Ecological site F130BY002WV
Frigid Colluvium

Last updated: 9/07/2018
Accessed: 05/19/2024

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): 130B–Southern Blue Ridge

This MLRA is in North Carolina (51 percent), Tennessee (18 percent), Georgia (17 percent), Virginia (10 percent), and South Carolina (4 percent). It makes up about 16,080 square miles (41,665 square kilometers). It is locally known as the Southern Appalachians. It includes Lenoir, Morganton, Marion, Hendersonville, Waynesville, and Asheville, North Carolina; Gatlinburg, Tennessee; Damascus and Galax, Virginia; Walhalla, South Carolina; and Cleveland, Dahlonega, and Ellijay, Georgia. Interstate 40 crosses the parts of the area in Tennessee and North Carolina. Interstate 77 crosses the part in Virginia. Many national forests are in the area, including the Jefferson, Cherokee, Nantahala, Pisgah, and Chattahoochee National Forests. The Appalachian Trail begins on Springer Mountain in Georgia, near Amicalola State Park. The Great Smoky Mountains National Park is in this MLRA. The Mount Rogers National Recreation Area is in the part of the MLRA in Virginia. The Cherokee Indian Reservation is west of Waynesville, North Carolina.

Classification relationships

This ecosite is found in mountains in MLRA 130B: Southern Blue Ridge

This is a complex system that encompasses a matrix of co-occurring vegetation communities. Data and maps produced by the SE GAP Analysis Project were queried (USGS 2001). At the most detailed level natural vegetation is represented by NatureServe's Ecological System classification (NatureServe 2017). Data has been cross-walked with NVC classification levels (Class, Subclass, Formation, Division, Macrogroup, Ecological System). The classification approach used was the International Terrestrial Ecological Systems Classification (ITESC) (NatureServe 2007 and White 2003). Ecological Systems were cross-checked with the Vegetation Classification System developed for the Great Smoky Mountains National Park (GRSM) in 2009.

Ecological Systems covered by the reference condition of this Provisional Ecological Site (PES) include: Southern Appalachian Northern Hardwood Forest, Central and Southern Appalachian Spruce-Fir Forest, Southern Appalachian Grass and Shrub Bald, and Central and Southern Appalachian Montane Oak Forest. Other Ecological Systems may fall within this PES (Appalachian Hemlock-Hardwood Forest, for example) but in the interest of simplicity, they are excluded from the State and Transition Model.

Ecological site concept

Frigid Colluvium occurs at the higher elevation zones in the Southern Blue Ridge Mountains. Vegetation changes occur slowly, across elevation gradients. At the highest elevations (above 1890 m/6201 ft) Fraser Fir (*Abies fraseri*) typically dominates stands, with red spruce (*Picea rubens*) co-dominating between approximately 1675 (5495 ft) and 1890 m (6201 ft) elevation. Red spruce has been noted to co-dominate with northern hardwoods and eastern hemlock (*Tsuga canadensis*) as low as 1480 m (4856 ft) elevation (Jenkins 2007). Small-scale but ecologically important systems occur within this larger matrix, including beech (*Fagus grandifolia*) gaps, heath balds, grassy balds and boulderfields. High elevation climate is the most important determining factor for all of these communities.

This PES has been historically affected by both human and natural disturbance. Disturbance continues to play an important role in its existence and development. It is currently largely in State or Federal ownership and is used for watershed protection, recreation, and wildlife habitat. A small acreage is used for native pasture and Christmas tree production.

Many of the soils included in this PES include a "windswept" phase.

Associated sites

F130BY001WV	**Frigid Residuum**
F130BY009WV	**Shallow Frigid Residuum**

Similar sites

F130BY001WV	**Frigid Residuum** There are very few differences between these sites in terms of vegetation at the PES scale. However, multiple ecological sites are likely included. Future projects should identify specific investigation needed to differentiate ecological sites. These PES projects should be considered a work plan for future refinement, not an end-product.

Table 1. Dominant plant species

Tree	(1) *Picea rubens* (2) *Abies fraseri*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

Frigid Colluvium occurs at high elevations in the Southern Blue Ridge mountains, MLRA 130B in receiving positions. It co-occurs with frigid residuum.

