USDA Natural Resources
Conservation Service

Ecological site F124XY001OH
Shallow Acid Mixed Sedimentary Upland

Last updated: 9/26/2024
Accessed: 05/21/2025

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 200 to 400 meters (660 to 1310 feet). 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 940 to 1145 millimeters (37 to 45 inches) of precipitation. Average annual temperature is 8 to 13 degree C (46 to 56 degrees F) 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 (Cleland et al. 2007)
Province: 221 - Eastern Broadleaf Province
Section: 221E - Southern Unglaciated Allegheny Plateau
Subsection: 221Ea - Pittsburgh Low Plateau
221Eb - Teays Plateau
221Ee - Unglaciated Muskingam Plains
221Ef - Western Hocking Plateau
221Eg - Lower Scotio River Plateau
221En - Kinniconick and Licking Knobs
Section: 221H - North Cumberland Plateau (in Part)
Subsection: 221Hb - Kinniconick and Licking Knobs
221He - Miami - Scioto Plain - Tipton Till Plain

Ecological site concept

Within the dissected plateau of the unglaciated Western Allegheny Plateau, the Shallow Acid Mixed Sedimentary Uplands ecological site is set in upland landscapes occupying summits, shoulders and convex slopes where the soils are shallow. The Shallow Acid Mixed Sedimentary Upland ecological site is derived from non-calcareous to acid mixed sedimentary geology primarily composed of sandstone, shale, siltstone, and coal. Most sites are well-drained to somewhat excessively-drained. Representative soils include: Weikert, Ramsey. Reference plant communities include: Allegheny Plateau-Northeast Oak Forest.

Associated sites

F124XY002OH	**Acid Mixed Sedimentary Upland** Acid Mixed Sedimentary Upland ecological site is often adjacent to Shallow Acid Mixed Sedimentary Upland
F124XY004OH	**Acid Mixed Sedimentary Toeslope** Acid Mixed Sedimentary Toeslope ecological site often shares in the topgraphic sequence of the same local landscape.

Table 1. Dominant plant species

Tree	(1) *Quercus velutina*
Shrub	(1) *Vaccinium pallidum*
Herbaceous	(1) *Pteridium aquilinum*

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 Shallow Acid Mixed Sedimentary Upland ecological site is derived from non-calcareous to acid mixed sedimentary geology primarily composed of sandstone, shale, siltstone, and coal. Within the typical landscape of a dissected plateau with narrow to broad flat-bottomed valleys, the Shallow Acid Mixed Sedimentary Upland ecological site occupies the summits, shoulders, and upper convex slopes in situations where the soils are shallow. Slope and aspect are variable. Convex summits and exposed slopes facing southwest generally have the shallower soils.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Hillslope
Runoff class	Low to very high
Elevation	660–1,310 ft
Slope	2–70%
Water table depth	72 in
Aspect	Aspect is not a significant factor

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. High-intensity, convective thunderstorms are common in summer. Winter precipitation is mostly snow.

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 upland forests are at a low vulnerability risk to climate change with some impacts considered positive. Large gap disturbances from greater storm events, drier summer and fall conditions, and a potential increase in fire frequency, can favor oaks and hickories 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).

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)	40-44 in
Frost-free period (actual range)	115-148 days
Freeze-free period (actual range)	148-184 days
Precipitation total (actual range)	38-46 in
Frost-free period (average)	132 days
Freeze-free period (average)	167 days
Precipitation total (average)	42 in

