USDA Natural Resources Conservation Service

Ecological site F130AY008PA
Poorly To Somewhat Poorly Drained Floodplains And Toeslopes

Accessed: 05/18/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 130A–Northern Blue Ridge

Major Land Resource Area 130A is in the Northern Section of the Blue Ridge Province of the Appalachian Highlands. The region is characterized by rugged mountains with steep slopes, sharp crests, and narrow valleys. The mountain range forms a narrow band that runs north to south between the Piedmont Upland Section to the east, the Ridge and Valley section to the west, and the Southern Section of the Blue Ridge to the south. Stream dissection is deep and intricate. Major streams and their tributaries flow through gorges and gaps. Elevation ranges from about 820 feet (250 meters) in the lower valleys and on footslopes along the Potomac River just east of Harpers Ferry, where West Virginia joins Maryland and Virginia, to more than 4,200 feet (1,280 meters) along the Appalachian Trail in Bedford County, Virginia. Apple Orchard Mountain, the highest peak, is at an elevation of 4,225 feet (1,288 meters) (USDA 2006).

The backbone of the northern Blue Ridge is an anticline composed of rocks that can be can be divided into geological groupings based on age. In general, the oldest rocks are the furthest east, and become younger towards the west (Fichter and Baedke, 2000; Barnes and Sevon, 2002). The first group are plutonic rocks that formed when liquid molten rock, called magma, solidified deep within the earth’s crust over a billion years ago. Collectively referred to as the Grenville rocks, they make up much of the eastern half of the mountains and are composed of granites, gneisses, and granulites. The second group, characterized by the Catoctin greenstone formation, is slightly younger, and is made up of metabasalts and metarhyolites, types of igneous rocks that have been metamorphosed by heat and pressure. The third group was formed during the Cambrian period about 500 million years ago and are represented by the Harpers, Antiedam, Weverton, and Loudoun formations which comprise the Chilhowee group. These rocks are primariliy quartzites, phyllites, and meta-sandstones, and form the western flank of the Blue Ridge.

Preliminary ecological site differentiation is based on these three main age groups and geologies. The variable characteristics of the underlying rocks give rise to different soil physical and chemical properties and exert control on the landscape, slope shape, aspect, and elevation, all of which affect vegetation.

Classification relationships

This ecological site is found in Major Land Resource Area 130A – the Northern Blue Ridge. MLRA 130A is located within Land Resource
Region N – East and Central Farming and Forest Region (USDA 2006), and in United States Forest Service ecoregion M221D – Central
Appalachian Broadleaf Forest-Coniferous Forest-Meadow Province, Blue Ridge Mountain Province (Bailey, 1995).In addition, MLRA 130A
falls within area #66 of EPA Ecoregion Level III – the Blue Ridge (US EPA 2013). The Poorly to Somewhat Poorly Drained Mixed
Metamorphic Floodplain and Toeslope ecological site occurs within both 66b, EPA Ecoregion IV – Northern Sedimentary and
Metasedimentary Ridges, and in 66a - Northern Igneous Ridges (Woods et. al., 1996).

North-Central Interior and Appalachian Rich Swamp System - CES202.605 and
Central Appalachian Stream and Riparian System - CES202.609
Acer rubrum - *Fraxinus nigra* - *Betula alleghaniensis* / *Veratrum viride* - *Carex bromoides* Seep Forest association - CEGL008416

Acer rubrum - *Nyssa sylvatica* / *Ilex verticillata* - *Vaccinium fuscatum* / *Osmunda cinnamomea* Forest association - CEGL007853

Ecological site concept

The Poorly to Somewhat Poorly Drained Floodplains and Toeslopes ecological site of the Northern Blue Ridge region is located on
footslopes of mountains and hills, depressions, drainageways, swales, and floodplains. This ecological site contains both colluvial (material
that has moved from higher slopes to lower ones) and alluvial material (sediments transported by water and deposited along floodplains).
The main characteristic of these landscapes is that they are usually in lower slope positions and many contain wetlands. The colluvial and
alluvial materials are derived from a mixture of geologies including granite, gneiss, metabasalt, phyllite, quartzite, schist, sandstone,
siltstone, and shale.

The reference forest state is a combination of several vegetation communities within the North-Central Interior and Appalachian Rich
Swamp, the North-Central Appalachian Acidic Swamp, and the Central Appalachian Stream and Riparian Systems as defined by
NatureServe (NatureServe 2009; Anderson et. al. 2013). Tree species may include hemlock, red maple, and sourgum where the underlying
soil is acidic, or red maple and black ash where soil pH is closer to neutral. Drier areas may have hemlock and northern hardwood species
such as sugar maple, yellow birch, and American beech.

Disturbance agents in these forests include wind throw and ice damage. Despite the poor drainage, at least 15 percent of this ecological
site has been cleared for agricultural use, primarily pasture and hayland. Other human activity including logging and early settlement have
resulted in at least 27% of the forests becoming mid successional. The composition of the pre-settlement forest is not certain.

Associated sites

F130AY005PA	**Mixed Metamorphic - Metabasalt Footslopes And Terraces** The Mixed Metamorphic-Metabasalt Footslopes and Terraces are on nearby slopes.
F130AY007PA	**Fine To Loamy Mixed Metamorphic Floodplain** The Fine to Loamy Mixed Metamorphic Floodplain occurs along nearby drainageways and streams.

