

**Mountain Valley Pipeline, LLC
Mountain Valley Pipeline Project
Docket No. CP16-10-000**

**Implementation Plan
Dated October 2017**

Attachment IP-13a

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

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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. Initially, the primary goal of seeding is to establish a vegetative cover to minimize surface erosion and sedimentation resulting from precipitation and surface flow. The secondary goal of these seeding guidelines is to assist with establishing an assortment of native species beneficial for wildlife and pollinators. All recommended species are commercially available.

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. <i>italicum</i>))	5.0-7.9	NI/moderate
German/Foxtail Millet (<i>Setaria italica</i>)	5.3-6.9	FACU
Cereal Rye (<i>Secale cereale</i>)	52-8.0	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 at least 5 of the following species for permanent mixes, or suggest an existing restoration seed mix containing at least some of these species but not containing anything that would act invasive at the site. Please also 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	pH preference	Wetland Indicator Status
<i>Non-native</i>		
Hard Fescue (<i>Festuca ovina</i> var. <i>duriuscula</i> (<i>F. longifolia</i>))	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>Symphyotrichum</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 h.</i>))	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

To be installed as permanent vegetation in areas accessible to necessary drill or other 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, pick at least five species, or suggest an existing restoration seed mix containing at least some of these species but not containing anything not native to the state, or 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.

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 (pH and Wetland indicator status left blank for duplicate species)

Name	pH preference	Wetland Indicator Status
Dry Soils/Upland		
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> (<i>Cassia f.</i>))	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-
High Elevation		
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-
Riparian		
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> (<i>Cassia m.</i>)))	4.0-7.0	FAC+
New York Ironweed, (<i>Vernonia noveboracensis</i>)	4.5-8.0	FACW+
Partridge Pea, (<i>Chamaecrista fasciculata</i> (<i>Cassia f.</i>)))	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> (<i>Cassia h.</i>)))	circumn.	FAC
Wetland/Wet Soils (pH indicators left blank in this section because the majority of "problem" acid soil sites are dry uplands. Wetland indicators left blank 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' (Panicum clandestinum (Dichanthelium c.), 'Tioga')		
Fringed (Nodding) Sedge, (Carex crinita)		
Great Blue Lobelia, (Lobelia siphilitica)		
New York Ironweed, (Vernonia noveboracensis)		
Path Rush, (Juncus tenuis,)		
Purple Node Joe Pye Weed, (Eupatorium purpureum)		
Redtop Panicgrass, (Panicum rigidulum (P. stipitatum))		
Soft Rush (Juncus effusus)		
Spotted Joe Pye Weed, (Eupatorium maculatum (Eupatoriadelphus maculatus))		
Squarrose Sedge, (Carex squarrosa)		
Swamp Milkweed (Asclepias incarnata)		
Switchgrass, 'Cave-In-Rock' (Panicum virgatum, 'Cave-In-Rock')		
Tussock Sedge, (Carex stricta)		
Wild Senna (Senna hebecarpa (Cassia h.))		
Woolgrass, (Scirpus cyperinus)		

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) However, many of the species listed above would persist for several years following a lime addition with the initial seeding of soils. Blackberries and goldenrods do well in sunny, acid, dry soils, and ferns, lycopodiums, and mosses persist as vegetative cover in more shaded areas. The following are some suggestions of upland/dry site perennial species native to WV and VA, and the minimum pHs they can tolerate (all available from Ernst Seeds):

Table 4: Species for low pH soils

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

REFERENCES

- Ernst Conservation Seeds. 2016. Accessed August 8, 2016.
<http://www.ernstseed.com/speciesmix-search/>
- Steinfeld, D.E., S.A. Riley, K.M. Wilkinson, T.D. Landis, L.E. Riley. 2007. Roadside Revegetation: An Integrated Approach to Establishing Native Plants. Federal Highway Administration, Western Federal Lands Highway Division. Vancouver, WA.
http://www.nativerevegetation.org/learn/manual/ch_10_3.aspx
- Federal Energy Regulatory Commission. 2013. Upland Erosion Control, Revegetation, and Maintenance Plan, May 2013 Version. Office of Energy Projects, Washington, D.C.
- USDA-NRCS Wetland Indicator Status: More information and sources.
<https://plants.usda.gov/wetinfo.html> Accessed 11/14/16.
- Virginia Department of Conservation and Recreation. 1992. Virginia Erosion and Sediment Control Handbook. Division of Soil and Water Conservation, Richmond, VA.
- VA State Water Control Board. Virginia Administrative Code, Title 9 Environment. Chapter 840: Erosion and Sediment Control Regulations.
- Virginia Department of Forestry. 2002. Virginia's Forestry Best Management Practices for Water Quality, Fourth Edition.
- Virginia Department of Forestry. 2011. Virginia's Forestry Best Management Practices for Water Quality, Technical Manual, Fifth Edition.