USDA Natural Resources Conservation Service

Ecological site F130AY009VA
High Elevation Uplands

Accessed: 05/08/2024

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 High Elevation Uplands ecological site occurs within 66a of EPA Ecoregion IV – Northern Igneous Ridges (Woods et. al., 1996).

The Central and Southern Appalachian Montane Oak Forest System – CES202.596
• *Quercus rubra* - *Carya ovata* - *Fraxinus americana* / *Actaea racemosa* - *Hydrophyllum virginianum* Forest Association – CEGL008518
Northeastern Interior Dry-Mesic Oak Forest System - CES202.592

• *Quercus rubra* - (*Quercus alba*) / *Ilex montana* / *Dennstaedtia punctilobula* - *Lysimachia quadrifolia* Forest Association – CEGL008506

(NatureServe 2017)

Ecological site concept

The High Elevation Uplands are located in the Northern Blue Ridge region of the Appalachian highlands. This ecological site is found on mountain slopes, shoulders, and summits formed from a mixture of geologies including gneiss, granite, granodiorite, granulite, metabasalt, phyllite, quartzite, siltstone, and slate. Elevation is generally greater than 3000 feet (914m), but can range from 2000 to 4200 feet (610 to 1281m). Sites located on metabasalt (greenstone), amphibolite, pyroxene-bearing granulite, charnockite, and actinolite schist are richer in species composition compared to those underlain by less fertile geology. The high elevation is what distinguishes this ecological site from others in the Northern Blue Ridge. Above 3000 feet (914m) the vegetation remains dominated by oak, particularly Northern red oak and white oak, but individuals may be stunted or wind-flagged. Ridgetops are exposed and soils are thin and can be nutrient poor. At one time, American chestnut may have been a prominent species, but its importance has been dramatically reduced by chestnut blight. The Central and Southern Appalachian Montane Oak Forest System is characteristic of these areas (NatureServe 2009; Anderson, et. al. 2013).

Some of this ecological site has been subjected to human activity including logging, settlement, or other disturbance and is mid successional. These ruderal (growing where the natural vegetation has been disturbed by humans) forests and woodlands comprise only about 4% of the area (Landfire, 2013) and are not well described. It is assumed that a somewhat typical successional community with oak, pine, and tuliptree exists. This ecological site has not been converted to agriculture due to high elevation, steepness, and rockiness.

Associated sites

F130AY001PA	**Mixed Metamorphic And Granitic Upland** The Mixed Metamorphic and Granitic Uplands ecological site is associated but generally occurs at elevations below 3000 feet (915m).
F130AY002PA	**Metabasalt Upland** The Metabasalt Uplands ecological site is associated but generally occurs at elevations below 3000 feet (915m).

Table 1. Dominant plant species

Tree	(1) *Quercus rubra* (2) *Carya ovata*
Shrub	Not specified
Herbaceous	(1) *Actaea racemosa* (2) *Hydrophyllum virginianum*

Physiographic features

The High Elevation Uplands occur on a mixture of geologies including gneiss, granite, granodiorite, granulite, metabasalt, phyllite, quartzite, siltstone, and slate. Typical landscapes are mountain slopes, summits, shoulders, and benches. The ecological site can be found on the entire hill or mountain slope from top to bottom, with the shallower areas occupying the most convex summits and shoulders. Elevation is generally around 3000 feet (914m) but can range from 2000 to 4200 feet (610 to 1281m). Slopes range from 3 to 75 percent. Depth to bedrock is 15 to >60 inches (38 to >152cm) but can be deeper. This ecological site is not subject to flooding nor ponding.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Ridge
Flooding frequency	None

Ponding frequency	None
Elevation	610–1,280 m
Slope	3–75%
Water table depth	152 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 High Elevation Uplands provisional ecological site is mapped mainly in the southern 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 2 weather stations in proximity to this ecological site. 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)	157 days
Freeze-free period (average)	178 days
Precipitation total (average)	1,270 mm