Table 1. Dominant plant species

Tree	(1) *Acer rubrum* (2) *Fraxinus nigra*
Shrub	(1) *Veratrum viride*
Herbaceous	(1) *Carex bromoides*

Physiographic features

The Poorly to Somewhat Poorly Drained Floodplains and Toeslopes provisional ecological site occurs on mountain

slopes, hill slopes, depressions, drainageways, swales, and floodplains. This ecological site contains both colluvial (material that has moved from higher slopes to lower ones) and alluvial material (sediments transported by water and deposited along floodplains). The main characteristic of these landscapes is that they are usually in lower slope positions and many contain wetlands. The colluvial and alluvial materials are derived from a mixture of geologies including granite, gneiss, metabasalt, phyllite, quartzite, schist, sandstone, siltstone, and shales. Elevation is generally around 1000 feet (305m) but can range from 235 to 2000 feet (72 to 610m). Slopes range from level to 25 percent. Depth to bedrock is 80 inches or more (203cm), but a dense subsurface layer called a fragipan within 22 inches (56 cm) of the soil surface can restrict root growth and the downward flow of water in some areas. This ecological site can be subject to frequent and brief flooding (2 to 7 days). Frequent flooding is defined as having up to a 50 percent chance of flooding in any year (USDA 2016). Ponding can also occur in the wettest areas and last from 2 to 30 days. Some Urban lands are also included in this ecological site.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Mountain slope (3) Depression
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	37–488 m
Slope	0–25%
Ponding depth	0–38 cm
Water table depth	8–79 cm
Aspect	Aspect is not a significant factor

Climatic features

The Northern Blue Ridge, Major Land Resource Area (MLRA) 130A, appears to have three somewhat distinct sections based on PRISM data for average annual precipitation and minimum average annual temperature (PRISM 2013). The northernmost section that runs from Adams County, Pennsylvania south through Washington County, Maryland has an average annual average precipitation of 38 inches (97cm) in the lower elevations up to 50 inches (127 cm) in the higher elevations - about 2000 feet (610m). The average annual minimum temperature is 40 to 44°F (4.4 to 6.7°C). From Washington County, Maryland south to the northern tip of Rappahannock County, Virginia, the average annual precipitation is less variable, ranging from approximately 38 to 42 inches (97 to 107cm). The average annual minimum temperature remains about the same as to the north, 40 to 44°F (4.4 to 6.7°C). The lower third of MLRA 130A starting from northern Rappahannock County down through Bedford County, Virginia receives more moisture and is colder, with average annual precipitation that ranges from 40 (107cm) to greater than 50 inches (127cm) at elevations higher than 2000 feet (610m) which is a significant part of this section of the MLRA. Average minimum temperatures range from 34°F (1.1°C) at elevation greater than 3000 feet (914m) to 38°F (3.3°C) at the lowest elevations, less than 1000 feet (305m).

These three climate regions seem to correspond to differences in elevation and relief. Most of the Blue Ridge ranging from Adams County, Pennsylvania through Maryland to Rappahannock County, Virginia rises no higher than 2000 feet (610m). Much of the Blue Ridge south of and including Rappahannock County rises above 2000 feet up to 4000 feet (610 to 1219m).

The higher elevations interact with moist air that flows inland from the Atlantic Ocean. Along the east coast of the United States, winter storms moving across the continent encounter the warm Gulf Stream waters and begin to track northeastward paralleling the coast. As the moisture-laden air from the storms crosses Virginia, the eastern slopes and foothills of the Blue Ridge receive much of this precipitation (Hayden and Michaels 2017). In addition, the high relief of the mountains intercepts much of any moisture moving inland from the east coast. The Shenandoah Valley which lies just to the west of the Blue Ridge is one of the driest parts of the state of Virginia. Where the Blue Ridge elevation is greater than 2000 feet (610m), the east-facing slopes appear to receive over 50

inches (127cm) of annual rainfall on average while the Valley to the west of the mountains receives less than 38 inches (97 cm), and the mountains' western footslopes receive 2 to 4 inches (5 to 10cm) less of precipitation than the eastern ones (PRISM). This rain shadow effect is not as pronounced where the ridges are below 1640 ft (500m) of elevation.

Currently, the Poorly to Somewhat Poorly Drained Floodplains and Toeslopes provisional ecological site is mapped primarily in the northern half of the MLRA. Field work is needed to determine if the precipitation and annual average temperature differences are significant enough to cause major shifts in ecological sites within this area necessitating the further subdivision of broadly mapped PES into more refined climatic groupings.
Data for mean annual precipitation, frost-free and freeze-free periods and monthly precipitation for this ecological site are shown below. The original data used in developing the tables was obtained from the USDA-NRCS National Water & Climate Center (2015) climate information database for 4 weather stations throughout MLRA 130A in proximity to this ecological site. All climate station monthly averages for maximum and minimum temperature and precipitation were then added together and averaged to make this table.

