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agricultural areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

Continue revegetation efforts until revegetation is successful.

3. Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in agricultural areas until restoration is successful.
4. Restoration shall be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless otherwise approved by the landowner or land managing agency per section V.A.6), revegetation is successful, and proper drainage has been restored.
5. Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands shall not be done more frequently than every 3 years. However, to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.
6. Efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, shall continue throughout the life of the project. Maintain signs, gates, and permanent access roads as necessary.

B. REPORTING

1. The project sponsor shall maintain records that identify by milepost:
 - a. method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;
 - b. acreage treated;
 - c. dates of backfilling and seeding;
 - d. names of landowners requesting special seeding treatment and a description of the follow-up actions;
 - e. the location of any subsurface drainage repairs or improvements made during restoration; and
 - f. any problem areas and how they were addressed.

2. The project sponsor shall file with the Secretary quarterly activity reports documenting the results of follow-up inspections required by section VII.A.1; any problem areas, including those identified by the landowner; and corrective actions taken for at least 2 years following construction.

The requirement to file quarterly activity reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advanced notice provisions in the FERC's regulations.

**ATTACHMENT H-2
FERC WATERBODY AND WETLAND CONSTRUCTION AND
MITIGATION PROCEDURES**



**Federal Energy
Regulatory
Commission**

**Office of
Energy Projects**

May 2013

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

Washington, DC 20426

**WETLAND AND WATERBODY CONSTRUCTION AND
MITIGATION PROCEDURES**

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WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES (PROCEDURES)

I. APPLICABILITY

- A. The intent of these Procedures is to assist project sponsors by identifying baseline mitigation measures for minimizing the extent and duration of project-related disturbance on wetlands and waterbodies. Project sponsors shall specify in their applications for a new FERC authorization, and in prior notice and advance notice filings, any individual measures in these Procedures they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Project sponsors shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, project sponsors can request further changes as variances to the measures in these Procedures (or the applicant's approved procedures). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the project sponsor's written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;
2. is necessary because a portion of these Procedures is infeasible or unworkable based on project-specific conditions; or
3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Sponsors of projects planned for construction under the automatic authorization provisions in the FERC's regulations must receive written approval for any variances in advance of construction.

Project-related impacts on non-wetland areas are addressed in the staff's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

B. DEFINITIONS

1. “Waterbody” includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:
 - a. “minor waterbody” includes all waterbodies less than or equal to 10 feet wide at the water’s edge at the time of crossing;
 - b. “intermediate waterbody” includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water’s edge at the time of crossing; and
 - c. “major waterbody” includes all waterbodies greater than 100 feet wide at the water’s edge at the time of crossing.
2. “Wetland” includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

II. PRECONSTRUCTION FILING

- A. The following information must be filed with the Secretary of the FERC (Secretary) prior to the beginning of construction, for the review and written approval by the Director:
 1. site-specific justifications for extra work areas that would be closer than 50 feet from a waterbody or wetland; and
 2. site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands.
- B. The following information must be filed with the Secretary prior to the beginning of construction. These filing requirements do not apply to projects constructed under the automatic authorization provisions in the FERC’s regulations:
 1. Spill Prevention and Response Procedures specified in section IV.A;
 2. a schedule identifying when trenching or blasting will occur within each waterbody greater than 10 feet wide, within any designated coldwater fishery, and within any waterbody identified as habitat for federally-listed threatened or endangered species. The project sponsor will revise the schedule as necessary to provide FERC staff at least 14 days advance notice. Changes within this last 14-day period must provide for at least 48 hours advance notice;

3. plans for horizontal directional drills (HDD) under wetlands or waterbodies, specified in section V.B.6.d;
4. site-specific plans for major waterbody crossings, described in section V.B.9;
5. a wetland delineation report as described in section VI.A.1, if applicable; and
6. the hydrostatic testing information specified in section VII.B.3.

III. ENVIRONMENTAL INSPECTORS

- A. At least one Environmental Inspector having knowledge of the wetland and waterbody conditions in the project area is required for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.
- B. The Environmental Inspector's responsibilities are outlined in the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

IV. PRECONSTRUCTION PLANNING

- A. The project sponsor shall develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies. A copy must be filed with the Secretary prior to construction and made available in the field on each construction spread. This filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.
 1. It shall be the responsibility of the project sponsor and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. The project sponsor and its contractors must, at a minimum, ensure that:
 - a. all employees handling fuels and other hazardous materials are properly trained;
 - b. all equipment is in good operating order and inspected on a regular basis;
 - c. fuel trucks transporting fuel to on-site equipment travel only on approved access roads;
 - d. all equipment is parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the

project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

- e. hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas;
 - f. concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;
 - g. pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and
 - h. bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills.
2. The project sponsor and its contractors must structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, the project sponsor and its contractors must:
- a. ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discoveries of contamination;
 - b. ensure that each construction crew has on hand sufficient tools and material to stop leaks;
 - c. know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U. S. Coast Guard and the National Response Center) that must be notified of a spill; and

- d. follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

B. AGENCY COORDINATION

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC's Orders.

V. WATERBODY CROSSINGS

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply to the U.S. Army Corps of Engineers (COE), or its delegated agency, for the appropriate wetland and waterbody crossing permits.
2. Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.
3. Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.
4. Notify appropriate federal and state authorities at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits.

B. INSTALLATION

1. Time Window for Construction

Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows:

- a. coldwater fisheries - June 1 through September 30; and
- b. coolwater and warmwater fisheries - June 1 through November 30.

2. Extra Work Areas

- a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from water's edge, except where

the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

- b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected.
- c. Limit the size of extra work areas to the minimum needed to construct the waterbody crossing.

3. General Crossing Procedures

- a. Comply with the COE, or its delegated agency, permit terms and conditions.
- b. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.
- c. Where pipelines parallel a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact.
- d. Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.
- e. Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.
- f. Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.
- g. Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Plan, provided that the Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the project sponsor must comply with all applicable Procedure requirements for "waterbodies" as defined in section I.B.1.

4. Spoil Pile Placement and Control

- a. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas as described in section V.B.2.
- b. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

5. Equipment Bridges

- a. Only clearing equipment and equipment necessary for installation of equipment bridges may cross waterbodies prior to bridge installation. Limit the number of such crossings of each waterbody to one per piece of clearing equipment.
- b. Construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:
 - (1) equipment pads and culvert(s);
 - (2) equipment pads or railroad car bridges without culverts;
 - (3) clean rock fill and culvert(s); and
 - (4) flexi-float or portable bridges.

Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.

- c. Design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.
- d. Design and maintain equipment bridges to prevent soil from entering the waterbody.
- e. Remove temporary equipment bridges as soon as practicable after permanent seeding.
- f. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, remove temporary equipment bridges as soon as practicable after final cleanup.

- g. Obtain any necessary approval from the COE, or the appropriate state agency for permanent bridges.

6. Dry-Ditch Crossing Methods

- a. Unless approved otherwise by the appropriate federal or state agency, install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally-designated as critical habitat.

- b. Dam and Pump

- (1) The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage.
- (2) Implementation of the dam-and-pump crossing method must meet the following performance criteria:
 - (i) use sufficient pumps, including on-site backup pumps, to maintain downstream flows;
 - (ii) construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
 - (iii) screen pump intakes to minimize entrainment of fish;
 - (iv) prevent streambed scour at pump discharge; and
 - (v) continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

- c. Flume Crossing

The flume crossing method requires implementation of the following steps:

- (1) install flume pipe after blasting (if necessary), but before any trenching;
- (2) use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);

- (3) properly align flume pipe(s) to prevent bank erosion and streambed scour;
- (4) do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and
- (5) remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

d. Horizontal Directional Drill

For each waterbody or wetland that would be crossed using the HDD method, file with the Secretary for the review and written approval by the Director, a plan that includes:

- (1) site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;
- (2) justification that disturbed areas are limited to the minimum needed to construct the crossing;
- (3) identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;
- (4) a description of how an inadvertent release of drilling mud would be contained and cleaned up; and
- (5) a contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

The requirement to file HDD plans does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

7. Crossings of Minor Waterbodies

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

- a. except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours.

Streambanks and unconsolidated streambeds may require additional restoration after this period;

- b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and
- c. equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification or protected status (e.g., agricultural or intermittent drainage ditches). However, if an equipment bridge is used it must be constructed as described in section V.B.5.

8. Crossings of Intermediate Waterbodies

Where a dry-ditch crossing is not required, intermediate waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

- a. complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;
- b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and
- c. all other construction equipment must cross on an equipment bridge as specified in section V.B.5.

9. Crossings of Major Waterbodies

Before construction, the project sponsor shall file with the Secretary for the review and written approval by the Director a detailed, site-specific construction plan and scaled drawings identifying all areas to be disturbed by construction for each major waterbody crossing (the scaled drawings are not required for any offshore portions of pipeline projects). This plan must be developed in consultation with the appropriate state and federal agencies and shall include extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues. The requirement to file major waterbody crossing plans does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness.

10. Temporary Erosion and Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland.

Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan; however, the following specific measures must be implemented at stream crossings:

- a. install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or driveable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;
- b. where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and
- c. use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

11. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.
2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities. For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the waterbody channel.
3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector.
4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Do not use synthetic monofilament

mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

5. Application of riprap for bank stabilization must comply with COE, or its delegated agency, permit terms and conditions.
6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.
7. Revegetate disturbed riparian areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed lands.
8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan.

In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

9. Sections V.C.3 through V.C.7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

D. POST-CONSTRUCTION MAINTENANCE

1. Limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.
2. Do not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.
3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.

VI. WETLAND CROSSINGS

A. GENERAL

1. The project sponsor shall conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction. The requirement to file a wetland delineation report does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

This report shall identify:

- a. by milepost all wetlands that would be affected;
- b. the National Wetlands Inventory (NWI) classification for each wetland;
- c. the crossing length of each wetland in feet; and
- d. the area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.

The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoiling requirements, apply to these agricultural wetlands.

2. Route the pipeline to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.
3. Limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the Director is required where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Early in the planning process the project sponsor is encouraged to identify site-specific areas where excessively wide trenches could occur and/or where spoil piles could be difficult to maintain because existing soils lack adequate unconfined compressive strength.
4. Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

5. Implement the measures of sections V and VI in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of sections V and VI cannot be met, the project sponsor must file with the Secretary a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan shall address at a minimum:
 - a. spoil control;
 - b. equipment bridges;
 - c. restoration of waterbody banks and wetland hydrology;
 - d. timing of the waterbody crossing;
 - e. method of crossing; and
 - f. size and location of all extra work areas.
6. Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.

B. INSTALLATION

1. Extra Work Areas and Access Roads
 - a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.
 - b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the site-specific conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected.
 - c. The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall

use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.

- d. The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

2. Crossing Procedures

- a. Comply with COE, or its delegated agency, permit terms and conditions.
- b. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.
- c. Use “push-pull” or “float” techniques to place the pipe in the trench where water and other site conditions allow.
- d. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.
- e. Limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.
- f. Cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

The project sponsor can burn woody debris in wetlands, if approved by the COE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.

- g. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Chief Inspector and Environmental Inspector determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.
- h. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are

saturated. Immediately after backfilling is complete, restore the segregated topsoil to its original location.

- i. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.
- j. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.
- k. Remove all project-related material used to support equipment on the construction right-of-way upon completion of construction.

3. Temporary Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in section VI.B.3.c, maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan.

- a. Install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.
- b. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.
- c. Install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Remove these sediment barriers during right-of-way cleanup.

4. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Where the pipeline trench may drain a wetland, construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology.
2. Restore pre-construction wetland contours to maintain the original wetland hydrology.
3. For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, install sediment barriers as outlined in the Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.
4. Do not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.
5. Consult with the appropriate federal or state agencies to develop a project-specific wetland restoration plan. The restoration plan shall include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of invasive species and noxious weeds (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. Provide this plan to the FERC staff upon request.
6. Until a project-specific wetland restoration plan is developed and/or implemented, temporarily revegetate the construction right-of-way with annual ryegrass at a rate of 40 pounds/acre (unless standing water is present).
7. Ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.
8. Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in section VII.A.4 of the Plan.

D. POST-CONSTRUCTION MAINTENANCE AND REPORTING

1. Do not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.
2. Do not use herbicides or pesticides in or within 100 feet of a wetland, except as allowed by the appropriate federal or state agency.
3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of wetland areas.
4. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful.
5. Wetland revegetation shall be considered successful if all of the following criteria are satisfied:
 - a. the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);
 - b. vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;
 - c. if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and
 - d. invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.
6. Within 3 years after construction, file a report with the Secretary identifying the status of the wetland revegetation efforts and documenting success as defined in section VI.D.5, above. The requirement to file wetland restoration reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advance notice provisions in the FERC's regulations.

