LOCALLY RARE SPECIES REPORT

MOUNTAIN VALLEY PIPELINE

JEFFERSON NATIONAL FOREST
EASTERN DIVIDE RANGER DISTRICT

May 24, 2017

Prepared for:

U.S. Department of Agriculture, Forest Service
Jefferson National Forest
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LIST OF ACRONYMS AND ABBREVIATIONS

ATWS	additional temporary workspace
BA	Biological Assessment
BE	Biological Evaluation
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
hp	horsepower
JNF	Jefferson National Forest
LRS	Locally Rare Species
MVP	Mountain Valley Pipeline, LLC
Project	Mountain Valley Pipeline Project
ROW	right-of-way
TES	Threatened, endangered, Forest Service sensitive
Transco	Transcontinental Gas Pipe Line Company, LLC
USFS	U.S. Forest Service

1.0 Introduction

1.1 Project Introduction

Mountain Valley Pipeline, LLC (MVP), a joint venture between EQT Midstream Partners, LP, NextEra Energy, Inc., WGL Holdings, Inc., Con Edison Gas Midstream, LLC, and RGC Midstream, LLC, 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 488.3-kilometer (303.4-mi), 106.7-centimeter (42-in) 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.

The proposed pipeline will extend from the existing Equitrans, L.P. transmission system and other natural gas facilities in Wetzel County, West Virginia to the existing Transcontinental Gas Pipe Line Company, LLC's (Transco) Zone 5 compressor station 165 in Pittsylvania County, Virginia (Appendix A Figure 1). In addition to the pipeline, the Project will require approximately 171,600 horsepower (hp) of compression at three compressor stations currently planned along the route as well as measurement, regulation, and other ancillary facilities required for the safe operation of the pipeline. The pipeline is designed to transport up to 2.0 million dekatherms per day of natural gas.

1.2 Mountain Valley Pipeline and Jefferson National Forest

Approximately 3.5 miles of the proposed alignment cross Jefferson National Forest (JNF) lands in Monroe County, West Virginia and Giles and Montgomery counties, Virginia. The 6-mile Pocahontas Road (Forest Road 972) and 1-mile Mystery Ridge Road (Forest Road 11080) in Giles County, Virginia are currently proposed to provide access to portions of the alignment near Peters Mountain. Additionally, two additional temporary workspaces (ATWS) are currently proposed in Montgomery County. No ancillary facilities or new access roads are proposed to be constructed on JNF land.

A Biological Evaluation (BE) for this Project was submitted on March 3, 2017. The BE assesses potential impacts to species identified as sensitive by the Regional Forester (Forest Service Sensitive Species).

This report assesses the potential effects of the Project on Locally Rare Species (LRS). These species are selected by the U.S. Forest Service (USFS) based on their rarity on a particular Forest, in this case JNF. Typically, the range-wide populations of LRS are

secure; however, that is not always the case as some may be designated as federal or state species of concern or under review for potential federal listing.

1.3 Proposed Alignment on JNF Land

The Project crosses into the JNF in Monroe County, West Virginia, southwest of the town of Lindside, and continues to the edge of JNF land at the border of Virginia. The proposed alignment continues through Virginia and crosses the JNF again in Montgomery County.

The West Virginia portion of the Project lies in the Allegheny Plateau, Allegheny Mountains, and Valley and Ridge Physiographic regions. In Virginia, the Project lies in the Valley and Ridge, Blue Ridge, and Piedmont Physiographic regions. All JNF areas crossed by the Project are within the Valley and Ridge Province (Fenneman 1938).

The geologic strata of the Valley and Ridge mountains consist of several bedrock formations. Silurian sandstones underlie ridge tops and upper to middle slopes are underlain by shale and minor sandstone. The lower portion of the mountains is underlain by a layer of calcareous shale, shale, and minor limestone. Mountain bases are characterized by limestone and valleys are underlain by dolomite. The Valley and Ridge Province is underlain by essentially the same strata as the Allegheny Plateau, which is located in western and central New York, northern and western Pennsylvania, northern and western West Virginia, and eastern Ohio. The Valley and Ridge Province, however, contains older parts of the stratigraphic column. Structurally, the Valley and Ridge is much more severely deformed than the Allegheny Plateau. The ridges were formed where stronger rocks resisted erosion, and the valleys were formed by constant erosion and down-cutting over time. The Valley and Ridge contrasts the Allegheny Plateau with its longitudinal ridges and much deeper dips in the strata (Fenneman 1938). Elevations of the Project within the JNF range between approximately 518 and 1,097 meters (1,700 and 3,600 ft).

The West Virginia/Virginia border approximately forms the western edge of the Valley and Ridge Province, which extends from southeast Tennessee northeast to eastern Pennsylvania in a fairly narrow band. The Valley and Ridge is part of the Oak-Chestnut forest described by Braun (1950). The region was traditionally dominated by oak and chestnut, but chestnut has been replaced in the canopy by oaks and hickories (Braun 1950). The portion of the JNF crossed by the Project is composed primarily of deciduous forest.

2.0 Locally Rare Species

On August 6, 2015, the USFS provided a list of 148 LRS (112 plants, 11 birds, 5 butterflies, 4 moths, 3 mammals, 3 reptiles, 3 millipedes, 2 dragonflies, 1 skipper, 1 amphibian, 1 freshwater mussel, 1 damselfly, and 1 isopod) that may occur within the Project area (Table 1). These species occupy a variety of habitats and are considered rare on or within the general vicinity of JNF.

3.0 Field Surveys

3.1 Summary

Field surveys for threatened, endangered, and Forest Service sensitive (TES) species were completed along the length of the proposed alignment. These surveys included bat presence/absence mist netting, portal searches for potential winter bat habitat, plant surveys, avian habitat assessments and nest surveys, and an abbreviated mussel survey on the current and abandoned Craig Creek crossings.

A 91-meter (300-ft) study corridor was used for field surveys unless a larger corridor was specified by applicable guidelines. Surveys were based on guidance provided by federal and state agencies, including the USFS for activities on JNF lands. The survey method consisted of walking the study corridor searching for different habitat types and species occurrences. Plant surveys employed a meander search method (Goff et al. 1982) where new habitat variations or unique areas were constantly being searched for in order to maximize florisitc variation. Wildlife surveys consisted of searching for individuals and/or signs of their presence. Searching for individuals consisted largely of visually scanning vegetation and looking under logs and rocks. Searching for signs of species consisted of studying scat, tracks, calls, nests, and/or egg masses detected during the survey. Survey intensity was concentrated on potential sites where ground disturbance will be greatest. Specific locations for each survey type are provided in the BE.

No federally listed species were identified during surveys. Two Forest Service Sensitive Species were observed along the proposed alignment: eastern small-footed bat (*Myotis leibii*) and rock skullcap (*Scutellaria saxatilis*). One additional Forest Service Sensitive Species, American barberry (*Berberis canadensis*), was identified along an abandoned route.

Table 1. Locally rare species within vicinity of the Mountain Valley Pipeline.