Table 3. Representative climatic features

Frost-free period (average)	169 days
Freeze-free period (average)	187 days
Precipitation total (average)	1,219 mm

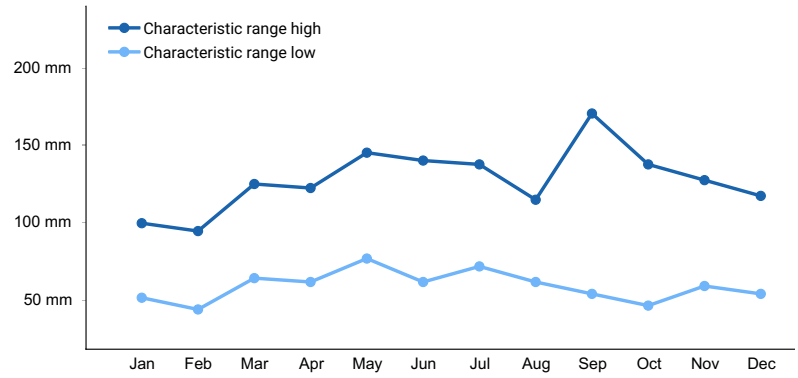

Figure 1. Monthly precipitation range

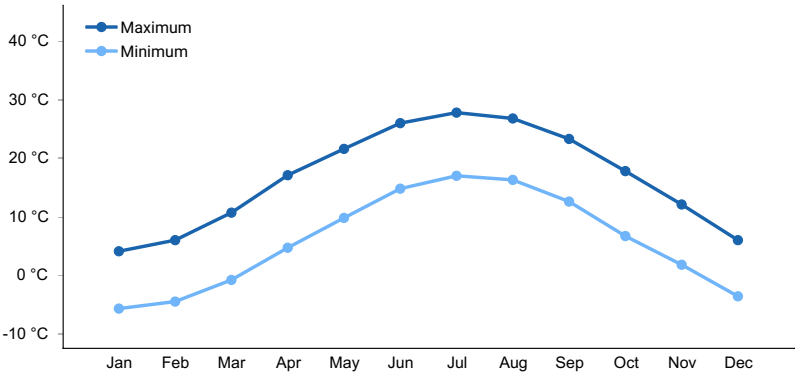

Figure 2. Monthly average minimum and maximum temperature

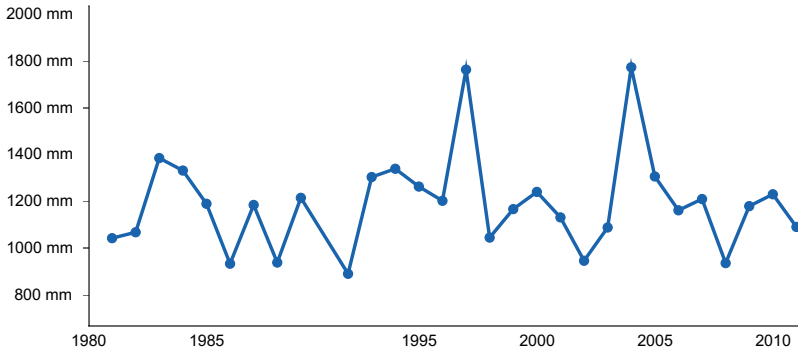

Figure 3. Annual precipitation pattern

Climate stations used

- (1) BIG MEADOWS [USC00440720], Syria, VA
- (2) MT WEATHER [USC00445851], Paris, VA
- (3) CATOCTIN MTN PARK [USC00181530], Sabillasville, MD
- (4) LURAY 5 E [USC00445096], Luray, VA

Influencing water features

The Poorly to Somewhat Poorly Drained Floodplains and Toeslopes ecological site includes wetlands. Wetlands are areas that support plants which are able to grow in water saturated conditions (called hydrophytes), have a predominance of undrained (hydric) soils, and are periodically saturated or covered by shallow water at some time during the growing season (Cowardin 1979). Wetlands are important habitats for many species of wildlife and perform flood protection, pollution control, and a variety of other important functions. Because of the importance of wetlands, the U.S. Fish and Wildlife Service developed a National Wetlands Inventory (NWI) to provide reliable information on the status and extent of wetland resources (Cowardin 1979). Within the NWI, these wetlands fall within the Palustrine system which includes all nontidal wetlands dominated by trees, shrubs, and persistent emergent plants in freshwater environments. This ecological site classifies as a Palustrine Broad-leaved Deciduous seasonally saturated Forested wetland (Cowardin 1979).

The hydrogeomorphic (HGM) wetland classification system was developed as a way to group wetlands that function similarly (Smith 1995) based on the landscape and hydrology. This is in contrast to the Cowardin system that groups wetlands in broad systems and vegetatively. The Poorly to Somewhat Poorly Drained Floodplains and Toeslopes encompass several different hydrogeomorphic classifications. Specific areas would need an onsite assessment to determine the actual group. These alluvial and colluvial landscapes fall within both Riverine and Depression HGM classes: Riverine (nonperennial) – a wetland associated with an intermittent or ephemeral stream; Riverine (upper perennial) – a wetland associated with a 1st or 2nd order perennial stream; Depression (Open, Ground Water); and Depression (Open Surface Water). Brooks further refined the HGM classification for wetlands occurring in the Mid-Atlantic region (Brooks et. al. 2013). Under their system, this ecological site would classify as a Riverine Floodplain complex (R2c): wetlands that are part of a mosaic dominated by floodplain features (former channels, depressions) that may include slope wetlands supported by ground water.

