USDA Natural Resources Conservation Service

Ecological site F124XY005OH
Mixed Limestone Rich Sideslope

Last updated: 6/30/2020
Accessed: 05/20/2024

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): 124X–Western Allegheny Plateau

Major Land Resource Area (MLRA): 124—Western Allegheny Plateau (USDA-NRCS, 2006)
MLRA 124, Western Allegheny Plateau extends from and includes western PA just north of Pittsburgh through southeastern OH to and includes northeastern KY. This area is primarily in the Kanawha Section of the Appalachian Province of the Appalachian Highlands. This MLRA is on an unglaciated dissected plateau with narrow level valley floors, rolling ridgetops, and hilly to steep slopes with dendritic stream drainages. A notable exception is the broad, Teays Valley, and other glacio-fluvial and glacio-lacustrine features attributed to nearby Pleistocene glaciation. Elevation ranges from 660 to 1310 feet (200 to 400 meters). The geology is predominantly cyclic beds of sandstone, siltstone, clay, shale and coal of Pennsylvanian age. Soils are dominated by Udalfs, Udults, and Ochcrepts with a mesic temperature regime in combination with five parent materials, residuum, colluvium, alluvium, eolian, and extra-glacial material of glacio-fluvial and glaciolacustrine mesic materials. The climate is predominately a humid continental to temperate, with 37 to 45 inches (940-1145 mm). Average annual temperature is 46 to 56 degrees F (8 to 13 degree C) with a freeze-free period averaging 185 days. Much of the areas is either forest or in farms, principally for hay and pasture, with fruits and vegetables grown locally. Coal and gas extraction are important industries in the northern part of the MLRA.

Classification relationships

USDA-NRCS (USDA 2006):
Land Resource Region (LRR): N—East and Central Farming and Forest Region
Major Land Resource Area (MLRA): 124—Western Allegheny Plateau
USDA-FS:
Province: Humid Temperate
Section: Southern Unglaciated Allegheny Plateau
Subsection: Pittsburgh Low Plateau
Unglaciated Muskingam Plains
Western Hocking Plateau
Lower Scotio River Plateau
Teays Plateau
Kinniconick and Licking Knobs
Section: North Cumberland Plateau (in Part)
Subsection: Kinniconick and Licking Knobs
Miami-Scioto Plain – Tipton Till Plain

Ecological site concept

Within the dissected plateau of the unglaciated Western Allegheny Plateau, the Mixed Limestone Rich sideslope ecological site is set in upland landscapes derived from limestone colluvium occupying sideslopes and toeslopes. The sites are well-drained. Representative soils include: Bledsoe, Mertz, and Renox. Reference plant communities

may include: Appalachian Sugar Maple - Chinquapin Oak Limestone Forest or Central Appalachian Rich Cove Forest.

Associated sites

F124XY003OH	**Mixed Limestone Rich Upland** Mixed Limestone Rich Upland ecological site is often adjacent to and upslope of Mixed Limestone Rich Upland.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

Due to the unglaciated nature of this highly dissected plateau, much of the appearance of the landscapes is directly related to the underlying geology and erosional processes. The Mixed Limestone Rich Sideslope ecological site is derived from colluvial limestone. Within the typical upland landscape of hills and plateaus, the Mixed Limestone Rich Sideslope ecological site occupies the concave sideslopes. Slope and aspect are variable.

Table 2. Representative physiographic features

Landforms	(1) Hillslope (2) Ridge
Elevation	203–399 m
Slope	2–70%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The regional climate of the unglaciated Western Allegheny Plateau is predominately a humid continental climate grading at the extreme southwestern corner a to humid temperate climate with hot summers and cool winters (Beck et al., 2018; Bailey, 2014). However, the local climate is highly influenced by the dissected terrain, where climatic variations may be greater at the local scale, e.g., cooler temperatures and shorter growing season at higher elevations and more northerly latitudes.

The average annual precipitation in most of this area is 37 to 45 [50] inches (940 to 1,145 [1,270] millimeters. High-intensity, convective thunderstorms are common in summer. The average annual temperature is 46 to 56 degrees F (8 to 13 degrees C). The freeze-free period (averages) 185 days.

Climate change is occurring, and the resiliency of any ecological site will depend upon the direct and indirect effects upon component species and shifting atmospheric and soil conditions.