Scientific Name	Common Name	Habitat	Range on or near JNF
Amphibians			
Cryptobranchus alleganienesis alleganienesis	eastern hellbender	clear, moderate- to fast-flowing streams and rivers with large flat rocks	New, Holston, Clinch, Powell River drainages; Highland County
Reptiles			
Opheodrys vernalis	smooth greensnake	moist meadows or grassy areas at the edges of bogs or small streams	Alleghany, Augusta, Bath, Craig, Highland, Page, Rockingham, Roanoke counties
Plestiodon anthracinus anthracinus	northern coal skink	rocky outcrops, ledges, or slabs within forested habitats	Alleghany, Augusta, Bath, Botetourt, Montgomery, Rockbridge, Rockingham counties
Pituophis melanoleucus melanoleucus	northern pine snake	dry open slopes with cover and soils suitable for burrowing	Augusta, Bath, Botetourt, Craig counties
Birds			
Accipiter cooperii	Cooper's hawk	forested habitats	Potts Mtn, Craig County; Mt. Rogers, Grayson, Smyth counties; Highland, Lee, Scott, Wise counties
Accipiter striatus	Sharp-shinned hawk	mixed or coniferous forests, open deciduous woodlands, thickets, edges	Alleghany, Giles, Grayson, Scott, Smyth, Tazewell, Washington counties
Aquila chrysaetos	Golden eagle	open and semi-open country	Transient and winter visitor; winter resident in southwestern VA and Highland County; rare summer visitor; no firm breeding records
Catharus ustulatus	Swainson's thrush	spruce forests and dense streamside woods	Rare summer resident on Mt. Rogers since 1966, Grayson County; Beartown, Tazewell County; Highland County
Certhia americana	Brown creeper	woodlands, groves, shade trees; breeds in mature forest, either coniferous or deciduous, with many large trees	Glen Alton, Giles County; Highland County; Mt Rogers, Grayson, Smyth, Washington counties
Empidonax alnorum	Alder flycatcher	thickets of deciduous trees and shrubs, usually near water	Mt Rogers, Grayson County since 1974; Blacksburg; Bath, Highland, Tazewell counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Loxia curvirostra	Red crossbill	spruce-fir or hemlock forests above 4,000 feet	Glen Alton, Giles County; Mt Rogers, Whitetop Mtn, Grayson, Smyth counties; Highland County; Shenandoah Mt. Area, Rockingham County
Setophaga cerulea	Cerulean warbler	closed canopy, structurally mature hardwood forest in a mesic or hydric condition	Peaks of Otter area Bedford, Botetourt counties; Bath, Craig, Dickenson, Giles, Lee, Scott, Wise counties
Setophaga fusca	Blackburnian warbler	breeds in boreal coniferous and mixed forests, especially spruce and hemlock	Augusta County; Mountain Lake, Giles County; Laurel Fork, Highland County; Mount Rogers, Smyth, Grayson counties; Russell County
Sphyrapicus varius	Yellow-bellied sapsucker	woodlands, aspen groves	In VA, rare and local summer resident; Amherst, Augusta, Bath, Highland counties; Mt Rogers, Grayson, Smyth, Giles counties
Vermivora chrysophera	Golden-winged warbler	open shrubby habitat at mid to high elevations within broader forested matrix west of the Blue Ridge Mountains	Augusta, Bath, Botetourt, Giles, Highland, Rockbridge, Tazewell, Washington counties.
Mammals			
Lontra canadensis	northern river otter	ponds, marshes, lakes, rivers, estuaries	Millboro Springs; James River; Cowpasture River; N and South Fork Shenandoah River; Big Otter Creek; New River at McCoy, North Fork Roanoke River
Mustela nivalis	least weasel	wide range of habitats, including forest, farmland and cultivated fields, grassy fields and meadows, riparian woodland, hedgerows, alpine meadows and forest, scrub, steppe, semi-desert, prairies, and coastal dunes	Ridge and Valley, Blue Ridge; Upper piedmont and mountains
Neotoma magister	Allegheny woodrat	Blue Ridge to the west; riparian areas, wooded wetlands, caves and cliffs	Range in VA uncertain, sites are being monitored presently to determine status; seems to be presently found over entire forest
Freshwater Mussels			
Elliptio lanceolata	yellow lance	Requires slow currents with unsilted sandy substrates and can tolerate a various water sizes	Roanoke River, James River