Soil features

The soil series associated with this site are Swampoodle, Scattersville, Rohrersville, Lantz, Hatboro, Foxville, and Airmont. These soils formed from alluvium and colluvium derived from a mixture of geologies including granite, gneiss, metabasalt, phyllite, quartzite, schist, sandstone, siltstone, and shales. They are on floodplains and toeslopes and can experience flooding and ponding. These soils are very poorly to somewhat poorly drained. In the wet areas, the water table can be within 3 inches (7.6cm) of the surface. Water table is within 30 inches (76cm) of the surface on drier convex spots. Permeability is slow to moderately rapid and soil is strongly to slightly acid with pH ranging from 5.0 to 6.1. Some soils may have a dense subsoil layer which restricts the downward flow of water and growth of roots within 22 inches (56cm) of the surface. Surface textures are loam and silt loam. Subsurface texture tends to be loamy.

Table 4. Representative soil features

Parent material	(1) Alluvium–metasedimentary rock (2) Colluvium–greenstone
Surface texture	(1) Cobbly silt loam (2) Extremely stony loam (3) Very cobbly
Family particle size	(1) Loamy
Drainage class	Very poorly drained to somewhat poorly drained
Permeability class	Slow to moderately rapid
Soil depth	56–203 cm
Surface fragment cover <=3"	0–13%
Surface fragment cover >3"	0–13%
Available water capacity (0-101.6cm)	8.38–19.05 cm
Soil reaction (1:1 water) (0-101.6cm)	5–6.1
Subsurface fragment volume <=3" (Depth not specified)	0–16%
Subsurface fragment volume >3" (Depth not specified)	0–47%

Ecological dynamics

The vegetation groupings described in this section are based on the terrestrial ecological system classification and vegetation associations developed by NatureServe (Comer 2003) and the Natural Heritage Programs of Pennsylvania (Zimmerman et al. 2012), Virginia (Fleming et al. 2013), West Virginia (WVDNR 2014), and Maryland (Harrison 2004). Terrestrial ecological systems are specifically defined as a group of plant community types (associations) that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. They are intended to provide a classification unit that is readily mappable, often from remote imagery, and readily identifiable by conservation and resource managers in the field. A given system will typically manifest itself in a landscape at intermediate geographic scales of tens to thousands of hectares and will persist for 50 or more years. A vegetation association is a plant community that is much more specific to a given soil, geology, landform, climate, hydrology, and disturbance history. It is the basic unit for vegetation classification. Each association will be named by the dominant species that occupy the different strata (tree, sapling, shrub, and herb). Within the NatureServe database, individual vegetation associations are assigned an identification number called a Community Element Global Code (CEGL). Most of the Information contained in this section was adapted from several sources, including the Nature Conservancy's Northeast Terrestrial and Aquatic Habitat map (Anderson et al., 2013), NatureServe's Ecological Systems of the United States (Comer 2003; NatureServe 2009), and Landfire's Biophysical Settings and Existing Vegetation Type layers (Landfire 2010; Landfire 2013). The USDA Plants database was used to verify species' scientific and common names (USDA, NRCS. 2017).

The reference forest state is a combination of several vegetation communities within the North-Central Interior and Appalachian Rich Swamp, the North-Central Appalachian Acidic Swamp, and the Central Appalachian Stream and Riparian Systems as defined by NatureServe (NatureServe 2009; Anderson et. al. 2013). Tree species may include Tsuga Canadensis (Eastern hemlock), *Acer rubrum* (red maple), and *Nyssa sylvatica* (blackgum) where the underlying soil is acidic, or *Acer rubrum* (Red maple), and *Fraxinus nigra* (Black ash) where soil pH is closer to neutral. Drier areas may have Tsuga Canadensis (Eastern hemlock) and northern hardwood species such as *Acer saccharum* (Sugar maple), *Betula alleghaniensis* (Yellow birch), and *Fagus grandifolia* (American beech). As a result of the somewhat gentler topography, the easier accessibility, and the better fertility and moisture content of alluvial soils, much of this ecological site has been settled, logged, and cleared relative to the steeper, drier, less fertile uplands. Currently, at least 27 percent is classified as Ruderal forest (Landfire 2013). Therefore, mature forests may reflect the current naturalized, minimally managed post disturbance state rather than the forest composition of historic pre-European settlement. Approximately 15 percent of this ecological site has been

converted to agricultural use, mainly pasture and hayland (Landfire 2013).

Disturbance agents in these forests include wind throw and ice damage. Nearby oak forests historically have been maintained by periodic fire. Fire suppression since the early 20th century in the eastern United States is believed to be leading to the overall replacement of oaks with fire-sensitive, non-oak species like maple, beech, birch, tuliptree, and black cherry (Brose et. al., 2008). Fire dynamics in bottomlands are not well-known, and probably only occurred in years that were extremely dry, since these areas naturally hold more moisture than upper slopes and ridge tops. Since most of the component species are among the less fire-tolerant, perhaps it can be assumed that fire historically has had only a limited effect on these particular landscapes. Hemlock has been greatly reduced by recent outbreaks of the hemlock woolly adelgid and may be restricted to the understory.