On these ecological sites, dry-mesic upland forests are at a low vulnerability risk with some impacts considered positive and mixed mesophytic forests are at a moderate vulnerability risk to climate change with impacts considered neutral-negative. Large gap disturbances from greater storm events, drier summer and fall conditions, and a potential increase in fire frequency, can favor oaks and hickories over American Beech and tuliptree and more southern plant species. Greater frequency and magnitude of storm events may increase large gap disturbances coupled with drier conditions in summer and fall may increase wildfires (Butler et al., 2015). Longer growing seasons may change plant species composition.

Table 3. Representative climatic features

Frost-free period (characteristic range)	122-142 days

Freeze-free period (characteristic range)	156-178 days
Precipitation total (characteristic range)	1,016-1,118 mm
Frost-free period (actual range)	115-148 days
Freeze-free period (actual range)	148-184 days
Precipitation total (actual range)	965-1,168 mm
Frost-free period (average)	132 days
Freeze-free period (average)	167 days
Precipitation total (average)	1,067 mm

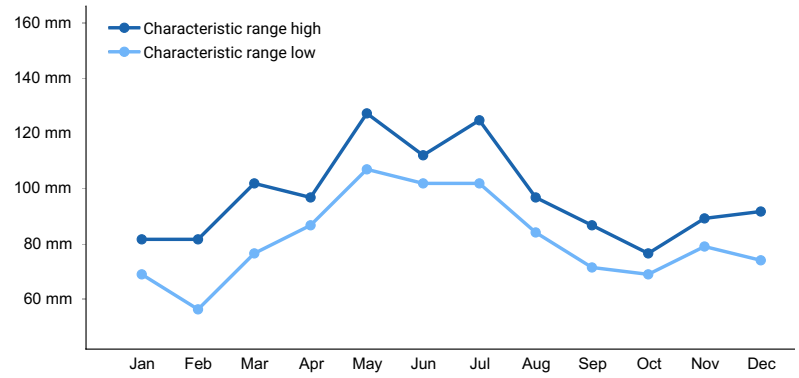


Figure 1. Monthly precipitation range

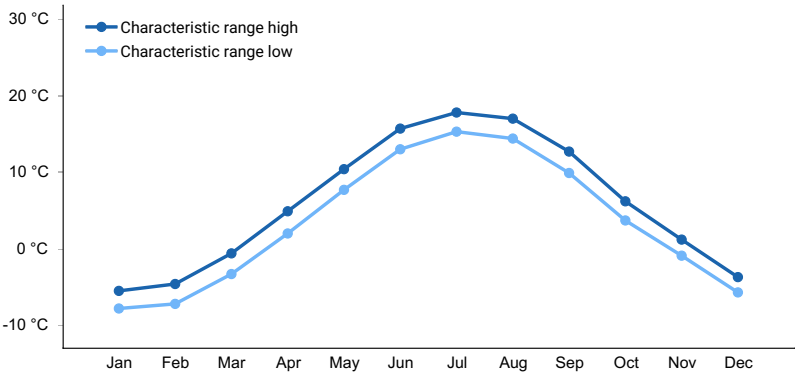


Figure 2. Monthly minimum temperature range

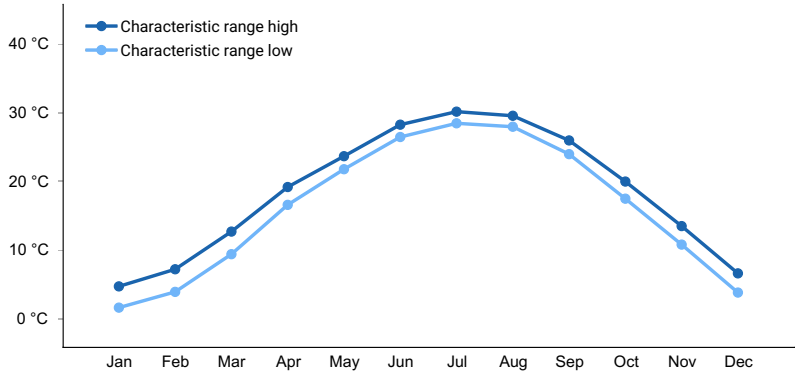


Figure 3. Monthly maximum temperature range

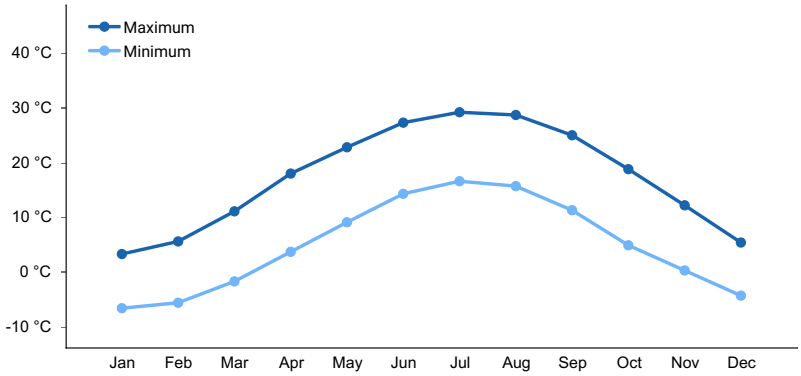