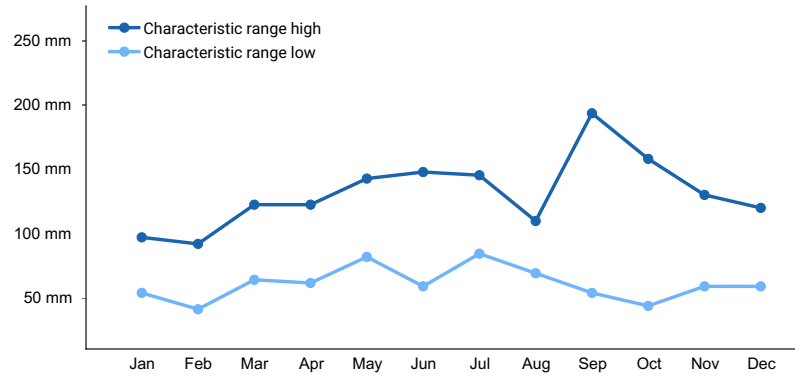

Figure 1. Monthly precipitation range

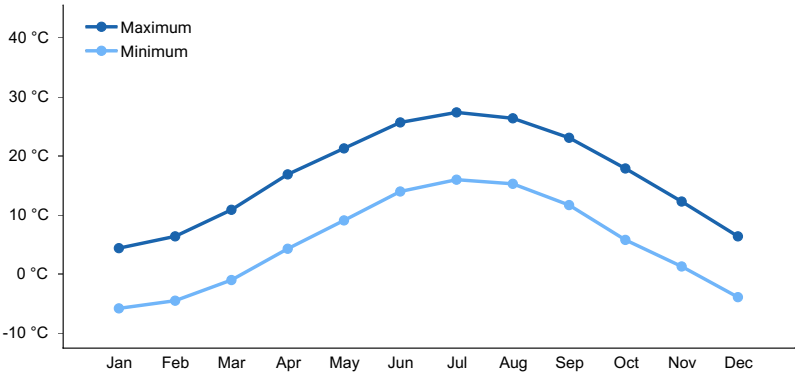

Figure 2. Monthly average minimum and maximum temperature

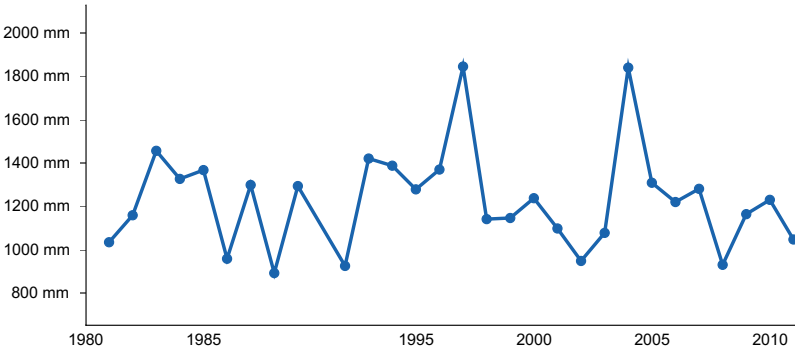

Figure 3. Annual precipitation pattern

Climate stations used

- (1) LURAY 5 E [USC00445096], Luray, VA
- (2) BIG MEADOWS [USC00440720], Syria, VA

Influencing water features

This ecological site is not influenced by wetland or riparian water features.

Soil features

The soil series associated with this site are: Unaka, Thunder, Sylvatus, Stumptown, Saunook, Plott, Pignut, Peaks, Myersville, Marbleyard, Lew, Edneytown, and Catoctin. They formed from a mixture of geologies including gneiss, granite, granodiorite, granulite, metabasalt, phyllite, quartzite, siltstone, and slate. Most of these soils have formed from residuum, which is bedrock that has been deeply weathered in place. Some areas are formed from colluvium, which is soil material that has been transported, usually down a slope gradient. Depth to bedrock is 15 to >60 inches (38 to >152cm) but can be deeper. The soils are well to excessively well-drained with average water table depth at greater than 60 inches (152cm) below the soil surface. Permeability ranges widely from very slow where

bedrock is closer to the surface or rapid where the soil contains many coarse fragments. Soil pH is extremely to slightly acid ranging from 4.0 to 6.2. Surface textures are clay loam, loam, sandy loam, silt loam, or silty clay loam, while subsoils are loamy. Soils data was obtained from the Natural Resources and Conservation Service (NRCS) National Soils Information System database (USDA 2015).