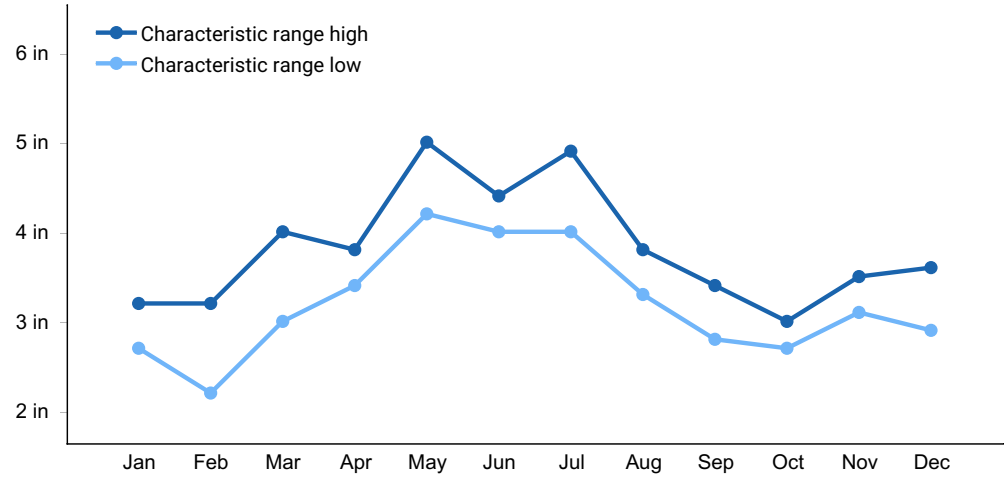


Figure 1. Monthly precipitation range

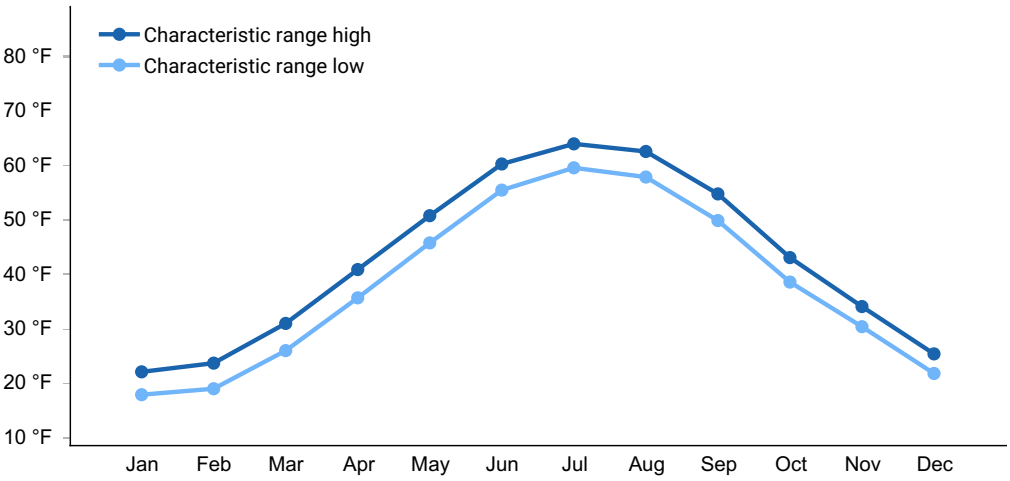


Figure 2. Monthly minimum temperature range

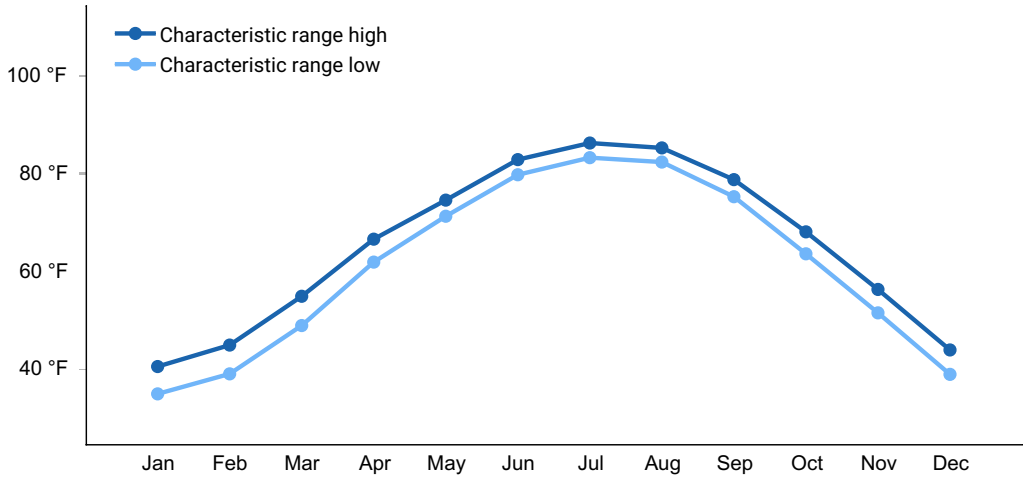


Figure 3. Monthly maximum temperature range

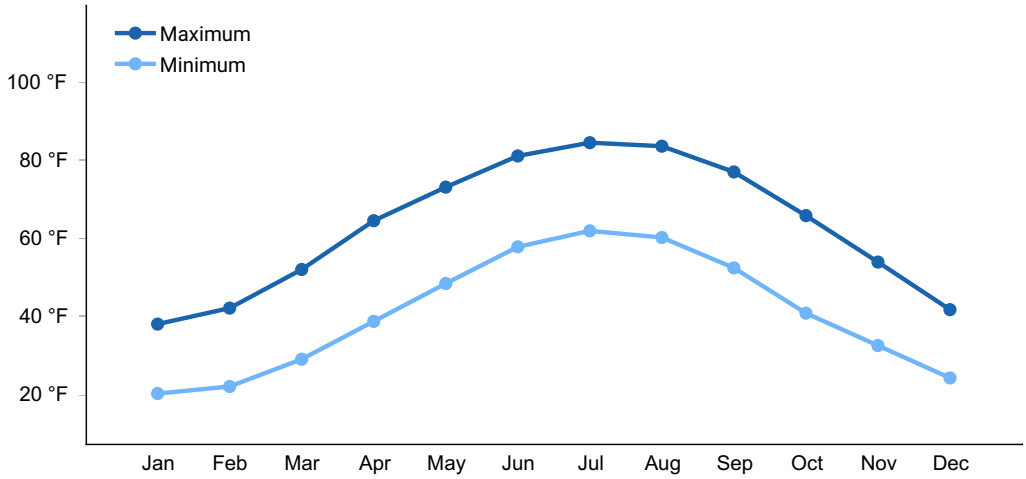


Figure 4. Monthly average minimum and maximum temperature

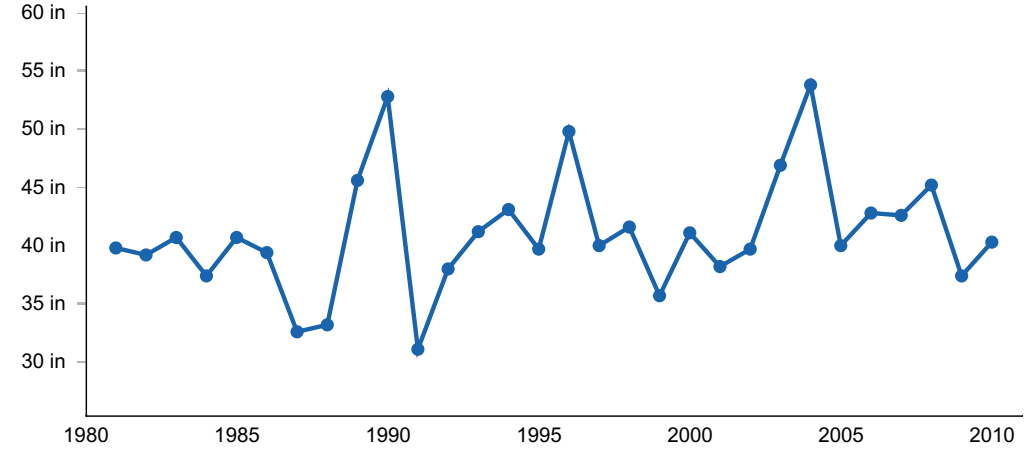


Figure 5. Annual precipitation pattern

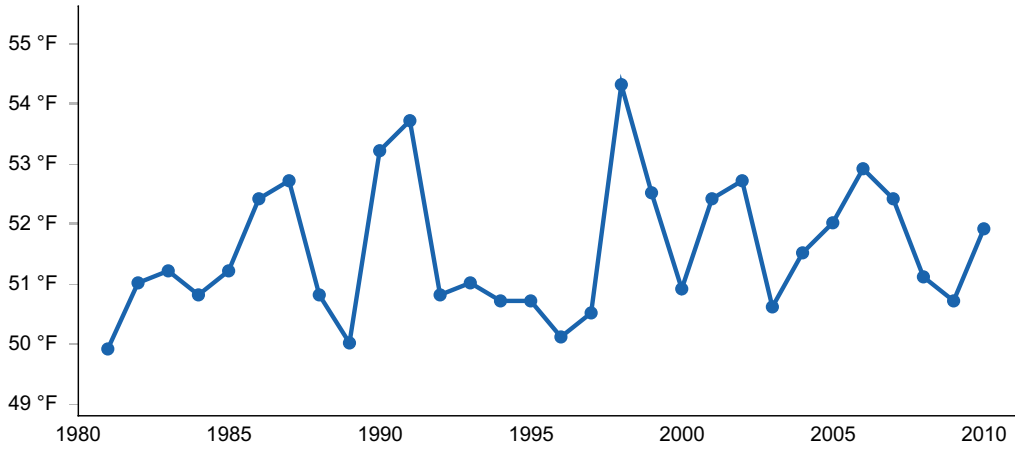


Figure 6. Annual average temperature pattern

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

Water features are not typically associated with this ecological site, but can be incidental.

Wetland description

N/A

Soil features