For any wetland where revegetation is not successful at the end of 3 years after construction, develop and implement (in consultation with a

professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

VII. HYDROSTATIC TESTING

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply for state-issued water withdrawal permits, as required.
2. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permits, as required.
3. Notify appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing.

B. GENERAL

1. Perform 100 percent radiographic inspection of all pipeline section welds or hydrotest the pipeline sections, before installation under waterbodies or wetlands.
2. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, address secondary containment and refueling of these pumps in the project's Spill Prevention and Response Procedures.
3. The project sponsor shall file with the Secretary before construction a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

C. INTAKE SOURCE AND RATE

1. Screen the intake hose to minimize the potential for entrainment of fish.
2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission.
3. Maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.
4. Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.

D. DISCHARGE LOCATION, METHOD, AND RATE

1. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.
2. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission.

**ATTACHMENT H-3
FS RECOMMENDATIONS FOR SEED MIXES AND SEEDING
TECHNIQUES**

SUGGESTED SEEDING TECHNIQUES FOR PIPELINE RIGHTS-OF-WAYS AND ASSOCIATED DISTURBANCES ON THE MONONGAHELA AND GEORGE WASHINGTON-JEFFERSON NATIONAL FORESTS

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Introduction

This document provides guidelines for erosion control seeding techniques in the reclamation and restoration of disturbed soils associated with pipeline installations and repairs/maintenance on National Forest lands. Erosion is an expected consequence of any soil disturbing activity that crosses variable and severe terrain. Therefore, a variety of short term and long term erosion control measures must be implemented. These include but are not limited to physical measures such as contouring; revegetation measures such as re-seeding and mulching; and follow up monitoring. This document specifically addresses seeding and mulching techniques.

The goal of this document is to assist contractors with designing projects so that projects are consistent with Forest Plan goals and objectives. Because every site is unique, guidelines are meant to be descriptive, not prescriptive. Specific proposals still need Forest Service approval. However, ensuring from the start that project designs are consistent with Forest Plan direction will facilitate both the review and implementation process.

Restoration objectives

The initial goal of seeding is to establish a vegetative cover to minimize surface erosion and sedimentation. The secondary goal of seeding is to assist with establishing an assortment of native species beneficial for wildlife and pollinators. Because native species often do not establish as easily nor spread as readily as species typically used for erosion control, it is important to use them in conjunction with erosion control species, and also to use techniques that maximize germination rates and likelihood of survival. This includes proper initial site stabilization, choosing appropriate site specific seed mixes, and using appropriate seeding techniques once the site has been stabilized. Follow-up monitoring and maintenance are also required so that site problems are dealt with immediately and treatments adjusted as needed.

This document includes guidelines for the following:

- 1) General erosion control and seeding
- 2) Seeding seasons
- 3) Nutrient additions
- 4) Mulch and binders

GENERAL DIRECTION FOR EROSION CONTROL AND SEEDING

Project plans must specify how each of these guidelines will be met.

- Placement of sequestered topsoil prior to seeding.
- Seed shall be Virginia or West Virginia certified seed (bag tags attached; seed certification shall meet each state's standards for their certified seed classification) or alternative seed sourced from approved distributors.
- USFS approval of treatments outside normal seeding seasons.
- All leguminous seed shall be either be pre-inoculated from a supplier, or mixed with inoculant specified for use on that particular seed according to manufacturer's directions. Inoculants shall be manually applied at double the manufacturer's rate. Inoculant shall be mixed with legume seed prior to mixing with other seeds. For hydro-seeding, use a minimum of five times the dry seeding rate of inoculant. (Flynn, 2015; Monsanto 2015)
- A minimum of 100 lbs/ac of seed will be applied when seeding for permanent erosion control (VA BMP) unless otherwise specified by the seed mix provider.
- A success standard/threshold, such as 70-85% ground cover, must be delineated, and provisions to monitor and report on site conditions. Please describe plans for implementing mitigation measures (in case of planting failures) to ensure planting success.
- Describe how subsoil will be tested for compaction, and loosened prior to topsoil replacement if necessary.
- Dry fertilizer and lime may need to be incorporated into the top 2-5 inches of soil after application, at rates indicated by the results of site-specific soil tests. Please describe plans for doing so. (FERC 2013, Virginia DEQ)
- All seeding must occur promptly after construction halts, either temporarily or permanently. Erosion control seed mixtures must be sufficient to stabilize sites for varying lengths of time, and seed mixes may need to vary depending on that timeframe. Please describe how quickly seeding will occur, and the decision thresholds for applying temporary versus permanent erosion control seed mixtures.
- Areas to be planted with species beneficial for wildlife after pipeline installation will be treated with temporary erosion control mix during a normal seeding season.
- Areas not to be treated with wildlife seed species will be treated with permanent erosion control seeding during a normal seeding season.
- Seeding rates should be doubled when hydroseeding (Steinfeld et. al., 2007)

NORMAL SEEDING SEASONS

Appropriate seasons for seeding can vary dramatically depending on elevation. Spring seeding can be conducted from March 15th – June 1st, and fall seeding can be done from August 15th – October 15th, but neither timeframe is appropriate in its entirety at all elevations. Please describe the timeframe in which seeding is proposed according to site specific elevations. Seeding windows should allow time for application, germination, and survival.

NUTRIENT ADDITIONS

In the absence of soil chemistry tests, the following guidelines can be used to develop fertilizer and liming rates. **Whenever possible, nutrient additions should be based on soil chemistry data in the interpretations provided with the order 1 soil survey.**

Fertilizer: 600-800 lbs/ac, 10-20-10 (Nitrogen, Phosphorous, Potassium), 400 lbs/ac 15-30-15, 800-1000 lbs/ac 10-10-10.

Lime: 1500-4000 lbs/ac (pelletized or dust), 4000 lbs/ac, Hydro Lime (2.5 gal container is equivalent to 1000 lbs limestone)—5-10 containers /ac.

MULCH AND BINDERS

Use of mulch materials and binders will be needed. Use of hay is prohibited on National Forest land due to invasive species concerns. Below are some guidelines that apply when selecting these materials for various sections of the ROW. Please describe how each of these issues will be addressed. All techniques must be appropriate for the % slope on which they will be applied. Please describe how mulching, seeding, and binding techniques will be adjusted to accommodate different slope classes (for example, 0-8%, 8-15%, 15-30%, 30-50%, etc.).