The information presented is representative of very complex vegetation communities. Key indicator plants and ecological processes are described to help inform land management decisions. Plant communities will differ across the major land resource region because of the naturally occurring variability in weather, soils, and aspect. The reference plant community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

State and transition model

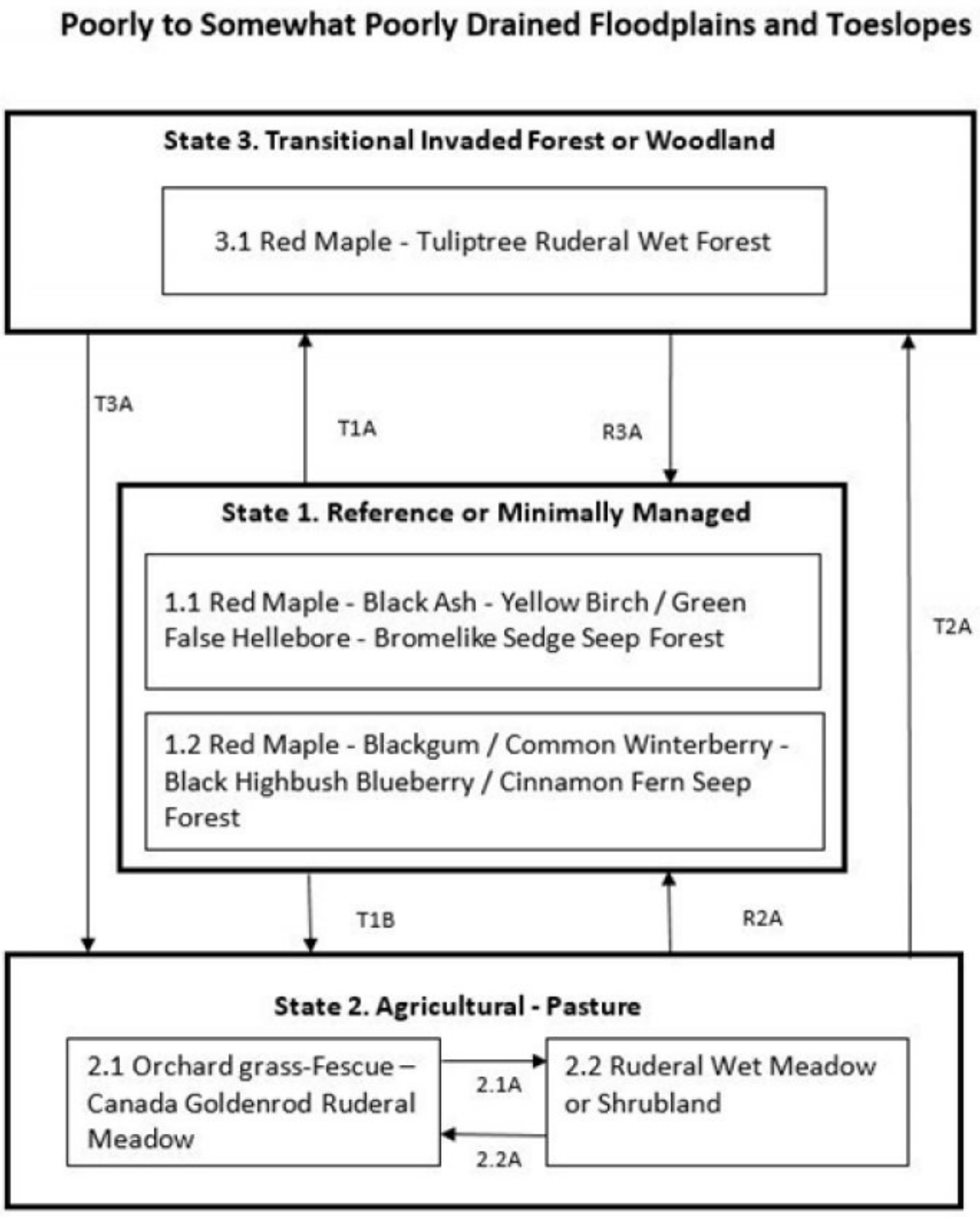

Figure 5. State and Transition Model

Code	Event/Activity
T1A	Logging followed by forest regrowth
T1B	Clearcutting; conversion to pasture, pasture seeding, installation of drainage system if needed, grassland management with regular mowing and grazing.
T2A	Abandonment of pasture or old field. Allow natural regeneration and cease grazing.
2.1A	Discontinue drainage maintenance. Allow hydrology to revert to natural wetland condition.
2.2A	Install or repair drainage system. Plant forage grasses.
R2A	Cease mowing, grazing, and pasture management, plant native seeds and seedlings, eliminate nonnative species, abandon any drainage systems.
T3A	Clearcutting, conversion to pasture, pasture seeding, installation of drainage system if needed, grassland management with regular mowing.
R3A	Aggressively control invasive and nonnative species. Plant native species if needed.