Figure 4. Monthly average minimum and maximum temperature

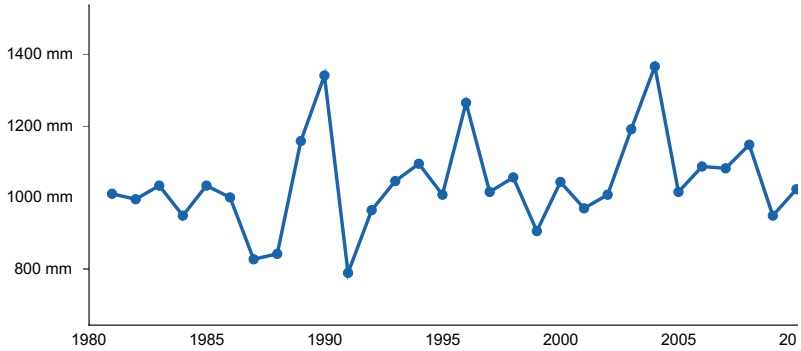


Figure 5. Annual precipitation pattern

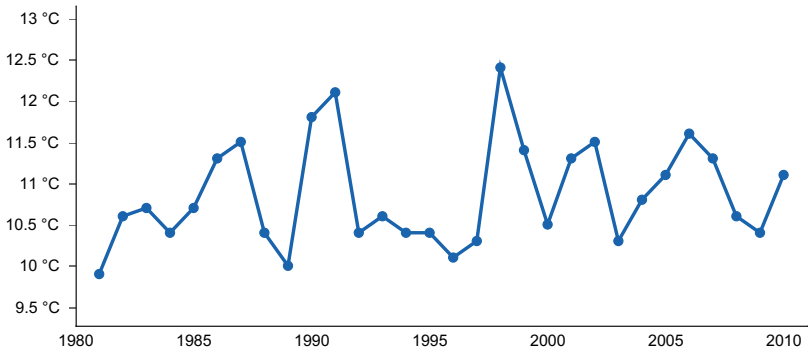


Figure 6. Annual average temperature pattern

Climate stations used

- (1) PUTNEYVILLE 2 SE DAM [USC00367229], Dayton, PA
- (2) FORD CITY 4 S DAM [USC00362942], Ford City, PA
- (3) BUTLER 2 SW [USC00361139], Butler, PA
- (4) DENISON WTR WKS [USC00332160], Dennison, OH
- (5) NEW PHILADELPHIA FLD [USW00004852], New Philadelphia, OH
- (6) MILLERSBURG [USC00335297], Millersburg, OH
- (7) DANVILLE 2 W [USC00332044], Danville, OH
- (8) COSHOCTON AG RSCH STN [USC00331905], Fresno, OH
- (9) COSHOCTON WPC PLT [USC00331890], Coshocton, OH
- (10) ZANESVILLE MUNI AP [USW00093824], Zanesville, OH
- (11) PHILO 3 SW [USC00336600], Philo, OH
- (12) NEW LEXINGTON 2 NW [USC00335857], New Lexington, OH
- (13) LOGAN [USC00334672], Logan, OH
- (14) JACKSON 3 NW [USC00334004], Jackson, OH
- (15) WAVERLY [USC00338830], Waverly, OH
- (16) PORTSMOUTH-SCIOTOVILLE [USC00336781], South Shore, OH

- (17) WARNOCK2 [USC00158432], Greenup, KY
- (18) GRAYSON 2 E [USC00153389], Grayson, KY
- (19) OLIVE HILL 5NE [USC00156012], Olive Hill, KY
- (20) GRAYSON 3 SW [USC00153391], Grayson, KY
- (21) GIMLET 9N [USC00153230], Olive Hill, KY
- (22) CAVE RUN LAKE [USC00152791], Morehead, KY
- (23) ASHLAND [USC00150254], South Point, KY

Influencing water features

N/A

Soil features

Representative soils include: Bledsoe, Mertz, and Renox. The sites are well-drained.