- Materials must be certified weed free or be accompanied by vendor's test results for noxious weed content.
- Seeded areas can be mulched with weed free straw at a rate of 2-4K lbs/ac, hand spread or blown, fiber mulch hydro-seeded at 1500-2000 lbs/ac., or other appropriate material.
- Natural biodegradable products are preferred. Materials must be demonstrated to be free of invasive species, including but not limited to plants, pests, and pathogens.
- Hydraulic erosion control products (HEPC) must be suitable for wildlife.
- If the use of stabilization netting is required/permitted, wildlife friendly geotextiles must be used. These products must either not contain netting, or netting must be made of 100% biodegradable non-plastic materials such as jute, sisal, or coir fiber. Plastic netting (such as polypropylene, nylon, polyethylene, and polyester), even if advertised as biodegradable, is not an acceptable alternative. Any netting used must also have a loose-weave design with movable joints between horizontal and vertical twines to reduce the chance for wildlife entanglement, injury, or death. (CA Coastal Commission, 2012)
- Avoid the use of silt fences reinforced with metal or plastic mesh.
- When no longer required, (after soils are stable and the vegetative cover is established), temporary erosion control and sediment control products should be promptly removed.
- Any products that require mixing with water need to have a Forest Service-approved water source. The source of water must not be contaminated with non-native invasive organisms that could spread into streams.

Hydroseeding

- Wood-fiber hydraulic mulches are generally short-lived and require a 24-hour period to dry before rainfall occurs.

- Wood fiber naturally has tackifying properties, but fiber alone may not be sufficient on steep slopes. In those cases the addition of a tackifier will help keep the seeds in contact with the soil. Describe plans to assess when this will be necessary, and describe the tackifier and application methods to be used.
- As wood chips, shredded woody materials, and other high-carbon materials decompose, they remove plant nutrients such as nitrogen from the soil. This can reduce soil fertility and make it difficult for grasses to grow. This should be taken into account when planning restoration seeding.

Binders

- The use of hydroseeding with binders will most likely be required in many areas on FS lands due to the steep terrain. Please describe site conditions where this will be used.
- The success of soil binders are somewhat dependent on the soil type present. If soil is compacted or high in clay and silt, soil binders may not penetrate soil surfaces.
- Whether short-life or long-life, soil binders should be non-toxic and organic based, such as guar, psyllium, or pitch and rosin emulsions. Please describe type of binder to be used under what circumstances, and specific application rates and methods.
- Materials or additives used as binders or emulsifiers cannot be toxic to soil organisms or otherwise prevent or inhibit seed germination.

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SUGGESTED SEED MIXES FOR PIPELINE RIGHTS-OF-WAYS AND ASSOCIATED DISTURBANCES ON THE MONONGAHELA AND GEORGE WASHINGTON-JEFFERSON NATIONAL FORESTS

November 2016

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Introduction

This document is meant to provide direction for assembling seed mixes to be used in reclamation and restoration of disturbed soils associated with pipeline installations and repairs/maintenance on the MNF and GW-Jefferson National Forests. All recommended species are commercially available. This document is intended to help restoration achieve two goals: 1) the initial goal of establishing a vegetative cover to minimize surface erosion and sedimentation resulting from precipitation and surface flow, and 2) the secondary goal of establishing an assortment of native species congruent with local ecological communities, and beneficial for wildlife and pollinators.

Because this area possesses such diverse landscapes and microclimates, it is critical to deploy appropriate seed mixes in appropriate habitats. However, native plants that provide diverse wildlife benefits and structural diversity on the landscape often do not germinate or grow fast enough to provide initial erosion control. Therefore, fast-germinating, non-invasive, annual cover crops are recommended for the first round of seeding to stabilize exposed soil. Once those have established and erosion is no longer an immediate threat, native seed mixes tailored to site-specific conditions should be installed among the erosion control species where possible.

When using native seed, use as local an ecotype as is available, in the following order of preference:

- from within state
- from the mountain regions of an adjoining state
- from within 100 miles, as long as it is within the Appalachian mountain ecosystem

This document contains:

- Species recommendations for both temporary and permanent erosion control mixes
- Species recommendations for native mixes beneficial for wildlife and pollinators
- Site specific species recommendations for special site conditions (upland/high elevation, riparian, wetland, and dry low pH soils). Wetland indicator status codes are used to indicate species' soil moisture preferences. (USDA NRCS)

SPECIES FOR EROSION CONTROL

Temporary erosion control species:

To be applied

- wherever erosion control is needed outside of normal seeding seasons
- concurrent with permanent erosion control, and
- prior to permanent seeding with wildlife mixes, where such follow-up is appropriate.

Select at least two of the following species for temporary mixes, or suggest an existing erosion control seed mix containing at least some of these species but not containing anything that would act invasive at the site. Please describe how seed mixes will be adjusted to accommodate different slope classes (for example, 0-8%, 8-15%, 15-30%, 30-50%, etc.)

Table 1: Temporary erosion control species

Name	pH preference	Wetland Indicator Status
Annual Ryegrass (<i>Lolium multiflorum</i> (L. perenne var. italicum))	5.0-7.9	NI/moderate
German/Foxtail Millet (<i>Setaria italica</i>)	5.3-6.9	FACU
Cereal Rye (<i>Secale cereale</i>)	5.2-8.0	NI/damp
Browntop Millet (<i>Panicum ramosum</i>) (introduced in VA & south; possibly ok for WV?)	5.5-6.9	FACU

Permanent erosion control species:

To be applied

- only during normal seeding season in spring and fall
- on slopes too steep or inaccessible for planting equipment, or
- on areas planned to be left not in final grade for more than 1 year.

Select 5 or more of the following species for permanent mixes, and/or suggest an existing restoration seed mix composed primarily of these species and not containing anything that would act invasive at the site. Please include at least one species from Table 1 or one non-native from Table 2 to provide quick cover and mulching/organic matter. Please describe how seed mixes will be adjusted to accommodate different slope classes (for example, 0-8%, 8-15%, 15-30%, 30-50%, etc.).