Table 2. Representative physiographic features

Landforms	(1) Cove (2) Drainageway
Flooding frequency	None
Elevation	1,148–2,029 m
Slope	5–60%
Water table depth	30 cm

Climatic features

The climate data presented here is for the entire MLRA and not this specific ecological site. In general, temperatures for this site will be cooler (mean annual air temperature ~40 - 45 degrees) and wetter (mean annual precipitation ~80 - 100") than the rest of the MLRA. All soils are considered frigid.

The average annual precipitation in this MLRA generally is 36 to 60 inches (915 to 1,525 millimeters), generally increasing with elevation. It is 60 to 90 inches (1,525 to 2,285 millimeters) in southwestern North Carolina and northeastern Georgia and can be as much as 119 inches (3,025 millimeters) on the higher peaks in the MLRA. Much of the precipitation occurs as snow at the higher elevations. The amount of precipitation is lowest in the fall. The average annual temperature ranges from 46 to 60 degrees F (8 to 16 degrees C), decreasing with elevation. The freeze-free period averages 185 days and ranges from 135 to 235 days. The freeze-free period is shorter at high elevations and on valley floors because of cold air drainage. Microclimate differences resulting from aspect significantly affect the type and vigor of the plant communities in the area. South- and west-facing slopes are

warmer and drier than north- and east-facing slopes and those shaded by the higher mountains.

Table 3. Representative climatic features

Frost-free period (average)	166 days
Freeze-free period (average)	192 days
Precipitation total (average)	1,397 mm