Scientific Name	Common Name	Habitat	Range on or near JNF
Isopods			
Caecidotea holsingeri	Greenbrier Valley cave isopod	aquatic cave habitats	Ridge & Valley; 10 sites throughout Allegheny, Bath, Giles, Highland counties, VA; Greenbrier County, WV
Millipedes			
Conotyla aeto	Aeto millipede	Presumably leaf litter	Known from only one site in VA: Burks Garden area, Tazewell County
Rudiloria trimaculata tortuas	A millipede	Presumably leaf litter	Known from only three localized and disjunct sites: Potts Mountain, Craig County; Mountain Lake, Giles County; Peaks of Otter, Bedford County
Zygonopus packardi	Packard's blind cave millipede	Caves	Hopkins Cave, Starnes Cave, Giles County; Hamilton Cave, Bland County; Tawny Cave, (private) Giles County
Damselflies			
Calopteryx angustipennis	Appalachian jewelwing	Aquatic	On island below ford of Craig Creek at Rt. 786, Botetourt County; along Passage Ck at Elizabeth Furnace, Shenandoah County
Dragonflies			
Lanthus parvulus	northern pygmy clubtail	Clear streams and brooks with strong current over clean gravel, cobbles or bedrock, on comparatively unproductive soils	Highland, Montgomery counties, VA; Trout Branch, WV
Aeshna mutata	spatterdock darner	Sinkhole ponds, bog ponds, small lakes, and artificial ponds; usually fishless	Bullpasture River gorge near Williamsville, Highland County; Shenandoah Pond, Augusta County; marsh near Paint Bank, Craig County
Butterflies, Moths, and Skipper			
Anaplectoides brunneomedia	Brown-lined dart moth	High-elevation forests	Grayson Highlands, Giles, Smyth counties
Boloria selene	silver-bordered fritillary	wet meadows, bogs, marshes	Bath, Giles, Highland, Nelson counties
Callophrys polios	hoary elfin	rocky or sandy barrens, bogs, outcrops etc. with abundant bearberry. Also in dry rocky forest with *Epigea repens*	Augusta, Highland, Roanoke counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Catocala marmorata	Marbled underwing	riparian and forested areas	Montgomery County
Catocala pretiosa pretiosa	Precious underwing	pinelands, swamp forest	Blue Ridge, Ridge & Valley
Erora laeta	early hairstreak	hardwood forests or hardwood-northern conifer mixed forests	Augusta, Bath, Bland, Botetourt, Craig, Giles, Highland, Montgomery, Rockbridge, Wise counties
Euchloe olympia	Olympia marble	open areas including prairies, foothills, lakeshore dunes, shale barrens, meadows, open woodlands	Augusta, Frederick, Giles, Highland, Lee, Rockingham, Shenandoah counties
Euphyes bimacula	two-spotted skipper	bogs, sedge meadows, sedge marshes along streams and sometimes openings in swamps	Augusta, Highland, Montgomery counties
Phyciodes batesii batesii	tawny crescent	Dry habitats, including clearings, open woods and roadsides containing wavy-leaved asters	Historically, 1938 and 1940, collected from Mountain Lake, Giles County; Bedford, Botetourt, Frederick counties
Synanthedon castaneae	chestnut clearwing moth	Forested	Blue Ridge, Ridge & Valley
Non-vascular Plants[1]			
Plagiochasma rupestre	A flapwort	Two Virginia collections, both from Giles County: soil pockets and shaly strata around edges of south and southeast-facing, reddish sandstone cliffs and ledges on bluff high above New River; shallow, bare soil on dry, shaded ledge and crevices at base of south-facing sandstone cliff mid-slope above New River	Giles County
Radula tenax	A liverwort	Moist rocks or trees on mountains below spruce-fir zone	Amherst, Giles, Whitetop, Grayson, Smyth counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Sphagnum angustifolium	narrowleaf peatmoss	high-elevation bogs, seepages, and saturated forests, usually with red spruce.	Giles, Grayson Cos, VA; Greenbrier, Pocahontas counties, WV
Sphagnum capillifolium	pom-pom peatmoss	bogs, wet rocks, and acid soil in spruce and spruce-hemlock forests	Giles, Grayson, Smyth Cos, VA; Pocahontas counties , WV
Sphagnum flexuosum	flexuose peatmoss	in superficial to deep peat of three mountain bogs in Giles County	Giles, Wythe counties
Sphagnum fuscum	brown peatmoss	bogs and seepages in Giles County	Giles County; Cascades of Little Stony Creek, Spruce Bog, and Cranberry Bog
Sphagnum girgensohnii	Girgensohn's peatmoss	bogs, saturated forests, and wet areas around Cascade Falls of Little Stony Creek in Giles County	Giles, Washington counties, VA; Pocahontas County, WV
Sphagnum quinquefarium	five-rowed peatmoss	saturated forests, especially of red spruce and hemlock; damp to wet outcrops and cliffs	Carroll, Giles, Grayson, Page, Smyth counties
Sphagnum rubellum	red peatmoss	bogs, saturated forests, and wet rocks at high elevations	Giles, Grayson , Smyth counties , VA; Pocahontas County, WV
Sphagnum russowii	Russow's peatmoss	bogs and saturated forests at high elevations in the mountains	Giles, Grayson, Rockingham counties
Sphagnum subtile	delicate peatmoss	seepages and saturated forests, especially of red spruce and hemlock, mostly at high elevations in the mountains	Giles, Russell counties, VA; Pocahontas County, WV
Vascular Plants[1]			
Arnoglossum reniforme	great Indian plantain	floodplain forests, stream banks and riverbanks, and rocky flood-scoured bars at lower elevations; cove forests, rich oak-hickory forests, northern hardwood forests, and clearings at middle to high elevations	Alleghany, Amherst, Augusta, Bath, Craig, Dickenson, Shenandoah, Nelson, Gray, Smyth counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Asplenium bradleyi	Bradley's spleenwort	crevices of dry, exposed or partly shaded cliffs and outcrops of sandstone, quartzite, gneiss, schist, and other felsic metasedimentary rocks, at low to moderate elevations	Botetourt, Dickenson, Giles, Rockingham counties
Baptisia australis var. australis	blue wild indigo	flood-scoured rocky or gravelly bars and outcrops along high-gradient rivers and streams	Augusta, Bedford, Frederick, Giles, Page, Rockingham, Rockbridge, Pulaski, Scott, Shenandoah counties
Botrychium lanceolatum var. angustisegmentum	triangle grape fern	high-elevation forests, rocky stream banks, and grassy balds.	Giles, Grayson counties
Botrychium simplex var. simplex	dwarf grape fern	mesic and dry-mesic forests	Giles, Grayson, Page, Shenandoah counties
Calopogon tuberosus	tuberous grass-pink	bogs, fens, and seeps on both basic and acidic substrates in the mountains	Ridge & Valley; Blue Ridge; Shenandoah, Warren counties south to Lee County, west to Grayson County
Camassia scilloides	wild hyacinth	moist prairies, savannas, open woodlands, rocky wooded slopes, or limestone glades; mesic to damp open forests, low fields and meadows along streams, dry rocky upland forests; usually on calcareous substrates	Bath, Giles, Highland, Rockbridge, Scott, Smyth, Washington counties
Campanula rotundifolia	Harebell	limestone and dolomite barrens, outcrops, and cliffs	Giles, Rockbridge counties
Carex buxbaumii	brown bog sedge	bogs, seeps, calcareous and mafic fens, depression swamps and ponds, and wet meadows	Augusta, Bath, Giles, Nelson, Rockingham counties
Carex conoidea	field sedge	calcareous and mafic fens, saturated meadows and old fields over limestone, dolomite, or mafic substrates	Bath, Grayson, Highland, Washington counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Carex cristatella	crested sedge	wet meadows, fens, seeps, ditches, and river shores; usually in calcareous soils or nutrient-rich alluvium	Augusta, Bath, Bland, Giles, Grayson, Montgomery, Tazwell, Smyth, Washington counties
Carex flava	yellow sedge	calcareous fens and seeps	Dismal Creek, Giles County
Carex interior	inland sedge	calcareous seeps, fens, and wet meadows	Augusta, Bland, Grayson, Highland, Montgomery, Washington counties
Carex oklahomensis	Oklahoma sedge	calcareous roadbank seeps	Giles County; likely introduced from the west
Carex purpurifera	limestone purple sedge	rich cove forests, dry-mesic to dry calcareous forests over Mississippian limestone	Lee, Russell, Scott, Wise counties
Carex roanensis	Roan Mountain sedge	mostly dry-mesic (occasionally mesic or dry), often rocky, oak, oak-hickory, and mixed hardwood forests at middle to high elevations	Augusta, Smith, Tazwell, Wise, Washington counties
Carex tetanica	rigid sedge	calcareous fens and spring marshes, wet meadows and prairies, calcareous seeps and seepage swamps	Washington County to Montgomery County; Allegheny, Augusta, Frederick, Highland, Shenandoah
Carex vesicaria	inflated sedge	montane depression ponds, mafic fens, very wet seeps and spring marshes	Amherst, Botetourt, Bath, Craig, Grayson, Wythe counties
Chenopodium foggii	Fogg's goosefoot	dry, rocky open forests and woodlands; most known sites are on shale or moderately calcareous sandstones and support fairly diverse oak-hickory vegetation	Alleghany, Bath, Giles, Rockingham, Shenandoah counties
Cheilanthes eatonii Baker	chestnut lip fern	rocky slopes and ledges	Alleghany, Giles , Montgomery, Page, Pulaski, Rockbridge, Shenandoah, Wythe counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Cirsium altissimum	tall thistle	floodplain forests, riverbanks, alluvial fields, low mesic forests, and clearings	Botetourt, Giles, Shenandoah counties
Clematis catesbyana	satin-curls	calcareous woodlands, outcrops, clearings, and roadsides	Augusta, Giles, Lee, Russell, Smyth, Tazwell, Wise counties
Clematis occidentalis var. occidentalis	purple clematis	higher-elevation forests, rock outcrops, clearings, and roadsides; occasionally in seeps and seepage swamps	Allegheny, Augusta, Giles, Highland, Montgomery, Page, Shenandoah, Warren counties
Cornus rugosa	roundleaf dogwood	rocky forests and boulder fields	Augusta, Craig, Giles, Highland, Rockbridge, Shenandoah counties
Crataegus calpodendron	pear hawthorn	openly wooded slopes and ravines, stream banks, and open, often rocky upland forests over basic or calcareous rocks	Allegheny, Amherst, Page, Pulaski, Smyth, Wise counties
Crataegus mollis var. mollis	downy hawthorn	mesic to dry upland forests, clearings, and old fields in the mountains	Botetourt, Montgomery, Roanoke, Wise counties
Crataegus pruinosa	prunose hawthorn	old fields, clearings, and dry, often rocky, forests	Ridge & Valley; Blue Ridge, except far southwest VA
Crataegus succulenta var. succulenta	fleshy hawthorn	most often in old fields, pastures, clearings, and forest edges; occasionally on forested slopes and ridges	Alleghany, Craig, Highland, Montgomery, Wythe, Page, Smyth, Tazwell counties
Cuscuta coryli	hazel dodder	dry, open forests, rocky woodlands and barrens on mafic and calcareous rocks	Augusta, Bath, Giles, Page, Rockingham, Russell, Warren counties
Cuscuta rostrata	beaked dodder	middle- to high-elevation montane forests and clearings	Bath, Buchanan, Giles, Highland, Rockbridge, Russell, Smyth, Tazwell, Washington counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Cypripedium reginae	showy lady's-slipper	fens, seepage swamps, and mesic forests, in soils weathered from calcareous rocks	Giles, Page, Rockingham, Warren, Washington counties
Cystopteris tennesseensis	Tennessee bladder fern	moist to dry limestone or dolomite outcrops	Pulaski, Montgomery counties
Desmodium canadense	showy tick-trefoil	fens, wet meadows, and riverside scour bars	Augusta, Bland, Rockbridge, Russell, Washington counties
Desmodium cuspidatum	toothed tick-trefoil	dry calcareous forests, woodlands, and barrens; floodplain forests and riverbanks	Ridge & Valley; Blue Ridge; Scott County to Augusta, Nelson counties
Dichanthelium annulum	ringed panic grass	dry open forests, woodlands, barrens, and clearings; usually in rocky, sandy, or shrink-swell hardpan soils	Craig, Giles, Lee counties
Eleocharis intermedia	matted spikerush	calcareous fens and seeps; muddy pools, depressions, ditches, and ruts in disturbed open ground over limestone or dolomite	Montgomery, Pulaski, Russell, Tazwell, Wythe counties
Elymus canadensis var. canadensis	nodding wild rye	riverbanks, alluvial fields and clearings, and other open, disturbed habitats near rivers and large streams	Giles, Rockbridge, Rockingham, Shenandoah counties
Elymus trachycaulus ssp. trachycaulus	slender wheatgrass	dry, open oak or oak-hickory forests and shale woodlands; usually on gentle upper slopes or crests of shale, sandstone, or metasiltstone ridges	Ridge & Valley; Craig County north to Rockingham County
Epilobium ciliatum ssp. ciliatum	American willow-herb	bogs, seeps, wet meadows, and wet clearings; usually at higher elevations	Bland, Giles, Grayson, Highland, Scott, Smyth, Washington counties
Epilobium leptophyllum	bog willow-herb	bogs, fens, seeps, and boggy meadows	Southwest VA

Scientific Name	Common Name	Habitat	Range on or near JNF
Fleischmannia incarnata	pink thoroughwort	mesic to dry, open forests, woodlands, and clearings over calcareous and mafic rocks, and coastal shell deposits	Bath, Craig, Giles, Page, Scott counties
Eurybia radula	low rough aster	fens, bogs, and seeps	Augusta, Bedford, Craig, Frederick, Highland, Montgomery counties
Eutrochium maculatum var. maculatum	spotted joe-pye weed	calcareous fens and spring marshes, wet meadows, and streambanks	Ridge & Valley; Highland County to Dickenson County
Gaylussacia brachycera	box huckleberry	dry, acidic forests and woodlands of oaks, pines, and other heaths	Ridge & Valley
Gentiana linearis	narrow-leaf gentian	bogs, fens, floodplain (river or stream floodplains), meadows and fields, shores of rivers or lakes	Bland, Montgomery counties
Gentianopsis crinita	greater fringed gentian	calcareous seeps and wet meadows	Southwest VA
Gnaphalium uliginosum	low cudweed	high-elevation clearings, usually in ruts, muddy depressions, or rocky ephemeral pools	Grayson, Highland, Page, Rockingham counties
Goodyera repens	dwarf rattlesnake-plantain	acidic cove forests and hemlock forests, often rooted in moss	Ridge & Valley; Blue Ridge; Rockingham County to Wise Coutny
Helianthus laevigatus	smooth sunflower	dry, open forests, rocky woodlands, barrens, clearings, and road banks on both acidic and basic substrates	Ridge & Valley; Wythe County north to Shenandoah County
Heuchera hispida	purple alumroot	calcareous rocky forests and rock outcrops, most numerous in carbonate-rock areas	Ridge & Valley, Blue Ridge
Heuchera longiflora	long-flowered alumroot	rocky forests and woodlands over limestone, dolomite, and calcareous shales, siltstones, or sandstones	Far southwest VA