Representative soils include: Weikert, Ramsey. Theses soils formed from a mixture of geologies sandstone, shale, and siltstone. The soils texture family include sandy, loamy, and loamy-skeletal. These soils are shallow, less than 50 centimeters (20 inches) and well-drained to somewhat excessively drained on residuum.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone and shale
Surface texture	(1) Loam (2) Sand
Drainage class	Well drained to somewhat excessively drained
Permeability class	Slow to moderately rapid
Depth to restrictive layer	15–18 in
Soil depth	15–18 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	1–2 in
Soil reaction (1:1 water) (Depth not specified)	3.8–6
Subsurface fragment volume <=3" (Depth not specified)	7–33%
Subsurface fragment volume >3" (Depth not specified)	3–80%

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) and Terrestrial and Palustrine Plant Communities of Pennsylvania, 2nd Edition (Zimmerman et al., 2012)..

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. The Shallow Acid Mixed Sedimentary Upland ecological site is typical of shallow soils on dry convex, exposed summits, shoulder and upper slopes. The vegetation of the Shallow Acid Mixed Sedimentary Upland ecological site is varied but dominated by oak-hickory, and pine-oak. Within the Reference State, plant communities are part of the Central Appalachian Dry Oak-Pine Forest system (CES202.591), North Central Interior Dry Oak Forest and Woodland system (CES202.047), and Alleghany-Cumberland Dry Oak Forest and Woodland system (CES202.359). Besides the mature plant community-types listed, other spontaneous, successional plant community-types may exist following natural disturbances.