Ecological dynamics

[Caveat: The vegetation information contained in this section is only provisional, based on concepts, not yet validated with field work.*]

The vegetation groupings described in this section are based on the terrestrial ecological system classification and vegetation associations developed by NatureServe (Comer et al., 2003). Terrestrial ecological SYSTEMS are specifically defined as a group of plant community types called 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 terrain and 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 and recognized by the US National Vegetation Classification (FDGC, 2008; USNVC, 2017). Each association will be named by the diagnostic and often dominant species that occupy the different height strata (represented by tree, shrub, and herb layers). Within the NatureServe Explorer database, ecological systems are numbered by a community Ecological System Code (CES) and individual vegetation associations are assigned an identification number called a Community Element Global Code (CEGL).

Additional and more localized vegetation information can be provided by the various State Heritage Programs. Additional insights to the vegetation were provided by Plant Communities of Ohio: A Preliminary Classification (Anderson, 1982).

Due to a long history of human activity, the reference condition more accurately reflects the current naturalized, minimally-managed state rather than the historic, pre-European settlement condition. Calcareous (limestone) uplands of the unglaciated, Western Alleghany Plateau are quite variable depending on the landform position. The vegetation of the Mixed Limestone Rich Sideslope ecological site occupies colluvial lower, sideslopes.

The vegetation of the Mixed Limestone Rich Sideslope ecological site is quite varied but dominated by Chinquapin oak- sugar maple or Chinquapin oak-eastern red cedar. Within the Reference State, plant communities are part of the Central Appalachian Alkaline Glade and Woodland (CES202.602) and may transition South-Central Interior Mesophytic Forest (CES202.887) (NatureServe, 2020). Besides the mature plant community-types listed here, other spontaneous, successional plant community-types that exist following disturbance or management are normally considered phases of the minimally managed Reference State. However, if dominated by non-native plant, the altered plant community-type would be considered belonging to the Semi-Natural State.

Agents-of-change within any ecological site include both natural and anthropogenic stressors. Canopy disturbances such as fire, wind, and ice storms, will tend to favor oaks and pines. (Lafon et al., 2017). Conversely, fire suppression, a changing climate, and natural forest succession effect mesophication, a trend toward more shade tolerant species, e.g., white ash, sugar maple, red maple, American beech. (Nowacki et al., 2008). However, site conditions do influence the degree of mesophication. Within the Mixed Limestone Rich Sideslope ecological site,