Figure 6. Legend

State 1
Reference or Minimally Managed

The reference forest state is a combination of several vegetation communities within the North-Central Interior and Appalachian Rich Swamp, the North-Central Appalachian Acidic Swamp, and the Central Appalachian Stream and Riparian Systems as defined by NatureServe (NatureServe 2009; Anderson et. al. 2013). Due to the long history of human activity, the associations listed below may in reality reflect the current naturalized, minimally managed, post disturbance state rather than the historic, pre-European settlement condition. These areas will have a mixture of mesophytic (moisture loving) hardwood and hemlock forests, but the primary conditions described below will be

wetland associations. The listed reference communities have been documented on this ecological site and are associated with the Northern Blue Ridge primarily in groundwater charged wetlands, but poorly drained areas fed by surface water are also present and include many of the same species. Due to the heterogeneity and the broadness of this provisional ecological unit, they are not intended to cover every situation nor the full range of conditions and species. There are no transition pathways designated between the two communities in the reference state because the differences in vegetation are more controlled by landscape and localized soil chemistry then by management or disturbance.

Community 1.1
Acer rubrum - Fraxinus nigra - Betula alleghaniensis / Veratrum viride - Carex bromoides Seep Forest

The Red Maple - Black Ash - Yellow Birch / Green False Hellebore - Bromelike Sedge Seep Forest, also known as the Central Appalachian Basic Seepage Swamp Forest (CEGL008416; NatureServe 2017) occupies groundwater-saturated stream headwaters, large spring seeps and runs, and lateral areas in ravine and stream bottoms where groundwater emerges at the base of slopes. It is most frequent and best developed on Catoctin Formation metabasalt (greenstone) of the Northern Blue Ridge and other base-rich substrates. Soil chemistry data indicate moderately high calcium and magnesium levels. Overstory composition is mixed, with *Acer rubrum* (Red maple), Fraxinus Americana (White ash), and *Liriodendron tulipifera* (Tuliptree) the most abundant species. *Fraxinus nigra* (Black ash) is a frequent overstory associate but more abundant and sometimes dominant in the understory, along with young *Acer rubrum* and *Fraxinus americana*. With increasing elevation, *Betula alleghaniensis* (Yellow birch) becomes increasingly important, codominating most stands above 2500 feet (760m) in Virginia and in the Catoctin Mountains of Maryland. Minor tree associates include *Betula lenta* (Sweet birch) and Tilia Americana (American basswood). Canopy closure is often incomplete (60-80% canopy cover), most evidently because of blowdowns. Very wet microhabitats that impede the establishment and firm rooting of trees may also contribute to a somewhat open canopy. Shrub stratum diversity is moderately high; *Lindera benzoin* (Spicebush) is usually the most abundant species, and considerable stratum cover is contributed by tree saplings. Other frequently occurring shrubs are *Alnus serrulata* (Hazel alder), *Carpinus caroliniana* (American hornbeam), *Hamamelis virginiana* (American witchhazel), *Ilex verticillata* (Common Winterberry), and *Sambucus nigra* ssp. Canadensis (American black elderberry). Except in local areas where shrubs are dense, herbaceous cover is high, almost 90% on average. One or both of the early-maturing forbs *Symplocarpus foetidus* (Skunk cabbage) (mostly at lower elevations) and *Veratrum viride* (Green false hellebore) are usually dominant over substantial areas. Because of microtopographic diversity, herbaceous patch-mosaics are typical in this vegetation. More-or-less constant, sometimes locally abundant species include *Eurybia schreberi* (Schreber's aster), *Caltha palustris* (Yellow marsh marigold), *Carex bromoides* (Brome-like sedge), *Carex gynandra* (Nodding sedge), *Carex prasina* (Drooping sedge), *Chelone glabra* (White turtlehead), *Chrysosplenium americanum* (American golden saxifrage), *Cinna arundinacea* (Sweet woodreed), *Dryopteris carthusiana* (Spinulose woodfern), Dryopteris goldiana (Goldie's woodfern), *Glyceria striata* (Fowl mannagrass), *Impatiens capensis* (Jewelweed), *Osmunda cinnamomea* (Cinnamon fern), *Osmunda regalis* var. spectabilis (Royal fern), *Ranunculus recurvatus* (Blisterwort), *Saxifraga pensylvanica* (Eastern swamp saxifrage), *Packera aurea* (Golden ragwort), *Sphenopholis pensylvanica* (Swamp wedgescale), *Thalictrum pubescens* (King of the meadow), and *Viola cucullata* (Marsh blue violet). Moss cover is often significant but only rarely includes Sphagnum spp. (Sphagnum). Upland species commonly occur in well-drained hummock microhabitats and contribute to relatively high species-richness values for this type of wetland.

Community 1.2
Acer rubrum - Nyssa sylvatica/Ilex verticillata - Vaccinium fuscatum/Osmunda cinnamomea Seep Forest