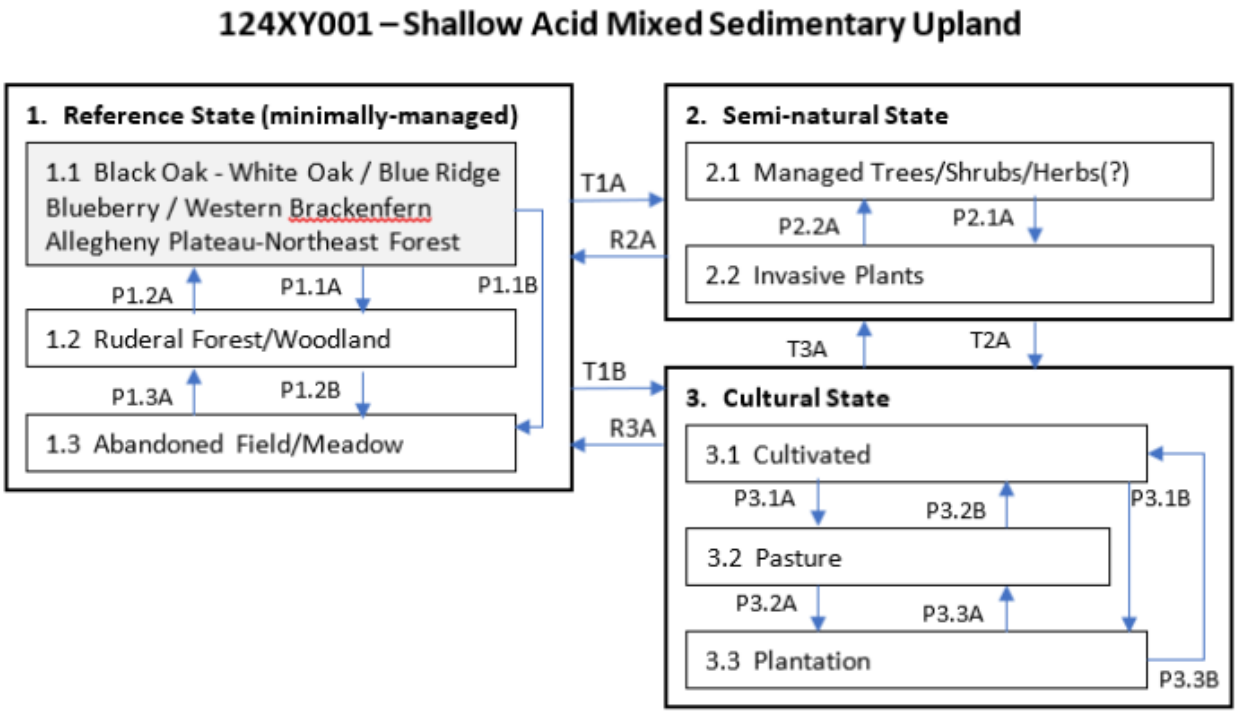
Agents-of-change within any ecological site include both natural and anthropogenic stressors. Canopy disturbances such as fire, wind, and ice storms, will tend to favor oaks and pines. (Lafon et al., 2017). Conversely, fire suppression, a changing climate, and natural forest succession effect mesophication, 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. Mesophication is more subdued on more xeric , exposed summits and southwest upper slopes. 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). Within the unglaciated, Western Alleghany Plateau, most of the hills remain forested (especially to the south), with agriculture and residential development concentrated in the valleys, though some exceptions occur. 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



Transition	*Drivers/practices*
T1A	Forest mgmt., Disturbance
T1B, T2A	Disturbance/cutting/clearing, Brush removal
R2A, R3A	Restoration & Mgmt, Forest Stand Improvement, Early Successional Habitat Development, Upland Wildlife Mgmt, Invasive spp. Control, Plant establishment
T3A	Abandonment, Plant establishment, Forest mgmt.
P2.1A	Disturbance, Invasive species establishment
P2.2A	Invasive spp. Control, Forest mgmt..
P1.3A, P1.2A	Abandonment, succession
P3.1A, P3.2A, P3.3A, P3.1B, P3.2B, P3.3B	Changing agricultural phases
P1.1A, P1.1B, P1.2B	Disturbance, Early Successional Habitat Development

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 – more commonly: • Quercus (velutina, alba) / *Vaccinium pallidum* / *Pteridium aquilinum* Allegheny Plateau-Northeast Forest (CEGL006018) (Translated Name: (Black Oak, White Oak) / Blue Ridge Blueberry / Western Brackenfern Allegheny Plateau-Northeast Forest) [Common Name: Allegheny Plateau-Northeast Oak Forest] Other plant communities may include: • *Pinus virginiana* - Pinus (rigida, echinata) - (*Quercus montana*) / *Vaccinium pallidum* Forest (CEGL007119) (Translated Name: Virginia Pine - (Pitch Pine, Shortleaf Pine) - (Chestnut Oak) / Blue Ridge Blueberry Forest) [Common Name: Appalachian Low-Elevation Mixed Pine / Blue Ridge Blueberry Forest] • *Quercus alba* - (*Quercus velutina*) / *Lespedeza virginica* - *Eupatorium hyssopifolium* Woodland (CEGL006433) (White Oak - (Black Oak) / Slender Bushclover - Hyssopleaf Thoroughwort Woodland) [Western Allegheny Plateau Oak Barrens] (Source: NatureServe 2020)

Community 1.1
Black Oak - White Oak / Blue Ridge Blueberry / Western Brackenfern Allegheny Plateau-Northeast Forest