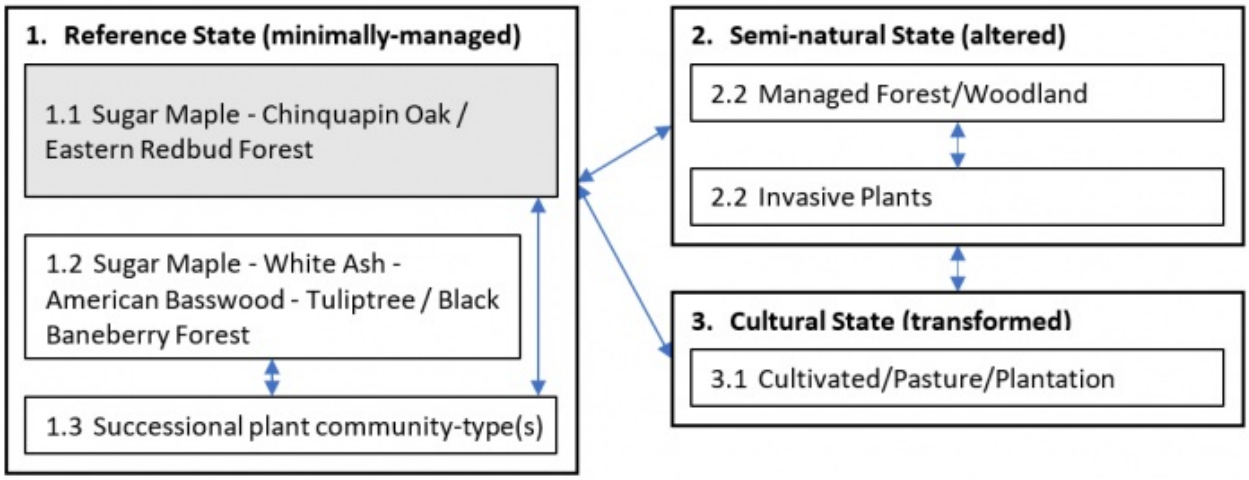
mesophication is more pronounced in more common mesic conditions, while more subdued on less common xeric conditions. Where deer densities are high, deer browse has a pronounced effect on plant regeneration, structure, and species diversity. However, deer browse can vary across the landscape (Royo et al., 2017). Currently, deer browsing pressure in southeastern Ohio is relatively low (Apsley and McCarthy, 2004). Invasive and incursive plants can directly affect forest ecosystems in many ways; through direct competition for resources, alter fire or hydrologic conditions and affect species diversity. Insect pests and diseases such as the Gypsy moth, oak decline and armillaria root rot can cause reduced productivity and mortality in target oak species (Butler et al., 2015). With increasing moisture stress and drought, beech bark disease may increase. (Butler et al., 2015). Within the unglaciated Western Alleghany Plateau, most of the hills remain forested, with some agriculture on lands flat enough to support it. Agriculture and residential development are concentrated in the valleys. Surface mining for coal affects land and water to varying degrees (Ohio Div. of Wildlife, 2015; USDA-NRCS, 2006).

Other ecological states, a Semi-natural State and a Cultural State are recognized. The Semi-natural State would expect plant communities where ecological processes primarily operate with some conditioning by land management, e.g., managed forests, or plant communities that are an artifact of land management e.g., predominately invasive plants. The Cultural State is a completely converted or transformed state; heavily or completely conditioned by land management, e.g., cultivated lands, pasture/haylands, vineyards, and plantations, etc. Generally, the form of vegetation in the Semi-natural State or the Cultural State is not able to be specified until field work is conducted.

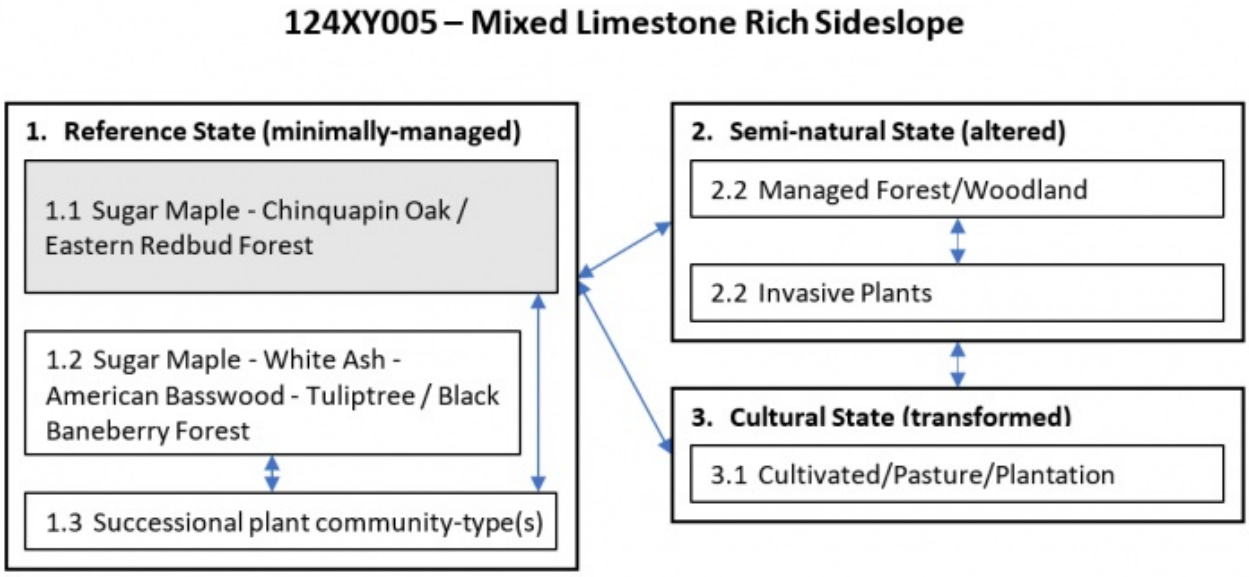
[*Caveat] The vegetation information presented is representative of complex plant communities. Key indicator plants and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and geography. The reference plant community is not necessarily the management goal. The drafts of species lists are merely 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