The Red Maple - Blackgum / Common Winterberry - Black Highbush Blueberry / Cinnamon Fern Seep Forest, also known as the Central Appalachian Acidic Seepage Swamp Forest (CEGL007853) occurs on groundwater-saturated flats and low slopes along streams in the Ridge and Valley, northern Cumberland Plateau, Northern Blue Ridge, and western Piedmont at elevations of 700-2900 feet (200-900 m). Habitats are usually more-or-less narrow and elongate, with hummock-and-hollow microtopography, and frequently with a small ephemeral stream channel running through or adjacent to the community. Substrates are poorly drained mineral soils. The ground surface is slightly sloping, and drainage is usually via small, intricately braided channels with interspersed hummocks. The canopy is usually closed and consists of *Acer rubrum* (Red maple), *Nyssa sylvatica* (Sourgum), and *Liriodendron tulipifera* (Tuliptree). *Quercus alba* (White oak) is an important associate in some areas, and *Ulmus rubra* (Slippery

elm), Fraxinus Americana (White ash), and *Platanus occidentalis* (American sycamore) are present in some stands. Minor or local tree species include Magnolia acuminate (Cucumbertree), Tsuga Canadensis (Eastern hemlock), *Betula lenta* (Sweet birch), *Pinus rigida* (Pitch pine), and *Pinus strobus* (Eastern white pine). The shrub stratum may be well-developed and includes *Ilex verticillata* (Common Winterberry), *Ilex opaca* (American holly), *Vaccinium corymbosum* (Highbush blueberry), *Kalmia latifolia* (Mountain laurel), *Alnus serrulata* (Hazel alder), *Viburnum nudum* var. cassinoides (With-rod), *Viburnum dentatum* (Southern arrowwood), Smilax spp. (Greenbriar), and, less consistently, *Carpinus caroliniana* (American hornbeam), *Asimina triloba* (Pawpaw), *Euonymus americanus* (Bursting heart), *Lindera benzoin* (Spicebush), *Gaylussacia frondosa* (Blue huckleberry), *Gaylussacia baccata* (Black huckleberry), *Menziesia pilosa* (Minniebush), *Vaccinium fuscatum* (Black highbush blueberry), *Chionanthus virginicus* (White fringetree), *Viburnum nudum* var. nudum (Possumhaw), *Rhododendron viscosum*,(Swamp azalea) and *Toxicodendron vernix* (Poison sumac). *Rubus hispidus* (Bristly dewberry) is an abundant creeping vine in many stands. Typical herbaceous plants include *Osmunda cinnamomea* (Cinnamon fern), *Carex gynandra* (Nodding sedge), *Carex lurida* (Shallow sedge), *Carex atlantica* (Prickly bog sedge), *Carex debilis* (Wihte edge sedge), *Thelypteris noveboracensis* (New York fern), *Platanthera clavellata* (Small green wood orchid), *Chelone glabra* (White turtlehead), *Medeola virginiana* (Indian cucumber), *Dioscorea quaternata* (Fourleaf yam), Juncus effuses (Common rush), *Lycopus uniflorus* (Northern bugleweed), *Lycopodium obscurum* (Rare clubmoss), *Osmunda regalis* var. spectabilis (Royal fern), *Symplocarpus foetidus* (Skunk cabbage), *Veratrum viride* (Green false hellebore), Viola hastate (Halberdleaf yellow violet), and *Viola cucullata* (Marsh blue violet).

State 2
Agricultural – Pasture

Community 2.1
Dactylis glomerata - Festuca spp. - Solidago canadensis Ruderal Mesic Meadow Alliance

The Orchardgrass - Fescue species - Canada Goldenrod Ruderal Mesic Meadow Alliance (A1190, NatureServe 2017) is a broadly defined community which includes mesic abandoned pastures and agricultural fields and is largely composed of non-native cool-season grasses and herbs (generally of European origin) in the early stages of succession. This community is assumed to exist on this ecological site where forests have been cleared and in some cases where drainage has occurred or soils are not hydric. Species composition varies from site to site, depending on land-use history and perhaps soil type, but in general this vegetation is quite wide-ranging in northeastern and midwestern states. Dominant grasses vary from site to site but generally include the exotic grasses *Agrostis stolonifera* (Creeping bentgrass), *Agrostis hyemalis* (Winter bentgrass), *Anthoxanthum odoratum*, (Sweet vernalgrass), *Bromus inermis* (Smooth Brome), *Bromus tectorum* (Cheatgrass), *Dactylis glomerata* (Orchardgrass), Schedonorus arundinaceum (Tall fescue), *Lolium perenne* (Perennial ryegrass), Phleum pretense (Timothy) as well as weedy natives such as *Elymus repens* (Quackgrass), *Poa pratensis* (Kentucky bluegrass), and, less commonly, *Schizachyrium scoparium* (Little bluestem). Herbaceous species may be minor or dominant and include various Solidago spp. (goldenrods), Sympyotrichum spp. (Asters), and other native and non-native species. At least 15% of the Poorly to Somewhat Poorly Drained Floodplains and Toeslopes is in agricultural use, mostly pasture and hayland (Landfire 2013).