Scientific Name	Common Name	Habitat	Range on or near JNF
Hexalectris spicata var. spicata	crested coralroot	rich mesic forests, dry rocky woodlands over basic and calcareous rocks	Ridge & Valley; Blue Ridge
Houstonia canadensis	Canada bluets	limestone woodlands, barrens, and outcrops	Giles, Lee, Pulaski, Scott, Washington, Wise, Wythe counties
Hypericum boreale	Northern St. John's-wort	sinkhole ponds in the Shenandoah Valley, interdune ponds near the coast	Rockbridge County to Rockingham County
Hypericum fraseri	Fraser's Marsh St. John's-wort	bogs, mafic fens, seeps, seepage swamps, depression ponds and swamps	Alleghany County north to Highland County; Giles County
Juncus articulatus	jointed rush	stream banks, gravel bars, open seeps	Wise County to Bland, Buchanan, Montgomery to Craig, Highland counties
Juncus brachycephalus	small-head rush	calcareous fens and seeps	Ridge & Valley
Juncus brevicaudatus	narrow-panicled rush	bogs, seeps, sphagnous pond edges, and beaver meadows, mostly at high elevations	Ridge & Valley
Leucothoe fontanesiana	highland dog-hobble	cove forests, bluffs, and stream banks; occurs soils weathered from sandstone, limestone, and granitic rocks	Bland, Lee, Scott counties
Linum sulcatum	grooved yellow flax	dry rocky woodlands and barrens over limestone, dolomite, or, rarely, metabasalt, calcareous sandstone, and calcareous shale	Ridge & Valley, Blue Ridge; Lee, Russell, Pulaski counties to Warren County
Liparis loeselii	bog twayblade	fens, seeps, seepage swamps, and wet meadows, usually in calcareous soils	Ridge & Valley, Blue Ridge; Dismal Creek, Giles Co

Scientific Name	Common Name	Habitat	Range on or near JNF
Lithospermum latifolium	American gromwell	mesic to dry forests and woodlands over limestone and dolomite	Ridge & Valley; Blue Ridge
Lycopodiella inundata	northern bog clubmoss	bogs, seeps, boggy clearings, seepy pond edges, and borrow pits	Bath, Giles, Highland, Rockingham Cos to Rockbridge counties
Lythrum alatum	winged loosestrife	calcareous fens and prairies, wet meadows and clearings, riverside prairies and flood-scoured bars	Augusta, Rockbridge, Warren, Washington counties
Melica nitens	three-flower melic grass	dry rocky woodlands, bluffs, and cliffs; mostly on limestone and dolomite, occasionally on calcareous shale or metasiltstone	Ridge & Valley
Micranthes pensylvanica	swamp saxifrage	forested seeps and seepage swamps, usually on calcareous or mafic substrates	Ridge & Valley, Blue Ridge; Botetourt County to Warren County; Grayson, Giles counties
Parnassia grandifolia	large-leaved grass-of-parnassus	fens and thinly wooded, gravelly seeps over limestone, dolomite, amphibolite, and ultramafic rocks; restricted to calcareous or magnesium-rich soils	Augusta County, Montgomery County
Paronychia virginica var. virginica	yellow nailwort	shale barrens and cliffs	Alleghany, Botetourt, Giles, Wythe counties
Patis racemosa	black-seed ricegrass	rich cove forests, dry-mesic to dry upland forests, rocky woodlands, boulder fields, and shaded outcrops on mafic and calcareous substrates	Ridge & Valley, Blue Ridge
Phlox amplifolia	large-leaf phlox	mesic to dry-mesic montane forests and well-drained floodplain forests	Ridge & Valley; Alleghany County

Scientific Name	Common Name	Habitat	Range on or near JNF
Platanthera grandiflora	large purple fringed orchid	mesic cove forests, seeps, and seepage swamps	Ridge & Valley, Blue Ridge
Poa palustris	fowl bluegrass	calcareous spring marshes, wet meadows, rocky stream banks and bars, seeps, bogs, and high-elevation beaver meadows	Ridge & Valley, Blue Ridge; Giles County north to Augusta County
Prunus nigra	Canada plum	old fields, fencerows, and forest edges	Ridge and Valley, Blue Ridge; Montgomery County to Warren County
Pyrola elliptica	Shinleaf	mesic to dry mixed oak forests, northern red oak forests, spruce forests	Tazwell County to Shenandoah County
Rhododendron arborescens	sweet azalea	rocky forests, banks, and outcrops along rivers and high-gradient streams; habitats are usually within or just above the zone of frequent flood-scouring	Giles, Grayson counties; Guest River Gorge, Wise County
Rhododendron cumberlandense	Cumberland azalea	montane forests and woodlands	Southern Ridge & Valley
Rosa setigera	climbing prairie rose	old fields, clearings, pastures, stream banks, and roadsides	Ridge & Valley; Amherst, Highland, Lee, Montgomery, Scott, Warren counties
Rubus idaeus ssp. strigosus	red raspberry	rocky, high-elevation forests, boulder fields, outcrops, clearings, and old fields; rarely at the edges of high-elevation beaver wetlands	Ridge & Valley, Blue Ridge; Bath County to Page County
Ruellia purshiana	Pursh's wild-petunia	dry forests, rocky woodlands, and barrens over calcareous and mafic rocks	Ridge & Valley, Blue Ridge; Lee County to Frederick County
Sagittaria rigida	sessile-fruited arrowhead	natural mountain ponds, wet meadows	Augusta, Frederick, Giles, Nelson, Page, Pulaski, Rockbridge counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Sanicula trifoliata	large-fruited sanicle	rich, mesic cove and slope forests, dry-mesic oak-hickory forests on mafic or calcareous substrates, rich northern hardwood forests	Ridge & Valley, Blue Ridge; Scott County to Shenandoah County
Scutellaria ovata ssp. rugosa	heart-leaf skullcap	dry, rocky open forests, woodlands, barrens, and clearings over limestone, dolomite, shale, metabasalt, and other base-rich rocks	Ridge & Valley; Giles, Montgomery counties to Bath, Rockbridge counties; Ridge & Valley in WV
Scutellaria leonardii	small skullcap	dry, rocky woodlands, barrens, outcrop crevices, and clearings over mafic and calcareous rocks, including limestone, dolomite, calcareous shales, metabasalt, diabase, amphibolite, and gabbro	Ridge & Valley; Frederick County south to Lee County
Solidago rigida var. rigida	stiff goldenrod	dry, rocky woodlands, barrens, and outcrops	Ridge & Valley
Sparganium emersum	narrow-leaf burreed	bogs, peaty beaver wetlands, and calcareous marshes	Bath, Frederick, Giles, Highland, Russell, Washington counties
Spartina pectinata	freshwater cordgrass	calcareous (rarely mafic) fens and wet meadows, flood-scoured rocky river shores and bars, and riverside prairies	Augusta, Bland, Dickenson, Giles, Rockbridge, Wise, Wythe counties
Spiranthes lucida	shining ladies'-tresses	calcareous fens and seeps; rarely on rocky or sandy river shores	Ridge & Valley; Washington County north to Frederick County
Spiranthes ochroleuca	yellow nodding ladies'-tresses	open forests, clearings, and meadows, often at higher elevations	Ridge & Valley, Blue Ridge; Warren County south to Scott County