Table 4. Representative soil features

Parent material	(1) Residuum–metasedimentary rock (2) Colluvium–greenstone
Surface texture	(1) Channery silt loam (2) Extremely channery loam (3) Extremely stony sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Very slow to rapid
Soil depth	38–163 cm
Surface fragment cover <=3"	0–30%
Surface fragment cover >3"	1–30%
Available water capacity (0-101.6cm)	3.56–15.75 cm
Soil reaction (1:1 water) (0-101.6cm)	4–6.2
Subsurface fragment volume <=3" (Depth not specified)	0–45%
Subsurface fragment volume >3" (Depth not specified)	0–65%

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).

What distinguishes this ecological site from others in the Northern Blue Ridge is the inclusion of high elevation areas. Above 3000 feet (914m) the vegetation remains dominated by oak as in most of the Northern Blue Ridge but individuals may be stunted or wind-flagged. The Central and Southern Appalachian Montane Oak Forest System is characteristic of these areas (NatureServe 2009; Anderson, et. al. 2013). *Quercus rubra* (Northern red oak) and *Quercus alba* (White oak) are the most common oak species. Other associated trees may include *Prunus serotina* (Black cherry), *Betula lenta* (Sweet birch), and *Betula alleghaniensis* (Yellow birch). *Castanea dentata* (American

chestnut) sprouts are also common, but the importance of chestnut in these forests has been dramatically altered by chestnut blight. *Ilex montana* (Mountain holly) and *Rhododendron prinophyllum* (Early azalea) are typical shrubs. In base-rich soils that are underlain by metabasalt (greenstone), amphibolite, pyroxene-bearing granulite, charnockite, and actinolite schist, the characteristic forest is oak, but includes an herb layer that resembles that of a rich cove forest – generally high species diversity, with total cover often exceeding 80%.

Areas not underlain by hi-base geology will generally be acidic and less fertile. Tree species may include *Quercus rubra*, *Quercus alba*, *Quercus velutina*, Quercus prinus, and *Quercus coccinea* (red, white, black, chestnut and scarlet oaks) and Carya spp. (hickories). *Acer rubrum* (Red maple), *Betula lenta* (Sweet birch), and *Betula alleghaniensis* (Yellow birch) may be common associates. Heath shrubs like Vaccinium spp. (blueberries) and *Kalmia latifolia* (Mountain laurel) are often present but not well developed. *Castanea dentata* (American chestnut) was a prominent tree before chestnut blight eradicated it as a canopy constituent. This plant community is characteristic of the Northeastern Interior Dry-Mesic Oak Forest System, which is predominant throughout most of the Northern Blue Ridge (NatureServe 2009; Anderson et. al 2013). *Pinus virginiana* (Virginia pine), and *Pinus strobus* (Eastern white pine) may also be present. This ecological site may include small patches of barrens as well as seepage wetlands.

Disturbance agents in these forests include fire, wind throw, and ice damage. Gypsy moths can wreak havoc in the oak over story periodically. Fire dynamics in these high elevation areas are not well-known, although 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 maples, beeches, birches, tulip poplars, and black cherry (Brose et. al., 2008).

Some of this ecological site has been subjected to human activity including logging, settlement, or other disturbance, therefore at least 4% of the forests are mid successional. These ruderal (growing where the natural vegetation has been disturbed by humans) forests and woodlands have not been described, but it is assumed that a somewhat typical successional community with oak, pine, and tuliptree exists. This ecological site has not been converted to agriculture due to high elevation, steepness, and rockiness.