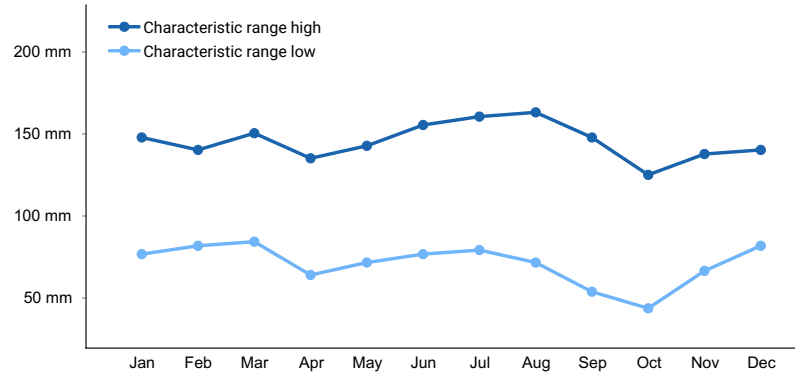

Figure 1. Monthly precipitation range

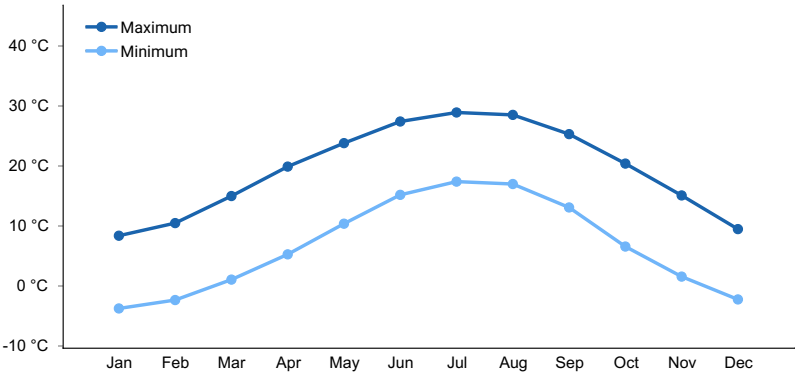

Figure 2. Monthly average minimum and maximum temperature

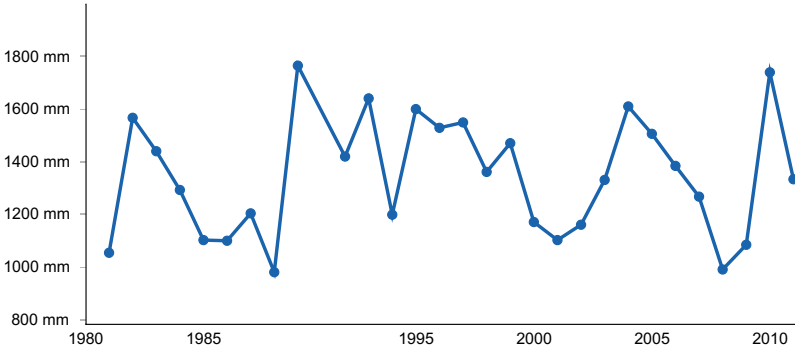

Figure 3. Annual precipitation pattern

Climate stations used

- (1) FRANKLIN [USC00313228], Franklin, NC
- (2) HENDERSONVILLE 1 NE [USC00313976], Hendersonville, NC
- (3) ERWIN 1 W [USC00402934], Erwin, TN
- (4) BALL GROUND [USC00090603], Ball Ground, GA
- (5) BREVARD [USC00311055], Brevard, NC
- (6) GALAX RADIO WBRF [USC00443267], Galax, VA

Influencing water features

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

Soil features

Soil series included in this PES are Chiltoskie, Heintooga, and Horsetrough, Tanassee, and Balsam. These soils occur in coves at high elevations in the Southern Blue Ridge mountains, MLRA 130B.

Figure 5. Tanassee Soil Profile (Photo credit: Anthony Khiel

Table 4. Representative soil features

Parent material	(1) Colluvium–graywacke (2) Residuum–metaconglomerate
Surface texture	(1) Cobbly fine sandy loam (2) Flaggy loam (3) Stony sandy loam
Drainage class	Poorly drained to well drained
Permeability class	Moderately rapid to rapid
Soil depth	117 cm
Surface fragment cover <=3"	0–75%
Surface fragment cover >3"	0–75%
Available water capacity (0-101.6cm)	6.86–19.3 cm
Soil reaction (1:1 water) (0-101.6cm)	3.6–4.9
Subsurface fragment volume <=3" (Depth not specified)	1–27%
Subsurface fragment volume >3" (Depth not specified)	0–70%

Ecological dynamics

A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a major land resource area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a provisional site, the soil vegetation interactions as expressed in the state and transition model are similar and the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional sites are likely to be refined into more precise group during the process of meeting the APPROVED ECOLOGICAL SITE

DESCRIPTION criteria.

This PROVISIONAL ECOLOGICAL SITE has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with this ecological site does not meet the approved ecological site description standard, but it has been through a quality control and quality assurance processes to ensure consistency and completeness. Further investigations, reviews and correlations are necessary before it becomes an approved ecological site description.

The vegetation groupings described in this section are based on the terrestrial ecological system classification developed by NatureServe (Comer et al. 2003). Ecological systems represent recurring groups of biological communities that are found in similar physical environments and are influenced by similar dynamic ecological processes, such as fire or flooding. 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.

Provisional Ecological Sites are intended to be very broad and should be considered first approximations based on existing available data. This PES covers multiple ecological systems. The systems included display gradual intergradation with elevation and so were initially grouped together. The ecological systems defined by NatureServe that occur within the reference community of this PES include:

1. Southern Appalachian Northern Hardwood Forest
2. Central and Southern Appalachian Spruce-Fir Forest
3. Central and Southern Appalachian Montane Oak Forest

Southern Appalachian Grass and Shrub balds also occur in small acreages on this PES. However, they are ecologically significant and so will be included in the narrative.

The following descriptions were taken directly from NatureServe:

Central and Southern Appalachian Northern Hardwood Forest: "This ecological system consists of hardwood forests of the higher elevation zones of the Southern Appalachians, generally above 1372 m (4500 feet) elevation within its primary range. Included are classic northern hardwood forests, dominated by various combinations of mesophytic hardwoods, which interfinger with high-elevation oak forests downslope or on more exposed aspects. The combination of elevation and aspect provides habitat for this system. Included in this system are limited areas locally known as "beech gaps" and "boulderfields." Stands are dominated by various combinations of Appalachian mesophytic trees, including *Acer saccharum*, *Aesculus flava*, *Betula alleghaniensis*, *Fagus grandifolia*, and *Tsuga canadensis*. *Prunus serotina* and *Tilia americana* var. heterophylla are occasionally abundant. *Quercus rubra* may be present but is not dominant."