Scientific Name	Common Name	Habitat	Range on or near JNF
Sporobolus neglectus	small dropseed	dry limestone and dolomite barrens, cliffs, outcrops, and rocky fields and pastures	Ridge & Valley, Blue Ridge; Lee County north to Page County
Stylophorum diphyllum	celandine poppy	rich, mesic cove and slope forests, usually over limestone or dolomite	Ridge & Valley; Roanoke County south to Lee County
Symphoricarpos albus	common snowberry	primarily in thin, dry, rocky, limestone woodlands; occasionally in similar woodlands on other substrates such as calcareous sandstone	Russell County north to Shenandoah County
Taenidia montana	mountain pimpernel	dry woodlands, barrens, outcrops, and open rocky forests on shale and calcareous sandstone of the Ridge and Valley, as well as metabasalt and calc-alkaline granites of the Blue Ridge	Ridge & Valley, Blue Ridge; Craig, Roanoke, Bedford counties north to Frederick County
Turritis glabra	tower mustard	roadsides, forest edges, and other open, disturbed habitats	Craig, Montgomery, Smyth counties
Trichostema setaceum	narrow-leaf blue curls	shale, sandstone, and mafic barrens and outcrops in the mountains and Piedmont; sandy woodlands and clearings in the Coastal Plain	Washington, Rockbridge, Bath, Page, Shenandoah, Warren counties
Trifolium virginicum	Kate's mountain clover	dry open woodlands, barrens, and outcrops	Ridge & Valley; Craig County north to Frederick County
Triphora trianthophora ssp. trianthophora	nodding pogonia	in the mountains, it is most often found under hemlocks or in moist soils and moss of old logging roads	Washington, Grayson Cos north to Rockingham County
Vaccinium macrocarpon	cranberry	mountain bogs, sphagnous mountain pond margins, pocosins, and interdune swales.	Augusta, Giles, Grayson counties

Scientific Name	Common Name	Habitat	Range on or near JNF
Veronica scutellata	marsh speedwell	seeps, fens, and spring runs; usually in calcareous wetlands	Augusta, Bath, Grayson counties
Viburnum lentago	nannyberry	shrubby seeps, stream banks, and old fields	Augusta, Giles, Highland, Page counties
Vicia americana var. americana	American purple vetch	dry, shaly or rocky woodlands, forest edges and clearings, riverside prairies and outcrops	Ridge & Valley, Blue Ridge; Washington County north to Rockingham County
Viola walteri	prostrate blue violet	mesic to dry, rocky forests, woodlands, barrens, ledges, pastures, and road banks on limestone and dolomite	Botetourt County south to Russell County

1 – habitat descriptions provided by the Digital Atlas of Virginia Flora (http://vaplantatlas.org/)

3.2 Locally Rare Species

In addition to surveying for the TES species, field scientists conducted habitat assessments and surveys for LRS identified as potentially occurring within the proposed alignment. No LRS were documented within the Project area. Surveys on an abandoned route did document a midden attributed to the Allegheny woodrat (approximately 0.3 mile west of the proposed alignment). Additionally, golden eagles were observed flying on, and around, JNF; however, no observations occurred along the proposed alignment, and no nests were observed.

4.0 Discussion

Effects determinations for LRS are provided and defined as follows: A **No Impacts** determination is appropriate when the action will have no impacts on the species. A **Beneficial Impacts** determination is appropriate when positive effects occur without any adverse effects. Two types of **May Impact Individuals** determinations can be made: one is appropriate when the impact is not likely to cause a trend toward federal listing or loss of viability, and the other is appropriate when the impact is likely to cause a trend toward federal listing or loss of viability.

4.1 Amphibians

Eastern hellbenders (*Cryptobranchus alleganiensis*) are known or considered likely to occur in two counties (Giles and Montgomery) traversed by the Project. A **No Impacts** determination is made for the eastern hellbender as the species is likely absent from the Project impact area based on the negative survey results and unsuitable habitat.

4.2 Reptiles

A **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability** determination is made for the northern coal skink (*Plestiodon anthracinus anthracinus*) and northern pine snake (*Pituophis melanoleucus melanoleucus*). Potentially suitable habitat for both species was identified in the field; however, individuals were not observed during field surveys. Both species may occur in the Project area based on the presence of rocky outcrops, dry open slopes; the lack of observations may be a result of their obscure nature. The largest threat to these species from Project development and operation would be removal of potentially suitable habitat from the Project area and direct mortality during grading of the right-of-way (ROW) or excavation of the pipeline trench.

A **No Impacts** determination is made for the smooth greensnake (*Opheodrys vernalis*) as the species is likely absent from the Project impact area based on the negative survey results and lack of suitable habitat.

4.3 Avian

A **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability** determination is made for Cooper's Hawk (*Accipiter cooperii*), Sharp-shinned Hawk (*A. striatus*), Golden Eagle (*Aquila chrysaetos*), Brown Creeper (*Certhia americana*), Alder Flycatcher (*Empidonax alnorum*), Cerulean Warbler (*Setophaga cerulea*), Blackburnian Warbler (*S. fusca*), Yellow-bellied Sapsucker (*Sphyrapicus varius*), and Golden-winged Warbler (*Vermivora chrysoptera*). Potentially suitable habitat exists for these species within the Project area, but only Golden Eagles were observed (April 2016) during field surveys in the vicinity of the Project. No nests were observed. Direct impacts to individuals are not expected; however, long-term adverse impacts to potential habitat may occur.

A **No Impacts** determination is made for the Swainson's Thrush (*Catharus ustulatus*) and Red Crossbill (*Loxia curvirostra*) as these species are likely absent from the Project impact area based on the negative survey results and lack of suitable habitat.

4.4 Mammals

A **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability** determination is made for the least weasel (*Mustela nivalis*) and Allegheny woodrat (*Neotoma magister*). Potentially suitable habitat for both species was identified in the field; however, individuals were not observed on the proposed route during field surveys, likely due to their nocturnal and secretive nature. Identification of a woodrat midden on an abandoned route indicates the presence of potentially suitable habitat in other areas; thus, suitable habitat should not be a limiting factor for this species on JNF. Additionally, it is possible the Project may create habitat for the least weasel as it is known to inhabit more open, non-forested areas such as fields, meadows, and hedgerows.

A **No Impacts** determination is made for the northern river otter (*Lontra canadensis*) as the species is likely absent from the Project impact area based on the lack of suitable habitat.

4.5 Freshwater Mussels

In addition to its LRS designation, the yellow lance (*Elliptio lanceolata*) is also a Forest Service Sensitive Species. Additionally, this species is proposed for federal listing under the Endangered Species Act (ESA) as of April 5, 2017.

A **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability** determination is made for the yellow lance. Populations of this species were not identified at any of the Project stream crossings, and the closest known population (according to the Virginia Department of Game and Inland Fisheries Wildlife Environmental Review Map Service database) occurs in Craig Creek downstream of the confluence with Barbours Creek approximately 58 stream kilometers (36.0 mi) downstream of the Project area. However, given the known

presence of the species within the Upper Johns Creek Subwatershed (0208020011101), a similarly sized watershed adjacent to the Trout Creek-Craig Creek Subwatershed, suitable habitat for the species may exist closer to the Project area. The biggest threat to the yellow lance includes temporary sedimentation increases within potentially suitable habitat downstream of the Project area. Acute siltation events and chronic turbidity have been documented to reduce growth rates and survivability in other mussel species. More than 20 mussel survey records exist in the aforementioned subwatershed (including past records upstream and downstream of the Project crossing and mussel surveys associated with the Project); however, no yellow lance have been collected. Given the lack of occurrence records within the Project vicinity, it is unlikely that sedimentation or other temporary impacts associated with construction will impact this species.

4.6 Isopods

The Greenbrier Valley cave isopod (*Caecidotea holsingeri*), also known as the Holsigner's cave isopod, is an LRS known to inhabit aquatic caves. This species is not known from the Project area, but may occur in the ridge and valley areas of JNF. Based on this remote possibility, a **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing** determination is made for this species.

No direct impacts are expected for the Greenbrier Valley cave isopod; however, potential increased sedimentation could occur if unknown habitat occurs close to the Project area. Additionally, noise/vibration disturbances as well as potential unintended impacts to caves or karst features could affect this species. While such impacts remain a possibility, they are highly unlikely to occur due to the various Project control plans that will be in place and executed during clearing and construction activities.

4.7 Millipedes

Three locally rare species of millipedes, Aeto millipede (*Conotyla aeto*), Packard's blind cave millipede (*Zygonopus packardi*), and an unnamed millipede (*Rudiloria trimaculata tortuas*) are considered for potential effects from the Project; two presumably occur in the leaf litter of forest floors, and the third occurs in caves. A **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing** determination is made for these millipede species. Since these species are extremely rare and have only been noted a few times (Shear 1971; 1972, Hoffman 1999), significant impacts are highly unlikely. Many millipedes have a very small home range, and it is likely based upon the scant number of records for these three millipede species that they do not disperse much beyond several hundred meters (Shear 1971; 1972, Hoffman 1999).