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

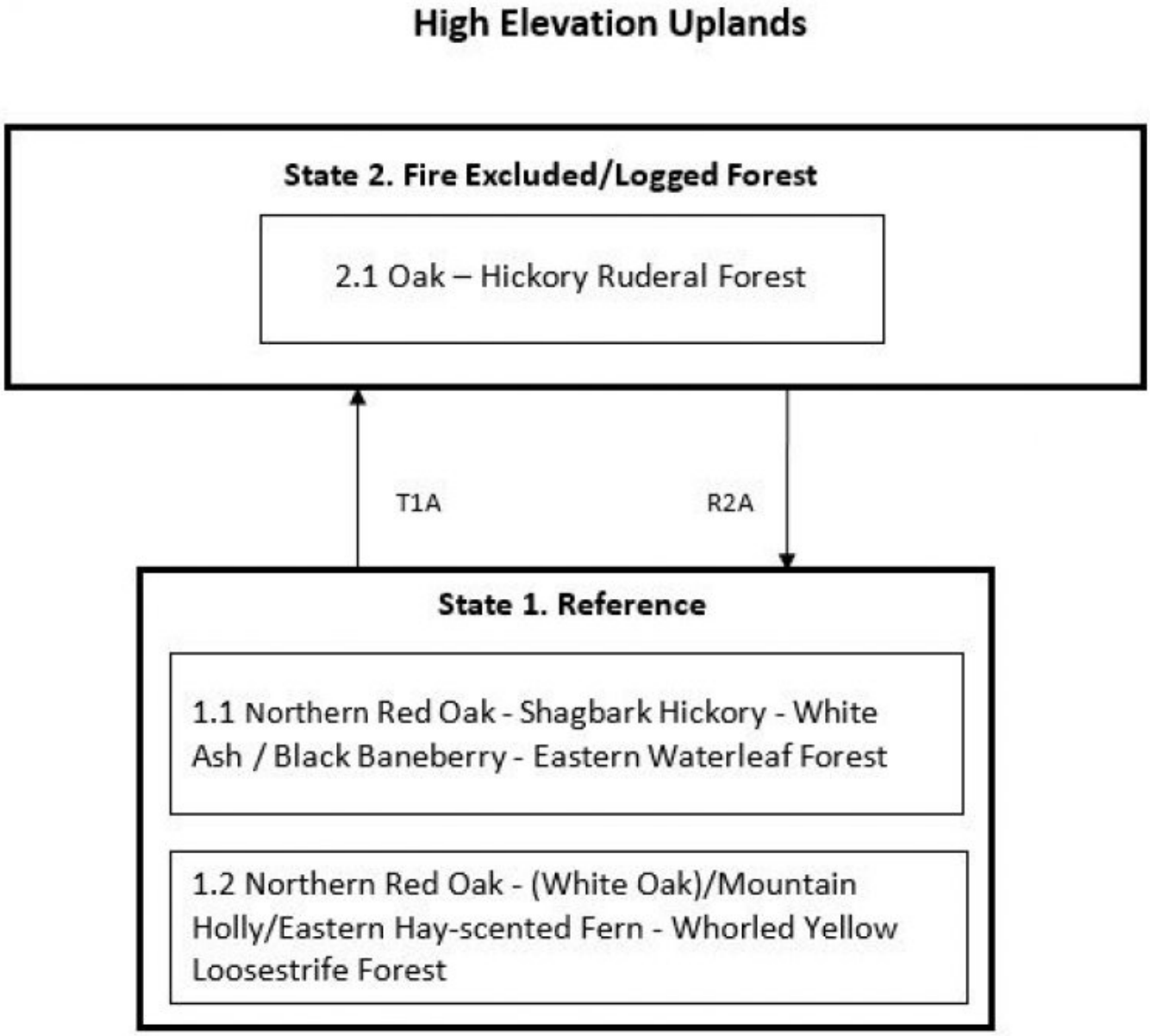

Figure 5. State and Transition Model

Code	Event/Activity
T1A	Logging followed by forest regrowth
R2A	Understory removal to promote growth of oak seedlings; possible use of prescribed fire plan.