Central and Southern Appalachian Spruce-Fir Forest: "This system consists of forests in the highest elevation zone of the Blue Ridge and parts of the Central Appalachians,
generally dominated by *Picea rubens*, *Abies fraseri*, or by a mixture of spruce and fir. *Abies fraseri* is the constituent fir from Mount
Rogers in Virginia southward. Examples occur above 1676 m (5500 feet) in the Southern Blue Ridge, but as low as 975 m (3200 feet)
at the northern range in West Virginia, and may range up to the highest peaks. Elevation and orographic effects make the climate cool
and wet, with heavy moisture input from fog as well as high rainfall. Strong winds, extreme cold, rime ice, and other extreme weather
are periodically important. The border of this system with adjacent systems is often gradational. The non-forested systems that occur in the same elevational zone may have transition zones of open woody vegetation, though some have sharp borders. The transition to Southern Appalachian Northern Hardwood Forest (CES202.029) or other systems that adjoin at lower elevations is marked by a
gradual shift in canopy dominance from conifers to hardwoods. In relatively undisturbed stands, the canopy composition and structure are the best way to determine the boundary of this system."

Central and Southern Appalachian Montane Oak Forest (may occur): "This system is found in the central and southern Appalachian Mountains. These high-elevation deciduous forests occur on exposed sites mostly between 915 and 1372 m (3000-4500 feet) elevation. The weathered soils are thin, nutrient-poor, low in organic matter, and

acidic. The forests are dominated by Quercus spp. (most commonly *Quercus rubra* and *Quercus alba*), with the individuals often stunted or wind-flagged. Castanea dentate sprouts are also common, but the importance of chestnut in these forests has been dramatically altered by chestnut blight. *Ilex montana* and *Rhododendron prinophyllum* are characteristic shrubs. Above 1372 m (4500 feet) elevation and below spruce-fir communities, this system tends to be replaced by the Southern Appalachian Northern Hardwood Forest (CES202.029)."

Southern Appalachian Grass and Shrub Balds: "This ecological system consists of dense herbaceous and shrubland communities in the highest elevational zone of the
southern Appalachians, generally above 1524 m (5000 feet) but occasionally to 1220 m (4000 feet), and at slightly lower elevations at
its northern limit in Virginia and West Virginia, and in the Cumberland Mountains along the Virginia-Kentucky border. Vegetation
consists either of dense shrub-dominated areas (heath balds) or dense herbaceous cover dominated by grasses or sedges (grassy balds).
The combination of high-elevation, non-wetland sites and dense herbaceous or shrub vegetation without appreciable rock outcrop conceptually distinguishes this system from all others in the southern Appalachians. However, the widespread areas of degraded spruce-fir with grass and shrub cover and the invasion of grassy balds by trees blur the distinction somewhat."

It is worthwhile to note and describe the beech gaps that occur in this ecological site. While there has been some debate about their origin, they are most likely a result of wind events (Russell 1953). Beech gaps occur on south-facing concave slopes, near the tops of major ridges (Fuller 1977) so it's likely that they receive more force from the wind. They persist in nearly uniform stands, reproducing primarily from sprouts. Russell (1953) documented that soils could be different in beech gaps (only weakly acid, no accumulation of peat, excessive depth of litter, and no podsolization) but whether that is due to the presence of beech or not is unclear. Fuller (1977) documented a combination of "interference mechanisms" that progressively increase spruce seed and seedling mortality in the beech gaps, thereby maintaining a nearly uniform stand of beech. Beech gaps have been negatively impacted by beech bark disease, an exotic insect-fungal pathogen complex that can result in mortality (Jenkins 2007). When queried, staff of the Great Smoky Mountains National Park (GRSM) report that many impacted sites still have beech present as young clones with only minor loading of beech bark disease. Where beech has been lost, the sites are either existing as a High Elevation Pin Cherry - Mountain Ash - Blackberry Thicket, or as a very young version of the northern hardwood forest (Troy Evans, personal communication).