Potential direct effects during surveys and construction include crushing individuals from trampling and heavy equipment, noise/vibration disturbances, clearing of ground litter and vegetation, disturbances to caves or karst features, or segregation of soil. In general, millipedes move fairly slowly and their ability to escape pedestrians and heavy equipment is limited; therefore, they could potentially become crushed or their tunnels

could become compacted. Potential indirect effects include the introduction of a potential barrier for dispersal (cleared ROW), changes in microclimate along edges, and the use of herbicides to control invasive plant species. Increased temperatures, changes in vegetation, and direct sunlight may be an inhospitable barrier to many millipede species. Clearing, construction, and maintenance of the ROW is likely to change the vegetation dynamics in many areas, which may in turn affect microclimates including temperature, precipitation, soil moisture, sun exposure, and available leaf litter, all of which may affect whether millipedes use the habitat. Other millipede species have been noted in utility ROWs, but they are much more common in forests among leaf litter.

4.8 Damselflies

Appalachian jewelwing (*Calopteryx angustipennis*) are rare damselflies that occur along rocky streams and rivers with moderate currents often in woodlands (Paulson 2011). A **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability** determination is made for this species.

Potential direct effects to this species include the crushing of immature individuals in creeks during pedestrian or heavy equipment crossings. Adults could also potentially be crushed; however, this is unlikely given the agility and speed of damselflies. In addition, noises and vibrations from construction have the potential to disturb damselflies while feeding or perching. Direct effects to habitat are likely to be ephemeral and temporary in nature as most streams and riparian areas will have impacts minimized. Many damselflies use perching areas on vegetation to rest, thermo-regulate, search for mates, and hunt prey (Dunkle 2000, Paulson 2011). These areas could be potentially removed, destroyed, or temporarily damaged during surveys, construction, and regular maintenance of the ROW.

4.9 Dragonflies

Potential effects to two dragonflies with dissimilar habitat preferences are considered: the northern pygmy clubtail (*Lanthus parvulus*), which prefers clear streams, and the spatterdock darner (*Aeshna mutata*), which is an obligate pond breeder (Paulson 2011). A **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability** determination is made for the northern pygmy clubtail. A **No Impacts** determination is made for the spatterdock darner due to lack of habitat.

Potential effects to northern pygmy clubtail include the crushing of immature individuals in creeks during pedestrian or heavy equipment crossings. Adults could also potentially be crushed, but this is highly unlikely given the agility and speed of dragonflies. Noises and vibrations from construction have the potential to disturb dragonflies while feeding or perching. Direct effects to habitat are likely to be ephemeral and temporary in nature as most streams and riparian areas will have impacts minimized. Increased sedimentation rates in streams could affect potential habitat for this species; however, sedimentation and erosion control plans should

minimize sedimentation and reduce this possible disturbance to habitat. In addition, the protection of riparian corridors and maintenance of riparian buffers will help minimize any effects. Potential indirect effects to dragonflies include impacts from disturbances to vegetation. Many dragonflies use perching areas on vegetation to rest, thermo-regulate, search for mates, and hunt prey (Paulson 2011). These areas could be potentially removed, destroyed, or temporarily damaged during surveys, construction, and regular maintenance of the ROW. Dragonflies can fly at very high speeds, are very maneuverable, and can disperse long distances (Paulson 2011).

4.10 Butterflies, Moths, and Skipper

Potential effects of the Project for five species of butterflies [silver-bordered fritillary (*Boloria selene*), hoary elfin (*Callophrys polios*), early hairstreak (*Erora laeta*), Olympia marble (*Euchloe olympia*), and tawny crescent (*Phyciodes batesii batesii*)], four moths [chestnut clearwing moth (*Synanthedon castaneae*), brown-lined dart moth (*Anaplectoides brunneomedia*), Marbled underwing (*Catocala marmorata*) and Precious underwing (*Catocala pretiosa pretiosa*)] and 1 skipper (Lepidoptera) [two-spotted skipper (*Euphyes bimacula*)] are considered. While minor impacts may occur to these species as a result of the Project, beneficial impacts are also expected to occur through the creation of the ROW and planting of specialized seed mixes. These impacts are expected to largely offset one another; therefore, a **May Impact Individuals – Is Not Likely to Cause a Trend Toward Federal Listing or Loss of Viability** determination is made for these species.

The butterflies use a variety of habitats ranging from open areas to deciduous forests to bogs, fens, and high quality wetlands. One species, the hoary elfin (*Callophrys polios*), is not known from the JNF Project area, but is known from an adjacent county (Roanoke). The moths and skipper also use a variety of habitats ranging from swamps to mixed hardwood forests to riparian forested areas. No suitable habitat was observed for the precious underwing (*Catocala pretiosa pretiosa*) and, according to the Virginia Department of Conservation and Recreation, the only known Virginia locality of the chestnut clearwing moth (*Synanthedon castaneae*) is in Falls Church.

Potential effects include crushing of individuals, especially immature individuals (caterpillars and pupae), in vegetation during surveys, construction, and maintenance operations of the ROW. Adult individuals are likely to flush when approached and thus are less likely to be crushed (Belth 2013). Individuals may also be disturbed by noises and vibrations during construction. Based on species biology, it is unlikely that these species would be disturbed during soil segregation but rather disturbed during vegetation removal. However, adults also need other forbs with nectar-bearing flowers for energy and reproduction. Since bogs and many wetlands are avoided in this Project, impacts to the silver-bordered fritillary (*Boloria selene*) and hoary elfin seem unlikely. Other species are likely to benefit from the addition of open areas with native flowering forbs. Increases in forb diversity and biomass are correlated to increased

butterfly diversity and biomass (Sparks and Parish 1995, Yamamoto et al. 2007, Becerra 2015) as has an increase in habitat diversity (Sagwe et al. 2015).

Potential indirect effects include the removal of habitat and host plants nectar-bearing plants for adults (Sparks and Parish 1995, Buckelew et al. 2000, Russell and Schultz 2010, Bohnenblust et al. 2013, Pleasants and Oberhauser 2013, Egan et al. 2014).

One additional impact to moths may be light pollution during construction along the ROW. Most arthropods are phototaxic (attracted to light) and are known to congregate under artificial lighting. Moths are often attracted to street and house lights, and consequently, moth populations may become depleted if the lighting they are attracted to is in an ecological sink (an area that ultimately cannot sustain a population; (Eisenbeis 2006)); however, Conrad et al. (2002) did not find negative changes in moth abundance as urban light increased over an eight-year period. Spoelstra et al. (2015) suggests that yearly decrease in moth populations as a response to urban lighting are slight and may only be noticeable over a longer period. It does seem clear that artificial lights tend to attract moths and may be responsible for reduced populations or disruptions in some species (Altermatt and Ebert 2016, MacGregor et al. 2017). However, once project construction is complete, artificial lighting will be limited to compressor station facilities.

4.11 Non-Vascular Plants

There are nine mosses and one liverwort on the LRS non-vascular plants list (Table 3). All the mosses were sphagnum peatmoss. They included narrowleaf peatmoss (*Sphagnum angustifolium*), pom-pom peatmoss (S. *capillifolium*), flexuose peatmoss (S. *flexuosum*), brown peatmoss (*S. fuscum*), Girgensohn's peatmoss (*S. girgensohnii*), five-rowed peatmoss (*S*. *quinquefarium*), red peatmoss (*S*. *rubellum*), Rossow's peatmoss (*S. russowii)* and delicate peatmoss (*S*. *subitle*). All of these species are found in very wet habitats. Some of these wet habitats include acid bogs, fens, heath mires, spray waterfalls, and hummocks in high-elevation Spruce-Fir forest. The vegetation in the areas where MVP will be crossing the JNF is composed almost entirely of dry oak forest and oak-pine forest. Dominant trees in these forests include chestnut oak (*Quercus prinus*), scarlet oak (*Q*. *coccinea*), white oak (*Quercus alba*), short-leaved pine (*Pinus echinata*), pitch pine (*Pinus rigida*), and table mountain pine (*Pinus pungens*). As a result, no habitat for these moss species exists on the portion of the corridor or access roads that goes through the JNF. A **No Impacts** determination has been made for these species.

There are two liverwort on the LRS non-vascular plants list. One is a flapwort (*Plagiochasma rupestre*), which has only been found in two locations in Virginia (not along the proposed alignment). Both locations were on reddish sandstone cliffs and ledges on bluffs. There were only two areas along the proposed alignment in JNF with rocky habitat that was similar to that described above. The first area was a rock outcrop at the top of Peters Mountain about two hundred feet north of the Appalachian National

Scenic Trail. The second was found at the top of Sinking Creek Mountain. Both of these areas where surveyed carefully for flapwort, as well as other rare plants, but the species was not observed. The second liverwort (*Radula tenax*) prefers moist rocks or trees below the spruce-fir zone (Hicks 1992). This species was also not observed. Since neither species was observed, a **No Impacts** determination is made.