Figure 6. Legend

State 1
Reference

The reference forest state is a combination of several vegetation communities within the Central and Southern

Appalachian Montane Oak Forest and the Northeastern Interior Dry-Mesic Oak Forest Systems as defined by NatureServe (NatureServe 2009). Above 3000 feet (914m) the vegetation remains dominated by oak, particularly Northern red oak and white oak, but individuals may be stunted or wind-flagged. At one time, American chestnut may have been a prominent species, but its importance has been dramatically reduced by chestnut blight. The reference communities listed below have been documented on this ecological site and are associated with the Northern Blue Ridge. 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 position and underlying geology than by human or natural disturbance.

Community 1.1
Quercus rubra - Carya ovata - Fraxinus americana / Actaea racemosa - Hydrophyllum virginianum Forest

The Northern Red Oak - Shagbark Hickory - White Ash / Black Baneberry - Eastern Waterleaf Forest, also known as the Central Appalachian Montane Oak - Hickory Forest (Basic Type) (CEGL008518; NatureServe 2017) forms extensive patches on the Northern Blue Ridge on deep, base rich soils weathered from mafic and calcareous parent material, including metabasalt (greenstone), amphibolite, pyroxene-bearing granulite, charnockite, and actinolite schist. It also occurs on sites underlain by calcareous sandstone, siltstone, metasiltone, phyllite, and felsic granites with mafic clasts. Occurrences span a range of intermediate elevations, from 2250-4150 feet (680-1265m), with a mean elevation of approximately 3280 feet (1000m). The characteristic expression of this community is that of an oak or oak-hickory forest with an herb layer that resembles that of a rich cove forest. *Quercus rubra* (Northern red oak) is the most constant member of the overstory but usually shares dominance with *Carya ovalis* (Red hickory), *Carya ovata* (Shagbark hickory), Fraxinus Americana (White ash) or, less frequently, other mesophytic hardwoods such as *Tilia americana* (American basswood), *Quercus alba* (White oak), *Carya cordiformis* (Bitternut hickory), *Prunus serotina* (Black cherry), and *Betula lenta* (Sweet birch). Both *Liriodendron tulipifera* (Tuliptree) and Quercus prinus (Chestnut oak), which are ubiquitous in much of the Central Appalachians, are uncommon to rare in this community type. The subcanopy tends to be strongly dominated by Carya spp. (Hickory) and *Fraxinus americana* (White ash), with *Acer saccharum* (Sugar maple), *Acer rubrum* (Red maple), *Acer pensylvanicum* (Striped maple), and *Ostrya virginiana* (Hophornbeam) also important in some stands. The shrub layer is typically sparse. Most stands have a lush and generally diverse herb layer, with total cover often exceeding 80% and strong patch-dominance by leafy, colonial forbs such as *Actaea racemosa* (= Cimicifuga racemosa) (Black baneberry), *Ageratina altissima* var. altissima (White snakeroot), *Hydrophyllum virginianum* (Eastern waterleaf), Collinsonia Canadensis (Richweed), *Caulophyllum thalictroides* (Blue cohosh), Laportea Canadensis (Canadia woodnettle), *Impatiens pallida* (Pale touch-me-not), *Thalictrum coriaceum* (Maid of the mist), and *Asclepias exaltata* (Poke milkweed). At higher elevations, where the type is transitional to northern red oak forests, *Dennstaedtia punctilobula* (Eastern hayscented fern) often dominates the herb layer in large clones.

Community 1.2
Quercus rubra - (Quercus alba) / Ilex montana / Dennstaedtia punctilobula Forest