Table 2: Permanent erosion control species

Name (sorted first by <i>Native status</i> and then by <i>Preference</i>)	pH preference	Wetland Indicator Status
<i>Non-native</i>		
Hard Fescue (<i>Festuca ovina</i> var. <i>duriuscula</i> (F. longifolia))	4.5-8.5	NI/dry
Creeping Red Fescue (<i>Festuca rubra</i>)	5.8-8.0	FACU

Chewings Fescue (<i>Festuca rubra</i> ssp. <i>commutata</i>)	acid tol.	FACU
Redtop (<i>Agrostis alba</i>)	4.5-8.0	FACW
<i>Native</i>		
<i>Highly Preferred</i>		
Indiangrass, (<i>Sorghastrum nutans</i>)	5.0-7.8	UPL
Purpletop (<i>Tridens flavus</i>)	4.5-6.5	FACU
<i>Preferred</i>		
Autumn Bentgrass, (<i>Agrostis perennans</i>)	5.5-7.5	FACU
Canada Wildrye (<i>Elymus canadensis</i>)	5.0-7.9	FACU+
Creeping Red Fescue (<i>Festuca rubra</i>)	5.8-8.0	FACU
Deertongue (<i>Dichanthelium clandestinum</i>)	4.0-7.5	FAC+
Marsh (Dense) Blazing Star (Spiked Gayfeather), (<i>Liatris spicata</i>)	5.6-7.5	FAC+
New England Aster, (<i>Aster novae-angliae</i> (<i>Symphotrichum</i>))	?	FACW
Oxeye Sunflower, (<i>Heliopsis helianthoides</i>)	?	FACU
Panicledleaf Ticktrefoil, (<i>Desmodium paniculatum</i>)	6.0-7.0	FACU
Showy Ticktrefoil, (<i>Desmodium canadense</i>)	wide tol	FAC
Slender Bushclover, (<i>Lespedeza virginica</i>)	acid tol	NI/dry
Slender Mountainmint (<i>Pycnanthemum tenuifolium</i>)	?	FAC-FACW
Virginia Wildrye, (<i>Elymus virginicus</i>)	5.0-7.4	FACW-
Wild Bergamot, (<i>Monarda fistulosa</i>)	6.0-8.0	UPL
Wild Senna (<i>Senna hebecarpa</i> (<i>Cassia</i> h.))	circumn.	FAC
<i>Moderately preferred</i>		
Partridge pea (<i>Chamaecrista fasciculata</i>)	5.5-7.5	FACU
Blackeyed Susan, (<i>Rudbeckia hirta</i>)	6.0-7.0	FACU-
Grain Rye (<i>Secale cereale</i>)	5.2-8.0	NI
Switchgrass (<i>Panicum virgatum</i>)	4.5-8.0	FAC
Ticklegrass (Rough Bentgrass), (<i>Agrostis scabra</i>)	6.0-8.0	FAC

NATIVE SPECIES FOR WILDLIFE AND POLLINATORS

These should be installed as permanent vegetation in areas accessible to drills or other necessary planting equipment. (Because native seed mixes need to be drilled or otherwise covered to enhance germination success, only areas accessible to the necessary equipment should be designated for follow-up native seeding.)

For **each** habitat type (dry, high, riparian, wet): select 5 or more of the following species, and/or suggest an existing restoration seed mix composed primarily of local genotypes (as described above) and not containing anything that would act invasive at the site. A temporary cover crop (Table 1) will also likely be necessary to stabilize the site and protect overwintering seeds.

“High elevation” species should be included in mixes on sites higher than 3,000 feet, or lower sites where the presence of red spruce indicates cold conditions. Please work with your FS contacts if you have suggestions for other appropriate species that are tolerant of short growing seasons and cold temperatures.

Ensure seed mixes are appropriate for local soil pH; see Table 4 for species to include in dry, acidic conditions. To ensure restoration success in a landscape with varying pH, more than one seed mix per habitat may be needed.

As with erosion control mixes, please describe how native seed mixes will be adjusted to accommodate different slope classes (for example, 0-8%, 8-15%, 15-30%, 30-50%, etc.).

Table 3: Native species for wildlife and pollinators

Name (sorted by <i>Habitat Type</i>)	pH preference	Wetland Indicator Status
<i>Dry Soils/Upland</i>		
Blackeyed Susan, (<i>Rudbeckia hirta</i>)	6.0-7.0	FACU-
Common Milkweed, (<i>Asclepias syriaca</i>)	calcareous	FACU
Indiangrass, (<i>Sorghastrum nutans</i>)	5.0-7.8	UPL
Oxeye Sunflower, (<i>Heliopsis helianthoides</i>)	?	FACU
Panicledleaf Ticktrefoil, (<i>Desmodium paniculatum</i>)	6.0-7.0	FACU
Partridge Pea, (<i>Chamaecrista fasciculata</i> (Cassia f.))	5.5-7.5	FACU
Showy Ticktrefoil, (<i>Desmodium canadense</i>)	wide tol	FAC
Switchgrass, (<i>Panicum virgatum</i>)	4.5-8.0	FAC
Virginia Wildrye, (<i>Elymus virginicus</i>)	5.0-7.4	FACW-
<i>High Elevation</i>		
Mountain Mint, <i>Pycnanthemum</i> spp.	?	FAC-FACW
Wild Bergamot, (<i>Monarda fistulosa</i>)	6.0-8.0	UPL
Virginia Wildrye, (<i>Elymus virginicus</i>)	5.0-7.4	FACW-
<i>Riparian</i>		
Autumn Bentgrass, (<i>Agrostis perennans</i>)	5.5-7.5	FACU
Big Bluestem, 'Niagara' (<i>Andropogon gerardii</i> , 'Niagara')	6.0-7.5	FAC
Boneset, (<i>Eupatorium perfoliatum</i>)	?	FACW+
Common Sneezeweed, (<i>Helenium autumnale</i>)	4.0-7.5	FACW+
Indiangrass, (<i>Sorghastrum nutans</i>)	5.0-7.8	UPL
Joe Pye Weed, (<i>Eupatorium fistulosum</i>)	4.5-7.0	FAC+
Maryland Senna (<i>Senna marilandica</i> (Cassia m.))	4.0-7.0	FAC+
New York Ironweed, (<i>Vernonia noveboracensis</i>)	4.5-8.0	FACW+
Partridge Pea, (<i>Chamaecrista fasciculata</i> (Cassia f.))	5.5-7.5	FACU
Spotted Joe Pye Weed, (<i>Eupatorium maculatum</i> (<i>Eupatoriadelphus maculatus</i>))	5.5-7.0	FACW
Swamp Milkweed (<i>Asclepias incarnata</i>)	5.0-8.0	OBL
Virginia Wildrye, (<i>Elymus virginicus</i>)	5.0-7.4	FACW-
Wild Senna (<i>Senna hebecarpa</i> (Cassia h.))	circumn.	FAC
<i>Wetland/Wet Soils</i> (pH indicators not included in this section because the majority of "problem" acid soil sites on these Forests are dry uplands. Wetland indicators not included because all plants are appropriate for wetlands)		
Blue False Indigo, (<i>Baptisia australis</i>)		