4.12 Vascular Plants

There are 101 species of vascular species on the LRS vascular plants list (Table 2; plant names follow Weakley et al. (2012)). The vegetation in the areas where MVP will be crossing the JNF is composed almost entirely of dry oak forest and oak-pine forest. As a result, many of the species on the LRS vascular plant list that are found in open habitats like prairies, barrens, and meadows would not be expected to be found along the proposed alignment that passes through the JNF. There is one small open area (150-200 ft wide) on a flat area at the top of Peters Mountain adjacent to the Appalachian National Scenic Trail. However, this area was highly disturbed in the past and is now dominated by non-native grasses. Some of the vascular species are found in open upland habitats include stiff goldenrod (*Solidago rigida* var*. rigida*), pear hawthorn (*Crataegus calpodendron*), fleshy hawthorn (*Crataegus succulent* var. *succulent*), downy hawthorn (*Crataegus mollis* var. *mollis*), prunose hawthorn (*Crataegus pruinosa*), hazel dodder (*Cuscuta coryli*), ringed panic grass (*Dichanthelium annulum*), smooth sunflower (*Helianthus laevigatus*), Canada bluets (*Houstonia canadensis*), mountain pimpernel (*Taenidia montana*), pink thoroughwort (*Fleischmannia incarnata*), grooved yellow flax (*Linum sulcatum*), Canada plum (*Prunus nigra*), climbing prairie rose (*Rosa setigera*), red raspberry (*Rubus idaeus* ssp*. strigosus*), tower mustard (*Turritis glabra*), American purple vetch (*Vicia americana* var. *americana*), blue wild indigo (*Baptisia australis* var. *australis*) small dropseed (*Sporobolus neglectus*), Kate's Mountain clover (*Trifolium virginicum*) and heart-leaf skullcap (*Scutellaria ovata* ssp. *rugosa*). As mentioned above, there are no real natural open habitats in the corridor or access roads. The closest thing to this natural open habitat was the road edge of Pocahontas Road. These areas were surveyed closely for any of these open species. Since there were no real natural open habitat for these species and none were found, a **No Impacts** determination is made.

There were only three small, isolated wetlands found in areas where MVP will be crossing the JNF. They were found along Pocahontas Road at the top of the hill and were 0.003 acre, 0.02 acre, and 0.03 acre in size. All three were probably caused by the creation of the roads. There were a number of streams and the two access roads in the survey corridor. However, they were essentially all very small streams with very little wetland vegetation around them. Also, many of the streams were found along Pocahontas Road and were culverted under the road. As a result, it is not likely that many of the wetland plants on the LRS list could be found along the proposed alignment. Species found in open wet areas on this list include great Indian plantain (*Arnoglossum reniforme*), brown bog sedge (*Carex buxbaumii*), field sedge (*Carex conoidea*), crested sedge (*Carex cristalella*), yellow sedge (*Carex flava*), inland sedge

(*Carex interior*), Oklahoma sedge (*Carex okahomensis*), rigid sedge (*Carex tetanica*), showy lady's-slipper (*Cypripedium reginae*), showy tick-trefoil (*Desmodium canadense*), matted spikerush (*Eleocharis intermedia*), nodding wild rye (*Elymus canadensis* var. *canadensis*), American willow herb (*Epilobium ciliatum* ssp. *ciliatum*), low rough aster (*Eurybia radula*), spotted Joe-pye weed (*Eutrochium maculatum* var. *maculatum*), narrow-leaf gentian (*Gentiana linearis*), low cudweed (*Gnaphalium uliginosum*), Northern St. John's-wort (*Hypericum boreale*), jointed rush (*Juncus articulates*), small-head rush (*Juncus brachycephalus*), northern bog clubmoss (*Lycopodiella inundata*), fowl bluegrass (*Poa palustris*), sessile-fruited arrowhead (*Sagittaria rigida*), Fraser's Marsh St. John's-wort (*Hypericum fraseri*), cranberry (*Vaccinium macrocarpon*), marsh speedwell (*Veronica scutellata*), shinning ladies'-tresses (*Spiranthes lucida*), yellow nodding ladies'-tresses (*Spiranthes ochroleuca*), narrow-leaved burreed (*Sparganium emersum*), large-leaved grass-of-parnassus (*Parnassis grandifolia*), freshwater cordgrass (*Spartina pectinata*), narrow-panicled rush (*Juncus brevicaudatus*), bog willow-herb (*Epilobium leptophyllum*), tuberous grass-pink (*Calopogon tuberosus*), and winged loosestrife (*Lythrum alatum*). Since there are a substantial number of rare wetland species on the LRS list, a considerable amount of time was spent looking for rare plants along the small streams and the three small wetlands, even though they had marginal habitat. As a result, it is unlikely these wetland species exist along the proposed alignment; therefore, a **No Impacts** determination is made.

Since the forests in the areas where MVP will be crossing the JNF are dry forests rather than mesic or wet forests, mesic and wet forest species would not be expected to be found along the proposed alignment. Some of the species on the LRS list that are typical of mesic and wet forests include wild hyacinth (*Camassia scilloides*), limestone purple sedge (*Carex purpurifera*), inflated sedge (*Carex vesicaria*) dwarf rattlesnake-plantain (*Goodyera repens*), bog twayblade (*Liparis loeselii*), swamp saxifrage (*Micranthes pensylvanica*), black-seed ricegrass (*Patis racemosa*), large-leaf phlox (*Phlox amplifolia*), large-fruited sanicle (*Sanicula trifoliata*), celandine poppy (*Stylophorum diphyllum*), nodding pogonia (*Triphora trianthophora* ssp. *trianthophora*), crested coralroot (*Hexalectris spicata* var. *spicata*), long-flowered alumroot (*Huchera longiflora*), greater fringed gentian (*Gentianopsis crinita*), highland dog-hobble (*Leucothoe fontanesiana*), large purple fringed orchid (*Platanthera grandiflora*), shinleaf (*Pyrola elliptica*), nannyberry (*Viburnum lentago*), triangle grape fern (*Botrychium lanceolatum* var. *angustisegmentum*), dwarf grape fern (*Botrychium simplex* var. *simplex*) and prostrate blue violet (*Violia walteri*). Since the above species are rarely found in dry forest and none were found during surveys, a **No Impacts** determination is made.

There are several LRS found on rock outcrops. These species include Tennessee bladder fern (*Cystopteris tennesseensis*), yellow nailwort (*Paronychia virginica* var. *virginica*), narrow-leaf blue curls (*Trichostema setaceum*), Bradley's spleenwort (*Asplenium bradleyi)*, harebell (*Campanula rotundifolia*), chestnut lip-fern (*Chetlanthes*

eatonii), purple alumroot (*Heuchera hispida*), three-flower melic grass (*Melica nitens*), satin-curls (*Clematis catesbyana*), small skullcap (*Scutellaria leonardii*), Pursh's wild-petunia (*Ruellia purshiana*) and purple clematis (*Clematis occidentalis* var. *occidentalis*). As mentioned above, there were two areas of rock outcrop along the proposed alignment. One was on top of Peters Mountain, and the other is located on the top of Sinking Creek Mountain. Because there are a number of rare plants that are known to occur on rock outcrops, a considerable amount of time was spent surveying these sites. No rare plants were found. This may be in part due to the parent material of these outcrops. The proposed alignment on JNF is found in the Ridge and Valley physiographic province of Virginia (Weakley et al. 2012). In this province the outcrops at the top of mountains tend to be sandstone and quartzite, while the outcrops at lower elevations are composed of limestone, dolomite and shale. The two outcrops in this survey were composed of sandstone, while most of the LRS that are found on outcrops are known from outcrops composed of limestone parent material. Since no rare plants were found on these rock outcrops, a **No Impacts** determination is made.

The majority of the vegetation along the proposed alignment on JNF is composed of dry closed oak and oak-pine forest. Plants on the LRS list that are found in this vegetation type include roundleaf dogwood (*Cornus rugosa*), box huckleberry (*Gaylussacia brachycera*), sweet azalea (*Rhododedron arborescens*), Cumberland azalea (*Rhododendron cumberlandense*), Fogg's goosefoot (*Chenopodium foggii*), tall thistle (*Cirsium altissimum*), beaked dodder (*Cuscuta rostrata*), Roan Mountain sedge (*Carex roanensis*), toothed tick-trefoil (*Desmodium cuspidatum*), American gromwell (*Lithospermum latifolium*), slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*), and common snowberry (*Symphoricarpos albus*). With the exception of Roan Mountain sedge and Cumberland azalea, all of these species are known to occur in Giles or Montgomery counties. These species were searched for along the proposed alignment and were not found. While some potentially suitable habitat will be removed, no direct impacts are anticipated; therefore, a **No Impacts** determination is made for these species.