124XY005 – Mixed Limestone Rich Sideslope



Transition	*Drivers/practices*
T1-2, T3-2	forest management, fire suppression, disturbance, invasive plant establishment
T1-3, T2-3	cutting, land clearing, plant establishment
R2-1, R3-1	plant removal, plant establishment, successional management
CP1.1-1.3, CP1.2-1.3	disturbance, greater fire frequency
CP1.3-1.1, CP1.3-1.2	vegetation development/succession
CP2.1-2.2	invasive plant establishment, vegetation development/succession
CP2.2-2.1	invasive plant management, forest management



Transition	*Drivers/practices*
T1-2, T3-2	forest management, fire suppression, disturbance, invasive plant establishment
T1-3, T2-3	cutting, land clearing, plant establishment
R2-1, R3-1	plant removal, plant establishment, successional management
CP1.1-1.3, CP1.2-1.3	disturbance, greater fire frequency
CP1.3-1.1, CP1.3-1.2	vegetation development/succession
CP2.1-2.2	invasive plant establishment, vegetation development/succession
CP2.2-2.1	invasive plant management, forest management

State 1
Reference State (minimally-managed)

As a result of a long history of human activity, the associations listed below, may in reality, reflect the current naturalized, minimally-managed state rather than the historic, pre-European settlement condition. Notice transition pathways are not always designated between some of the communities in the reference state because the differences in vegetation are more controlled by landscape position, rather than disturbances or management, or that the relationships are not understood. In addition, undisclosed successional plant community-types following disturbance may be included as community phases. Within the reference state, the plant communities are quite variable and include: • *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL006017) (Translated Name: Sugar Maple - Chinquapin Oak / Eastern Redbud Forest) [Common Name: Appalachian Sugar Maple - Chinquapin Oak Limestone Forest] • *Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237) (Translated Name: Sugar Maple - White Ash - American Basswood - Tuliptree / Black Baneberry Forest) [Common Name: Central Appalachian Rich Cove Forest] (Source: NatureServe 2020)

Community 1.1
Sugar Maple - Chinquapin Oak / Eastern Redbud Forest

Acer saccharum - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL006017) (Translated Name: Sugar Maple - Chinquapin Oak / Eastern Redbud Forest) [Common Name: Appalachian Sugar Maple - Chinquapin Oak Limestone Forest] (Source: NatureServe 2020)

Community 1.2

Sugar Maple - White Ash - American Basswood - Tuliptree / Black Baneberry Forest

Acer saccharum - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237) (Translated Name: Sugar Maple - White Ash - American Basswood - Tuliptree / Black Baneberry Forest) [Common Name: Central Appalachian Rich Cove Forest] (Source: NatureServe 2020)

Community 1.3
Successional plant community-type(s)

Pathway 1.1-1.3
Community 1.1 to 1.3

disturbance, greater fire frequency

Pathway 1.2-1.3
Community 1.2 to 1.3

disturbance, greater fire frequency

Pathway 1.3-1.1
Community 1.3 to 1.1

vegetation development/succession

Pathway 1.3-1.2
Community 1.3 to 1.2

vegetation development/succession

State 2
Semi-natural State

The Semi-natural State would expect plant communities where ecological processes are primarily operating with some land conditioning in the past or present, e.g., managed forests, or plant communities that are an artifact of land management e.g., predominately invasive plants.

Community 2.1
Managed Forest/Woodland

Community 2.2
Invasive Plants

Pathway 2.1-2.2
Community 2.1 to 2.2

2.1-2.2 invasive plant establishment, vegetation development/succession

Pathway 2.2-2.1
Community 2.2 to 2.1

invasive plant management, forest management

State 3
Cultural State

The Cultural State would expect the ecological site to be strongly conditioned by land management/converted to Cultivated/Pasture/Plantation.