This PES largely falls under public ownership and is primarily forested. It is mostly managed for recreation, watershed protection, and wildlife habitat. There are some small pastures and Christmas tree farms. Potentially the greatest threat to this PES is invasive, exotic species. In particular, numerous forest pests have been introduced that have had serious negative impacts.

State and transition model

Figure 6. DRAFT STM

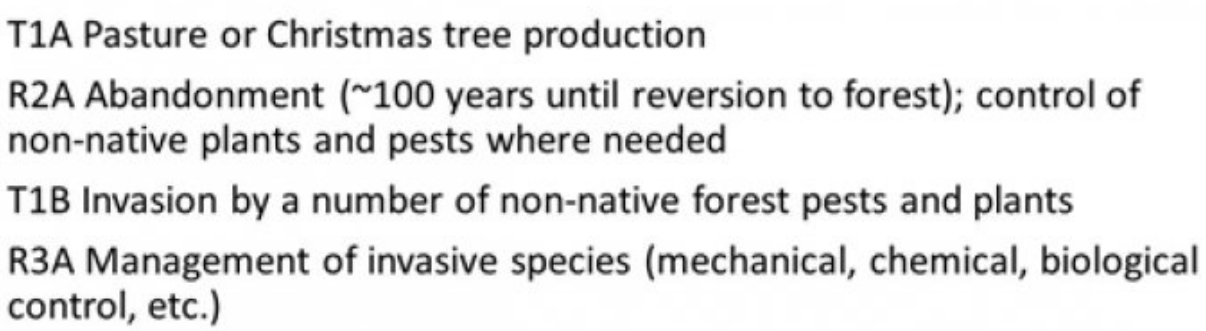

Figure 7. DRAFT Legend

State 1
Reference State

The reference state includes at least three NatureServe forested ecological systems in addition to heath and grass balds. All communities occur at high elevations in the Southern Blue Ridge Mountains and primarily fall under public ownership. Climate due to elevation largely determines where ecological systems occur. They do intergrade typically and so do not have "hard" boundaries. Heath and grass balds differ. Past disturbances interacting with topography and preexisting vegetation most likely produce heath balds (White et al. 2001). Once established, they

maintain the site for a long period of time and so are considered a stable vegetation community. Grassy balds are largely considered to be a result of past clearing and grazing prior to the establishment of public land ownership (Lindsay 1976). They require management such as tree and shrub clearing or they will eventually revert to forest.

Community 1.1
Southern Appalachian Northern Hardwood Forest

Community 1.2
Central and Southern Appalachian Spruce-Fir Forest

Community 1.3
Central and Southern Montane Oak Forest

This ecological system may occur at a lower elevation than this ecological site. Field investigations are needed to determine whether or not it should be included.

State 2
Managed State

Because most of this ecological site is publicly owned, very little private management takes place. However, some acreage is in pasture and Christmas tree production. Forestry may be important on National Forests.

State 3
Invaded State

Perhaps the greatest challenge to the integrity of this ecological site is the presence of invasive, non-native pests and pathogens. The impact and response varies by species and can be situational, depending on available resources. Fraser fir forests were decimated in the 1990's by the Balsam Woolly Adelgid but do seem to be recovering in some areas. Beech gaps were impacted by Beech Bark Disease. In some areas, they will be lost to other forest types in all likelihood.

Transition A
State 1 to 2

Conversion to pasture or Christmas tree farms

Transition B
State 1 to 3

Invasion by a number of non-native forest pests and pathogens

Restoration pathway A
State 2 to 1

Natural succession may suffice in some cases, especially where pasture is largely in native grasses. However, where needed some measures may be taken to re-establish the native forest community.

Restoration pathway A
State 3 to 1

Treatment and management will be very dependent on the specific problem and should be handled on a site by site basis.

Additional community tables

Other references

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Contributors

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Approval

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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):**

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

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

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):**

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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:**

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17. **Perennial plant reproductive capability:**