4.13 Topsoil Segregation

In a response to a request from the USFS received on November 15, 2016, MVP agreed to conduct topsoil segregation within the disturbed areas of the JNF. Topsoil segregation involves removing and storing topsoil separate from subsoil in disturbed areas. Following construction activities, topsoil is reapplied to disturbed areas. The removal, storage, and reapplication of topsoil will better facilitate growth of vegetation promoting the establishment of early successional habitat in disturbed areas. The act of segregating topsoil is unlikely to have negative impacts to species because topsoil segregation (1) will be temporary, (2) will occur in areas that are already disturbed, and (3) will occur in an active construction area. Topsoil segregation is likely to have a beneficial impact due to the more timely establishment of vegetation that will promote nesting and foraging habitat for early successional avifauna.

4.14 Herbicide Use

Nonnative plant species can spread rapidly in areas without natural controls (e.g., predation or disease), which can result in a reduction of plant diversity, alteration of ecological functions (e.g., plant-pollinator networks), and completion with native plants for resources (e.g., sunlight and nutrients). Herbicide use is common in treating and eradicating noxious, nonnative vegetation. Following construction, MVP will replant disturbed areas of the Project with native vegetation as directed by the USFS in documents received on November 21, 2016, titled Suggested Seed Mixes for Pipeline Rights-of-Way and Associated Disturbance on the Monongahela and George Washington-Jefferson National Forests and Suggested Seeding Techniques for Pipeline Rights-of-Way and Associated Disturbance on the Monongahela and George Washington-Jefferson National Forests. MVP will only use herbicides as directed by the USFS to address nonnative plants via treatment of individual problem plants/areas. To reduce the risk to non-target flora and fauna, MVP will comply with all local, state, and federal requirements related to the type and use of herbicides, including any requirements specified by the Forest Service on the JNF. As stated in MVP's Restoration and Rehabilitation Plan, MVP will take measures to avoid the introduction on noxious, nonnative vegetation. Such measures will help to reduce and eliminate the use of herbicides in portions of the Project.

As previously mentioned, herbicides will be used to reduce noxious, nonnative plant species in order to promote native vegetation. The establishment of native vegetation in disturbed areas is expected to improve the overall quality of habitat for fauna, including birds that use early successional habitat. Improving long-term habitat quality by reducing the colonization and spread on nonnative plants will outweigh the short-term impacts associated with herbicide use.

Short-term impact could include the potential to directly kill some individuals during application, but this is unlikely as most locally rare species will be able to flee the area. Other impacts could include a decrease in cover for smaller species and an increase in organic matter. MVP will follow the Herbicide Use Plan as approved by the US Forest Service to minimize the short-term effects to species in the area of herbicide use.

5.0 Mitigation Measures

Conservation measures to avoid and minimize the potential for adverse effects from construction, operation, and maintenance activities on federally listed species and Forest Service Sensitive Species and their suitable habitat are detailed in the Biological Assessment (BA) and BE respectively.

Project-wide mitigation measures will be implemented on JNF. These measures include:

- Routing Project facilities to avoid sensitive resources where possible;
- Reduction of the ROW in sensitive stream and wetland habitats;
- Co-locating Project facilities with existing pipeline or utility ROWs where feasible;
- Implementing the Project's Migratory Bird Habitat Conservation Plan:
  - Minimizing habitat fragmentation to the maximum extent possible;
  - Conducting environmental training of MVP personnel and inspection of construction and restoration activities;
  - Restricting maintenance activities to outside of the breeding/nesting season;
- Implementing the Project's Exotic and Invasive Species Control Plan during construction, operation, and maintenance of the Project:
  - Avoiding introduction of exotic/invasive species in organic materials brought on-site during construction by thoroughly cleaning equipment prior to mobilization to Project area;
  - Cleaning equipment and arranging a location where a JNF-designated employee can examine and certify equipment is clean and permitted for use on USFS property;
  - Conducting selective spot treatment or eradication of exotic/invasive plant species encountered during construction and operation of the Project;
  - Stripping topsoil from full width of the construction ROW and storing it separate from other soil.
  - Committing to using only USFS-requested seed mixes, in coordination with the USFS, during all restoration efforts;
  - Minimizing the time bare soil is exposed during construction to minimize opportunity for exotic/invasive plants to become established;
- Contaminants:
  - Implementing the Project-specific Spill Prevention, Control, and Countermeasure Plan;
  - Instituting preventative measures such as personnel training, equipment inspection, and refueling procedures to reduce likelihood of spills;
  - Prohibiting the parking, storage, or servicing of construction equipment, vehicles, hazardous materials, fuels, chemicals, lubricating oils, and petroleum products within 100-foot radius of any waterbody;

- Soil and Erosion Control:
    - Implementing the approved Project-specific Erosion and Sediment Control Plan;
    - Maintaining surface and ground water quality using appropriate erosion control practices and best management practices;
    - Complying with the FERC Upland Erosion Control, Revegetation, and Maintenance Plan (May 2013) and the FERC Wetland and Waterbody Construction and Mitigation Procedures (May 2013);
    - Installing erosion control measures immediately once construction beings;
- Sensitive Rare, Threatened, or Endangered Species Habitat;
    - Implementing the Project-specific Karst Management Plan to protect and minimize impacts to karst, karst-like features, and caves;
    - Committing to tree clearing activity outside of June-July to minimize impacts to non-volant, juvenile bats;
    - Abiding by all time-of-year restrictions for in-stream construction in waterbodies containing rare, threatened, or endangered aquatic species;
    - Co-locating the pipeline with existing Mystery Ridge Road to the extent practicable to avoid further fragmenting wildlife habitat;
    - Using existing Pocahontas Road and Mystery Ridge Road on JNF to avoid creation of new access roads;
    - Collecting seeds from discovered rock skullcap plants for planting upon completion of construction activities.

Tree clearing is proposed to occur in winter on JNF, which will reduce potential direct impacts to avian species that only use the area for summer breeding. The Project schedule is dependent upon obtaining all necessary authorizations, which will then dictate when Project tree-clearing activities can begin. MVP will begin tree-clearing activities as soon as allowed, which could be as early as November 2017. In that case, the majority of clearing will be completed by March 31, 2018. However, because of uncertainty associated with the Project's dependency on authorizations, and in order to estimate potential impacts as realistically as possible, the following clearing schedule is assumed for preparation of impact assessments:

- January to March 2018 – 167 miles
- April to May 2018 – 101 miles
- August to November 2018 – 32 miles

This schedule is based on the following assumptions: a clearing rate of 762 linear meters (2,500 feet) per day and clearing crews working 6 days per week with no clearing on standard federal holidays. If clearing begins earlier than January, then a greater portion of the Project will be cleared during winter 2018, meaning that actual

impacts to migratory birds will be less than assumed for this discussion. In addition, MVP is committed to the following clearing restrictions for identified areas along the Project:

- Areas within 8 kilometers (5 miles) of Indiana bat hibernacula or within 0.4 kilometer (0.25 mile) of northern long-eared bat hibernacula will be cleared before March 31, 2018, or after November 15, 2018,
- Identified loggerhead shrike suitable habitat will be cleared before March 31, 2018, or after July 31, 2018, and
- No clearing of any areas along the Project will occur between June 1 and July.

Additional avoidance and minimization measures, and mitigation measures that will benefit management indicator aquatic species include:

- For all wild trout stream crossings, MVP will abide by the in-stream construction restriction from October 1 – March 31;
- For coldwater stream crossings, MVP will abide by the in-stream construction restriction from September 15 – March 31 in West Virginia and March 1 – June 30;
- MVP has committed to fish relocations at all perennial stream crossings in Virginia.

Pipeline construction will be completed by December 2018 with a target in-service date for the Project of December 2018.

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APPENDIX A
FIGURES

Figure 1. Location of the proposed Mountain Valley Pipeline within the vicinity of the Jefferson National Forest in Virginia and West Virginia.

Stream
Pocahontas Road
Proposed Route
U.S. Forest Service (National Forest) Lands

Map Inset

Map Inset

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Base Map: ESRI ArcGIS Web service - "US TOPO MAPS" accessed - 5/19/2017

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