Community 3.1
Cultivated

Community 3.2
Pasture

Community 3.3
Plantation

Transition T1-2
State 1 to 2

forest management, fire suppression, disturbance, invasive plant establishment

Transition T1-3
State 1 to 3

cutting, land clearing, plant establishment

Restoration pathway R2-1
State 2 to 1

plant removal, plant establishment, successional management

Transition T2-3
State 2 to 3

cutting, land clearing, plant establishment

Restoration pathway R3-1
State 3 to 1

plant removal, plant establishment, successional management

Restoration pathway R3-2
State 3 to 2

forest management, fire suppression, disturbance, invasive plant establishment

Additional community tables

Inventory data references

Site Development and Testing Plan
Future work is needed, as described in a project plan, to validate the information presented in this provisional ecological site description. Future work includes field sampling, data collection and analysis by qualified vegetation ecologists and soil scientists. As warranted, annual reviews of the project plan can be conducted by the Ecological Site Technical Team. A final field review, peer review, quality control, and quality assurance reviews of the ESD are necessary to approve a final document.

Other references

Anderson, D. M. 1982. Plant Communities of Ohio: A Preliminary Classification. Division of Natural Areas and Preserves, Ohio Department of Natural Resources, Columbus, OH (Unpublished Report).

Apsley, D., and B.C. McCarthy. 2004. White-tailed deer herbivory on forest regeneration following fire and thinning

treatments in southern Ohio mixed oak forests. P. 461–471 In: Yaussy, D.A., D.M. Hix, R.P. Long, and P.C. Goebel (eds.) Proceedings, 14th Central Hardwood Forest Conference, 2004 March 16-19; Wooster, OH. Gen. Tech. Rep. NE-316. USDA Forest Service, Northeastern Research Station, Newtown Square, PA.

Bailey, R. 2014. Ecoregions: the ecosystem geography of the oceans and continents. 2nd ed. New York, NY: Springer-Verlag.

Beck, H.E., N.E. Zimmermann, T.R. McVicar, N. Vergopolan, A. Berg, E.F. Wood. 2018. Present and future Köppen-Geiger climate classification maps at 1-km resolution. Scientific Data5:180214, doi:10.1038/sdata.2018.214.

Butler, P.R., L. Iverson, F.R. Thompson, L. Brandt, S. Handler, M. Janowiak, P.D. Shannon, C. Swanston, K. Karriker, J. Bartig, and S. Connolly. 2015. Central Appalachians Forest Ecosystem Vulnerability Assessment and Synthesis: a Report From The Central Appalachians Climate Change Response Framework Project. Gen. Tech. Rep. NRS-146, US Department of Agriculture, Forest Service, Northern Research Station, Newtown Square, PA.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, and K. Snow. 2003. Ecological Systems of the United States: A Working Classification of US Terrestrial Systems. NatureServe, Arlington, VA.

FGDC (Federal Geographic Data Committee). 2008. National Vegetation Classification Standard, Version 2. VGDC-STD-005-2008 (Version 2). FGDC Vegetation Subcommittee, Reston, Virginia.

Lafon, C.W., A.T. Naito, H.D. Grissino-Mayer, S.P. Horn, and T.A. Waldrop. 2017. Fire History of the Appalachian Region: a Review and Synthesis. Gen. Tech. Rep. SRS-219., U.S. Department of Agriculture, Forest Service, Southern Research Station, Asheville, NC.

NatureServe 2020. NatureServe Explorer: An Online Encyclopedia of Life [web application]. Version #.#. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org (Accessed: April 2020).

Nowacki, G.J. and M.D. Abrams. 2008. The demise of fire and “mesophication” of forests in the eastern United States. Bioscience 58(2):123–138.

Ohio Division of Wildlife. 2015. Ohio’s State Wildlife Action Plan. Columbus, Ohio, USA.

Royo, A.A.; D.W. Kramer, K.V. Miller, N.P. Nibbelink, and S.L. Stout. 2017. Spatio-temporal variation in foodscapes modifies deer browsing impact on vegetation. Landscape Ecology 32(2):2281–2295.

USDA-NRCS [United States Department of Agriculture, Natural Resources Conservation Service]. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

USNVC [United States National Vegetation Classification]. 2019. United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. http://usnvc.org (accessed April 2020).

Contributors

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Approval

Nels Barrett, 6/30/2020

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	05/20/2024
Approved by	Nels Barrett
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):**

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

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

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

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:**