Bottlebrush Grass, (<i>Elymus hystrix</i> (<i>Hystrix patula</i>))
Canadian Anemone, (<i>Anemone canadensis</i>)
Canadian Burnet, (<i>Sanguisorba canadensis</i>)
Deertongue, 'Tioga' (<i>Panicum clandestinum</i> (<i>Dichanthelium</i> c.), 'Tioga')
Fringed (Nodding) Sedge, (<i>Carex crinita</i>)
Great Blue Lobelia, (<i>Lobelia siphilitica</i>)
New York Ironweed, (<i>Vernonia noveboracensis</i>)
Path Rush, (<i>Juncus tenuis</i> ,)
Purple Node Joe Pye Weed, (<i>Eupatorium purpureum</i>)
Redtop Panicgrass, (<i>Panicum rigidulum</i> (<i>P. stipitatum</i>))
Soft Rush (<i>Juncus effusus</i>)
Spotted Joe Pye Weed, (<i>Eupatorium maculatum</i> (<i>Eupatoriadelphus maculatus</i>))
Squarrose Sedge, (<i>Carex squarrosa</i>)
Swamp Milkweed (<i>Asclepias incarnata</i>)
Switchgrass, 'Cave-In-Rock' (<i>Panicum virgatum</i> , 'Cave-In-Rock')
Tussock Sedge, (<i>Carex stricta</i>)
Wild Senna (<i>Senna hebecarpa</i> (<i>Cassia</i> h.))
Woolgrass, (<i>Scirpus cyperinus</i>)

Low pH (acidic) soils

Few of the species listed above would naturally grow well in acidic soils as defined in this project (pH less than 4.8), though many would survive for several years if initial seeding was accompanied by a lime addition. For permanent cover, blackberries and goldenrods do well in sunny, acid, dry soils; and ferns, lycopodiums, and mosses persist as vegetative cover in more shaded areas. Table 4 lists perennial species native to WV and VA that should be included in permanent vegetation mixes for dry, acidic sites.

Table 4: Species for dry, acidic sites

Name	pH preference	Wetland Indicator Status
Purpletop (<i>Tridens flavus</i>)	4.5-6.5	FACU
Purple lovegrass (<i>Eragrostis spectabilis</i> (Pursh) Steud.)	4.0-7.5	UPL
Virginia spiderwort (<i>Tradescantia virginiana</i>)	4.0-8.0	FACU
Common blackberry (<i>Rubus allegheniensis</i>)	4.6-7.5	FACU-
Canada goldenrod, (<i>Solidago Canadensis</i>)	4.8-7.5	FACU
Indian hemp (<i>Apocynum cannabinum</i>)	4.5-7.0	FACU
White avens, (<i>Geum canadense</i>)	4.5-7.5	FACU
Splitbeard bluestem (<i>Andropogon ternarius</i> var. <i>Michx.</i>) (native to VA & KY, & south; a warm season bunchgrass.)	4.0-7.5	FACU
Slender woodoats ((<i>Chasmanthium laxum</i> (<i>Uniola laxa</i>))	4.5-7.0	FAC

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**ATTACHMENT H-4
FS TREE AND SHRUB PLANTING GUIDELINES FOR PIPELINE
RIGHTS-OF-WAY AND ASSOCIATED DISTURBANCES**

TREE AND SHRUB PLANTING GUIDELINES FOR PIPELINE RIGHTS-OF-WAY AND ASSOCIATED DISTURBANCES IN THE MONONGAHELA AND GEORGE WASHINGTON-JEFFERSON NATIONAL FORESTS

March 2017

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Introduction

This document provides guidelines and recommendations for planting trees and shrubs for the reclamation and restoration of pipeline installations and repairs and maintenance on National Forest lands. It is intended to guide reclamation and restoration efforts to results that are beneficial to a variety of wildlife, including birds, mammals, and pollinators. The pipeline will traverse different habitat types and elevations, so species need to be chosen accordingly for successful establishment. In addition to meeting habitat-specific requirements, vegetation species must also be native to the state in which they are planted and come from local seed sources and ecotypes.

For small mammals and game birds, placement and spacing of shrubs on the landscape are important. Shrubs placed close enough together that the crowns touch or grow together to form a large clump or thicket provides excellent cover, refuge, and brood-rearing habitat that is vital in open spaces.

Other considerations for choosing which small tree and shrub combinations to plant include pollination requirements, blooming times, and fruiting times. No tree or shrub requiring insect or wind pollination should be planted at a great distance from another plant of the same species. The best practice is to plant many of the same species in the same general area to maximize pollination, but nowhere should there be a monoculture. A variety of species should be planted together to provide a diversity of bloom shape, bloom color, and bloom time. There are many different types of pollinators, all of which require pollen and nectar. To get at these vital resources, they have developed different adaptive strategies. For instance, hummingbirds have very long, slender bills to reach into long, tubular-shaped blooms. A variety of color in the blooms attracts a wider variety of pollinators to the plants. And most important is to choose a variety in which there is something blooming in the spring, in the summer, and in the fall to ensure a consistent source of pollen and nectar throughout the active period for pollinators. There should be in any particular area at least a couple of species in bloom all year, except for in the winter.

The same concept exists for fruiting times of these plants but also extends into winter. Wildlife needs the nuts, seeds, and berries produced by these plants throughout the year. Many wildlife species remain active in the winter, when food is scarce, so having plant species that retain their food source into the winter is important for wildlife survival. Many, but not all, of the species below retain their food source into winter if not consumed before then.

Species Selection

The species in the tables below are divided into upland/dry and riparian/wet habitats and have a variety of pH preferences so that plants can be chosen for the appropriate habitat and soil types. They have elevation ranges that occur throughout the National Forests. The maximum heights of the species are also given. Depending on spacing, a feathered edge could be created by planting small trees on the forest/disturbance edge with shorter trees and shrubs on the other side toward the interior of the pipeline.

The species in the tables below are also divided into deer-resistant and non- or less deer-resistant plants. To reduce the cost and effort of planting, monitoring, and replacement, deer-resistant plants may be given preference. **However, the non-resistant apple, plum, hazelnut, and persimmon species are of high value to wildlife and also preferred for inclusion, and these particular species should be protected by fencing cages to prevent deer browse.** Other non-resistant plants may also be used but may receive damage without fencing, possibly leading to the need for replacement.