The Northern Red Oak - (White Oak)/Mountain Holly/Eastern Hay-scented Fern - Whorled Yellow Loosestrife Forest, also known as the Central Appalachian Northern Red Oak Forest (CEGL008506; NatureServe 2017) occurs in stands restricted to elevations above 3000 feet (915m). Most examples are located on gentle to only moderately steep ridge crests and upper slopes. Soils are frequently bouldery and moderately to strongly infertile, with low base status. *Quercus rubra* (Northern red oak) is the principal dominant species in the overstory, with *Quercus alba* (White oak) as a frequent but usually low-cover associate, often in a subcanopy layer. Canopy trees often exhibit stunted growth and sparse cover; the stature of these so-called "red oak orchards" reflects the harsh conditions of frequent wind and destructive ice storms. The abundance of *Castanea dentata* (American chestnut) in the understory suggests its former importance in stands of this type. Other tree associates in the canopy and subcanopy can include *Acer rubrum* (Red maple), *Betula alleghaniensis* (Yellow birch), *Betula lenta* (Sweet birch), *Prunus serotina* (Black cherry), Tsuga Canadensis (Eastern hemlock), and *Quercus velutina*, (Black oak). The shrub layer is generally sparse to patchy; *Acer pensylvanicum* (Striped maple), *Ilex montana* (Mountain holly), *Kalmia latifolia* (Mountain laurel), *Castanea dentata* (American chestnut), and *Hamamelis virginiana* (Witchhazel) are the most frequent species. Other tall shrubs occurring with lower cover and/or frequency include *Ribes rotundifolium* (Appalachian gooseberry), *Rubus allegheniensis* (Allegheny blackberry), *Rhododendron prinophyllum* (Early azalea), *Corylus cornuta* var. cornuta (Beaked hazelnut) and *Prunus virginiana* (Chokecherry). *Vaccinium pallidum* (Blue Ridge blueberry) and *Vaccinium stamineum* (Deerberry) are infrequent low shrubs, but sometimes

comprise 10% or more of the herb layer. Herbaceous composition varies considerably and usually features patch-dominance by one or more of the following: *Dennstaedtia punctilobula* (Eastern hayscented fern), *Carex pensylvanica* (Pennsylvania sedge), *Lysimachia quadrifolia* (Whorled yellow loosestrife), and *Deschampsia flexuosa* (Wavy hairgrass), *Calamagrostis porteri* (Porter's reedgrass) is a patch-dominant grass in a very small percentage of stands. Other characteristic herbs of this community are *Ageratina altissima* (White snakeroot), *Agrostis perennans* (Upland bentgrass), *Amianthium muscitoxicum* (Flypoison), *Aralia nudicaulis* (Wild sarsaparilla), *Asclepias exaltata* (Poke milkweed), *Dioscorea quaternata* , (Fourleaf yam), *Eurybia divaricata* (= Aster divaricatus) (White wood aster), *Hieracium paniculatum* (Allegheny hawkweed), *Maianthemum canadense* (Canada mayflower), Pedicularis Canadensis (Canadian lousewort), Potentilla Canadensis (Dwarf cinquefoil), *Prenanthes altissima* (Tall rattlesnake root), *Prenanthes trifoliolata*, (Gall of the earth), *Smilax herbacea* (Smooth carrionflower), *Solidago arguta* var. argute (Atlantic goldenrod), and *Solidago curtisii* (Mountain decumbent goldenrod). Many additional herbs occur at low cover and constancy.

State 2
Fire Excluded/Logged Forest

Community 2.1
Quercus spp. – Carya spp. Ruderal Forest

The Oak – Hickory Ruderal forest (combination of CEGL associations; NatureServe 2017) is assumed to exist as an alternative state on this landscape based on the history of the Appalachians and field work in oak hickory forests. We assume that the post logging, fire excluded oak – hickory forests are similar to the non-logged reference state with the exception that overall species diversity is less, and trees are even-aged due to logging. Where oaks are present, they are frequently multi-stemmed, resulting from coppicing. The understory of these sites are dominated by fire sensitive species, most notably *Acer rubrum* (Red maple). Pine species are common in successional forests including *Pinus strobus* (Eastern white pine) and *Pinus virginiana* (Virginia pine). Early successional species like *Robinia pseudoacacia* (black locust), *Liriodendron tulipifera* (tuliptree), and *Prunus serotina* (black cherry) may also be present.

Transition T1A
State 1 to 2

Logging followed by natural regeneration. Fire suppression may allow fire sensitive species like red maple, and birches to out compete oak seedlings in the understory.

Restoration pathway R2A
State 2 to 1

Control of understory to allow oak seedling recruitment. Prescribed fire will further advance the growth of oaks over fire sensitive species.

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:**

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

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

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:

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

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

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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:**