Community 2.2
Ruderal Wet Meadow or Shrubland

A Ruderal Wet Meadow or Shrubland community (similar to CEGL006571; NatureServe 2017) is assumed to exist in abandoned pasture or agricultural fields where drainage has not been maintained and wetland vegetation has recolonized. This wet meadow vegetation of the northeastern states occurs in a variety of settings, most frequently in low-lying areas of old fields or pastures, headwater basins, or beaver-impacted wetlands. The physiognomy is complex and variable, ranging from shrub thicket to herbaceous meadow with scattered shrubs. Shrub species usually include *Spiraea tomentosa* (Steeplebush), *Spiraea alba* var. alba (White meadowsweet), *Cornus amomum* (Silky dogwood), *Rubus allegheniensis* (Allegheny blackberry), *Rubus hispidus* (Bristly dewberry), Salix spp. (Willow), and others. *Hypericum densiflorum* (Bushy St. Johnswort) often occurs in the Central Appalachians. The invasive exotic shrubs *Lonicera morrowii* (Morrow's honeysuckle) and *Rosa multiflora* (Multiflora rose) may be locally abundant. Associated herbaceous species are also variable in composition, depending on land-use history. Commonly seen are *Phalaris arundinacea* (Reed canarygrass), *Solidago rugosa* (Wrinkleleaf goldenrod), *Solidago gigantea* (Giant goldenrod), Solidago Canadensis (Canada goldenrod), Juncus effuses (Common rush), *Scirpus cyperinus* (Woolgrass), *Scirpus expansus* (Woodland bulrush), *Leersia oryzoides* (rice cutgrass), Calamagrostis

Canadensis (Bluejoint), *Carex scoparia* (Broom sedge), Carex folliculate (Northern long sedge), *Carex lurida* (Shallow sedge), *Carex lupulina* (Hop sedge), *Carex vulpinoidea* (Fox sedge), *Carex trichocarpa* (Hairyfruit sedge), *Vernonia noveboracensis* (New York ironweed), *Triadenum virginicum* (Virginia marsh St. Johnswort), *Lycopus uniflorus* (Northern bugleweed), *Impatiens capensis* (Jewelweed), Eupatorium maculatum (Spotted Joe pye weed), *Polygonum sagittatum* (Arrowleaf tearthumb), *Thelypteris palustris* (Eastern marsh fern), *Onoclea sensibilis* (Sensitive fern), Eleocharis spp. (Spikerush), and others. The invasive species *Microstegium vimineum* (Nepalese browntop) can be abundant.

Pathway 2.1A
Community 2.1 to 2.2

Discontinue drainage maintenance. Allow hydrology to revert to natural wetland condition.

Pathway 2.2A
Community 2.2 to 2.1

Install or repair drainage system. Plant forage grasses.

State 3
Transitional Invaded Forest or Woodland

Community 3.1
Acer rubrum - Liriodendron tulipifera Ruderal Wet Forest

A Red Maple - Tuliptree Ruderal Wet Forest similar to the reference forests is assumed to exist on this ecological site in areas that have been logged or subject to other heavy disturbance. They may be weedy in character with understory exotic plants (of various growth forms) such as *Ligustrum sinense* (Chinese privet), *Lonicera japonica* (Japanese honeysuckle), and *Microstegium vimineum* (Nepalese browntop) which are known to occur in disturbed bottomland forests.

Transition T1B
State 1 to 2

Logging, clearing, draining, and then planting of non-native pasture grass mixes, and grazing. Maintenance with periodic mowing to prevent trees and shrubs from reestablishing. Possible installation and maintenance of drainage systems.

Transition T1A
State 1 to 3

Logging followed by natural regeneration.

Restoration pathway R2A
State 2 to 1

Cease mowing and pasture management, exclude grazing, plant native seeds and seedlings, eliminate and manage nonnative species, uninstall or cease maintenance on any drainage systems. Return to the reference or post logged minimally managed state may require a very long term series of costly management options and stages. Seeding of native species must be done fairly heavily, and actively managed for several years until well established. Herbivory can be a problem as well as competition from faster growing species. Depending on the existing seed bank and the proximity of a mature forest from which to recruit seeds, ruderal forests may regain a mixed forest stand. Nevertheless, sites that have been cleared and tilled have significant soil disturbance which may include compaction, erosion, loss of native soil structure, loss of soil organic matter, disruption of soil microorganisms, all which affect the soil’s nutrient availability and water holding capacity (Duiker and Myers, 2005). These characteristics favor recolonization by plant species that have wind dispersed seeds (verses those that propagate through underground roots called rhizomes, or which have heavy seeds that stay near the parent tree), are shade intolerant, and have rapid to moderate growth rates (Dyer, 2010). Aggressive control of nonnative species and

invasives will be ongoing.

Transition T2A
State 2 to 3

Cease mowing and pasture management, exclude grazing, plant native seeds and seedlings, eliminate and manage nonnative species, uninstall or cease maintenance on any drainage systems.

Restoration pathway R3A
State 3 to 1

Return to the reference or post logged minimally managed state may require a very long term series of costly management options and stages. Many species may need to be planted or seeded heavily to restore the system. Depending on the existing seed bank and the proximity of a mature forest from which to recruit seeds, ruderal forests may regain a mixed forest stand. Nevertheless, sites that have been cleared may have significant soil disturbance including compaction, erosion, loss of native soil structure, loss of soil organic matter, disruption of soil microorganisms, all which affect the soil's nutrient availability and water holding capacity (Duiker and Myers, 2005). These characteristics favor recolonization by plant species that have wind dispersed seeds (verses those that propagate through underground roots called rhizomes, or which have heavy seeds that stay near the parent tree), are shade intolerant, and have rapid to moderate growth rates (Dyer, 2010). Aggressive control of nonnative species and invasives will be ongoing.

Transition T3A
State 3 to 2

Logging, clearing, and then planting of non-native pasture grass mixes, and grazing. Maintenance with periodic mowing to prevent trees and shrubs from reestablishing. Establishment of drainage systems if needed.

Additional community tables

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**