Recommended Species for Dry Uplands

Species	Height	pH	Wetland Indicator Status	Planting Instructions	Dioecious?
Deer Resistant					
<i>Amelanchier arborea</i> (Common Serviceberry)	36'	4.8-7.5	FAC	20' apart	
<i>Amelanchier canadensis</i> (Canadian Serviceberry)	23'	5.5-7.5	FAC	15' apart	
<i>Amelanchier laevis</i> (Allegheny Serviceberry)	25'	<6.8		15' apart	
<i>Aralia spinosa</i> (Devil's Walking Stick)	20'	Varies	FAC	8' apart in clumps or offset rows	
<i>Asimina triloba</i> (Pawpaw)	30'	4.7-7.2	FAC	15' apart	
<i>Crataegus phaenopyrum</i> (Washington Hawthorne)	30'	6.8-7.2	FAC	15' apart	
<i>Crataegus macrosperma</i> (Bigfruit Hawthorne)	20'	Varies		15' apart	

<i>Gaylussacia baccata</i> (Black Huckleberry)	6'	Acidic	FACU	6' apart in clumps or offset rows	
<i>Ilex glabra</i> (Gray Inkberry)	8'	4.5-7.0	FAC	6' apart in clumps or offset rows	Y
<i>Ilex montana</i> (Mountain Holly)	30'	Acidic	FACU	20' apart	Y
<i>Kalmia latifolia</i> (Mountain Laurel)	15'	Acidic	FACU	8' apart in clumps or offset rows	
<i>Lindera benzoin</i> (Common Spicebush)	9'	5.0-8.9	FAC	8' apart in clumps or offset rows	Y
<i>Morus rubra</i> (Red Mulberry)	70'	5.0-7.0	FACU	20' apart	Y
<i>Picea rubens</i> (Red Spruce)	110'	4.0-5.8	FACU	20' apart	
<i>Ribes rotundifolium</i> (Appalachian Gooseberry)	5'	6.1-8.5		4' apart in clumps or offset rows	
<i>Sambucus canadensis</i> (American Black Elderberry)	12'	5.0-8.9	FAC	6' apart in clumps or offset rows	
<i>Viburnum dentatum</i> (Southern Arrowwood)	9'	<6.8	FAC	7' apart in clumps or offset rows	
<i>Viburnum prunifolium</i> (Blackhaw)	15'	6.8-7.2	FACU	8' apart in clumps or offset rows	
Not/Less Deer Resistant					
<i>Castanea pumila</i> (Chinquapin)	20'	4.5-6.6		10' apart	
<i>Ceanothus americanus</i> (New Jersey Tea)	3'	4.3-6.5		4' apart in clumps or offset rows	
<i>Celtis occidentalis</i> (Common Hackberry)	60'	6.0-7.8	FACU	50' apart	
<i>Cornus florida</i> (Flowering Dogwood)	30'	4.8-7.7	FACU	30' apart	
<i>Cornus racemose</i> (Gray Dogwood)	6'	4.8-7.4	FAC	3' apart in clumps or offset rows	
<i>Corylus Americana</i> (American Hazelnut)	10'	5.0-7.0	FACU	10' apart in clumps or offset rows	
<i>Corylus cornuta</i> (Beaked Hazelnut)	8'	4.8-7.5	FACU	8' apart in clumps or offset rows	
<i>Crataegus crus-galli</i> (Cockspur Hawthorn)	30'	4.5-7.2	FACU	25' apart	
<i>Diospyros virginiana</i> (American Persimmon)	55'	4.7-7.5	FAC	35' apart	Y
<i>Hamamelis virginiana</i> (American Witchhazel)	20'	4.5-6.2	FACU	15' apart	

<i>Malus coronaria</i> (American/Sweet Crabapple)	30'	7.0- basic		30' apart	
<i>Oxydendrum arboretum</i> (Sourwood)	35'	4.0-6.5	UPL	20' apart	
<i>Prunus alleghaniensis</i> (Allegheny Plum)	20'	5.0-7.5		20' apart	
<i>Prunus Americana</i> (American Plum)	25'	5.0-7.0	FACU	20' apart	
<i>Prunus angustifolia</i> (Chickasaw Plum)	25'	5.0-7.5		20' apart	
<i>Rhus typhina</i> (Staghorn Sumac)	30'	6.8-7.2		15' apart in clumps or offset rows	Y
<i>Sorbus Americana</i> (American Mountain Ash)	20'	Acidic	FACU	15' apart	
<i>Vaccinium angustifolium</i> (Lowbush Blueberry)	2'	<6.8	FACU	2' apart in clumps or offset rows	

FAC = facultative (occurs in wetlands and non-wetlands)

FACU = facultative upland (usually occurs in non-wetlands, but may occur in wetlands)

UPL = upland (almost never occur in wetlands)

Dioecious = male and female flowers occur on separate plants

Recommended Species for Riparian/Seep Areas

Species	Height	pH	Wetland Indicator Status	Planting Instructions	Dioecious?
Deer Resistant					
<i>Amorpha fruticose</i> (False Indigo Bush)	10'	5.0-8.5	FACW	7' apart in clumps or offset rows	
<i>Aronia arbutifolia</i> (Red Chokeberry)	12'	<6.8	FACW	4' apart in clumps or offset rows	
<i>Betula nigra</i> (River Birch)	70'	3.0-6.5	FACW	50' apart	
<i>Cephalanthus occidentalis</i> (Common Buttonbush)	12'	4.7-8.6	OBL	4' apart in clumps or offset rows	
<i>Cornus amomum</i> (Silky Dogwood)	10'	5.0-7.0	FACW	6' apart in clumps or offset rows	
<i>Cornus sericea</i> (Redosier Dogwood)	20'	<7.0	FACW	6' apart in clumps or offset rows	
<i>Crataegus viridis</i> (Green Hawthorne)	30'	4.3-7.3	FACW	25' apart	
<i>Hypericum densiflorum</i> (Bushy St. John's Wort)	5'	5.5-7.0	FACW	3' apart in clumps or offset rows	

<i>Ilex verticillata</i> (Winterberry Holly)	10'	4.5-7.5	FACW	6' apart in clumps or offset rows	Y
<i>Physocarpus opulifolius</i> (Common Ninebark)	10'	4.5-6.5	FACW	5' apart in clumps or offset rows	
<i>Rosa palustris</i> (Swamp Rose)	8'	4.0-7.0	OBL	5' apart in clumps or offset rows	
<i>Salix discolor</i> (Pussy Willow)	20'	6.8-7.2	FACW	8' apart in clumps or offset rows	Y
<i>Spiraea tomentosa</i> (Steelebush)	4'	Acidic	FACW	4' apart in clumps or offset rows	
Not/Less Deer Resistant					
<i>Alnus serrulata</i> (Hazel Alder)	15'	5.0-7.0	OBL	7' apart in clumps or offset rows	
<i>Vaccinium corymbosum</i> (Highbush Blueberry)	12'	4.7-7.5	FACW	5' apart in clumps or offset rows	
<i>Viburnum nudum</i> (possumhaw)	16'	<6.8	OBL	7' apart in clumps or offset rows	

FACW = facultative wetland (usually occurs in wetlands, but may occur in non-wetlands)

OBL – obligate wetland (almost always occurs in wetlands)

Dioecious = male and female flowers occur on different plants

Native Plant Sources

All species planted shall be native to the area. The seed source or ecotype for the saplings need to be as local as possible, with preference of within-state, then mountainous regions of an adjacent state, followed by within the Appalachian Mountain range. The seed source or ecotype should be verified with the vendor, as it is not always given in a catalog or online.

The species listed above are native to Virginia and West Virginia, common to the area, and adapted to the appropriate conditions. Other species exist that are beneficial to wildlife but are allelopathic, preventing the growth of other plants around them, which would reduce success of the plantings. Also, other species may not be adapted to the appropriate conditions. Therefore, it is highly recommended to use only the species listed in this document, as they have been researched with specific purposes in mind. Not every species must be used. If one is unavailable, it may be skipped, and another similar species for the appropriate conditions can be chosen from the list.

Care of Saplings and Planting Procedures

Trees and shrubs should be planted as at least two-year old saplings, and preferably older, with fruit and nut trees being as old as possible. They should be planted while still dormant, in early spring, if possible. Some species may be planted in late fall/early winter when dormant. Consult the vendor on the best time for planting for each species. A planting gel is recommended, as it

retains moisture at the roots after planting. The saplings should not be allowed to dry out during the planting process. To avoid saplings drying out and ensure proper tree planting, the following instructions should be followed:

Care and Handling

- Protection from Sun, Wind, and Adverse Temperature - Saplings should be handled, stored, and transported in a manner to protect them from sun and wind. Only one bag/bundle of saplings should be opened at one time. Partially used bags should be kept closed to prevent exposure of sapling roots to air. Any bag that is torn, separated, or otherwise opened should be immediately patched or otherwise resealed. Partially used bundles should be kept rolled and tied to prevent exposure of sapling roots to air.
- Keeping Sapling Roots Moist – Sapling roots should be kept moist at all times prior to and during planting. Water the roots of saplings in opened bags or bundles if the roots begin to dry. Saplings not being planted should be kept under a tarp in a protected and shaded area.
- Protection from Contamination and Damage - Saplings should be protected from contamination by materials such as gasoline, diesel fuel, oils, or chemicals. Do not crush or abuse saplings by hitting the root or striking the roots across an object to remove excess soil. Roots should not be cut or pruned.

Planting Procedures

- Saplings should not be separated prior to placement in planting bags. One bag should be opened at a time. Another bag should not be opened until the previously opened bag is empty. Planting bags should be free of tears and holes.
- Only one sapling at a time should be removed from the planting bag. This should be done after the planting hole has been made in the ground with a dibble bar, auger, or other suitable planting tool.
- Plant each sapling in a vertical position in a debris-free hole.
- Plant each sapling to a depth where groundline is at approximate root collar level.
- Pack soil firmly around each planted sapling. Close planting hole first at the bottom and finish by closing at the top. Soil should be firmly packed around each sapling and free from air pockets.
- Plant saplings in a manner to prevent "U" roots, "J" roots, "L" roots, and twisted or balled roots.
- Do not plant saplings in frozen ground or during freezing weather.

- Do not plant trees or shrubs in standing water.
- If a large rock is encountered and removed while digging planting holes, place the large rock far enough off to the side or into the forest to protect maintenance equipment when mowing.
- To avoid possible root damage, do not use planting tool to maneuver roots of saplings into holes.

Planting Configuration and Select Fencing

Planting Configuration

- Those species that form low, bushy, dense cover are to be planted in a clump or offset rows, as indicated in the tables. At least ten individuals should be planted at the specified spacing distances in order to form that cover or thicket.
- Those species that are more of a tree form are to be planted at the specified spacing distances with at least five individuals together for those that are monoecious in reproductive morphology (having male and female flowers on the same plant). For those trees and shrubs that are dioecious (having male and female flowers on different plants), as indicated in the tables, at least ten individuals need to be planted together at the specified distances if the sexes of the plants are unknown. If the sexes of the saplings are known, then five plants can be planted instead of ten with one male to four females.
- More than the above-mentioned minimums may be planted for each species in a given location, but there needs to be a variety of species in the area. For instance, instead of planting 200 gray inkberry plants together, plant 20, then 15 common spicebush, then 5 Washington hawthorns, and on down the line.

Select Fencing

Apple, plum, hazelnut, and persimmon trees should be individually fenced immediately after planting to protect from deer browse. Five- to six-foot tall, 12- to 14-gauge welded wire fence with 2"x4" openings between wires is recommend. The fence/cage around each of the above-mentioned saplings should be four feet in circumference to allow for crown spread within the fence. Each fence should be staked using two metal t-posts or other strong support and secured to the fence using metal clips, wire, or zip ties.

Monitoring, Replacement, and Maintenance

Trees and shrubs should be monitored for survival and fencing conditions. Monitoring should occur one year and three years after planting and should be performed anytime from bud break in the spring to leaf drop in the fall. If survival in any clump of planted species is less than 50%,

dead plants should be replaced. If survival of a particular species continues to be low in any given area, fencing may be required, or a more deer-resistant species should be substituted. Fencing that is damaged enough to impede the growth of the plants they protect should be repaired or replaced.

Maintenance of the pipeline opening adjacent to these plantings should be only through mechanical mowing and should occur outside of the bird nesting season, as outlined in the *Migratory Bird Plan*. Herbicide should **not** be used on these native plantings. Many of the shrubs spread through suckers, so herbicide use on these species would kill the entire plants.

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