• Quercus (velutina, alba) / *Vaccinium pallidum* / *Pteridium aquilinum* Allegheny Plateau-Northeast Forest (CEGL006018) (Translated Name: (Black Oak, White Oak) / Blue Ridge Blueberry / Western Brackenfern Allegheny Plateau-Northeast Forest) [Common Name: Allegheny Plateau-Northeast Oak Forest] The tree canopy includes black oak (*Quercus velutina*), white oak (*Quercus alba*), red oak (*Quercus rubra*), scarlet oak (*Quercus coccinea*), red maple (*Acer rubrum*), and chestnut oak (*Quercus montana* [= Quercus prinus]). Associates include pignut hickory (*Carya glabra*), shagbark hickory (*Carya ovata*), blackgum (*Nyssa sylvatica*), sassafras (*Sassafras albidum*), sweet birch (*Betula lenta*), and black cherry (*Prunus serotina*). American chestnut (*Castanea dentata*) was formerly of this forest in presettlement times. The understory consists of blackgum (*Nyssa sylvatica*) and low ericaceous shrubs such as Blue Ridge blueberry (*Vaccinium pallidum*), lowbush blueberry (*Vaccinium angustifolium*), deerberry (*Vaccinium stamineum*), black huckleberry (*Gaylussacia baccata*), mountain laurel (*Kalmia latifolia*), pink azalea (*Rhododendron periclymenoides*), and mapleleaf viburnum (*Viburnum acerifolium*). Common plants of the herbaceous layer include brackenfern (*Pteridium aquilinum*), Pennsylvania sedge (*Carex pensylvanica*), roughleaf ricegrass (*Oryzopsis asperifolia*), rattlesnake hawkweed (*Hieracium venosum*), eastern teaberry (*Gaultheria procumbens*), pink lady's-slipper (*Cypripedium acaule*), two-flower dwarf-dandelion (*Krigia biflora*), gaywings (*Polygala paucifolia*), starflower (*Trientalis borealis*), and Appalachian barren strawberry (*Waldsteinia fragarioides*). (Source: NatureServe 2020 [accessed April 2020], USNVC 2019 [accessed April 2020]).

Community 1.2
Successional plant community-type(s)

(to be determined)

Community 1.3
Successional/[Abandoned] Field/Meadow

to be developed

Pathway P1.1A
Community 1.1 to 1.2

disturbance, greater fire frequency

Pathway P1.1B
Community 1.1 to 1.3

Disturbance, Early Successional Habitat Development

Pathway P1.2A
Community 1.2 to 1.1

vegetation development/succession

Pathway P1.2B
Community 1.2 to 1.3

Disturbance, Early Successional Habitat Development

Pathway P1.3A
Community 1.3 to 1.2

Abandonment, 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

(to be developed)

Community 2.2
Invasive Plants

(to be developed)

Pathway P2.1A
Community 2.1 to 2.2

2.1-2.2 invasive plant establishment, vegetation development/succession

Pathway P2.2B
Community 2.2 to 2.1

invasive plant management, forest management

Conservation practices

Forest Stand Improvement
Invasive Plant Species Control

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

(to be determined)

Community 3.2
Pasture

(to be determined)

Community 3.3
Plantation

(to be determined)

Transition T1A
State 1 to 2

forest management, fire suppression, disturbance, invasive plant establishment

Conservation practices

Forest Stand Improvement

Transition T1B
State 1 to 3

cutting, land clearing, plant establishment

Conservation practices

Land Clearing

Restoration pathway R2A
State 2 to 1

plant removal, plant establishment, successional management

Conservation practices

Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Invasive Species Pest Management

Transition T2A
State 2 to 3

cutting, land clearing, plant establishment

Conservation practices

Land Clearing

Restoration pathway R3A
State 3 to 1

plant removal, plant establishment, successional management

Conservation practices

Restoration and Management of Natural Ecosystems

Native Plant Community Restoration and Management

Restoration pathway T3A
State 3 to 2

forest management, fire suppression, disturbance, invasive plant establishment

Conservation practices

Forest Stand Improvement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management

Additional community tables

Inventory data references

Site Development and Testing Plan
Future work is needed, as described in a future 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. (https://www.lm.doe.gov/cercla/documents/fernald_docs/cat/112509.pdf).

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, Wooster, OH. 16-19 March 2004. 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 Data 5(1):1-12.

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.

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C.A. Carpenter, and W.H.McNab. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. [Map. presentation scale 1:3,500,000, colored; A.M. Sloan, cartographer] Gen. Tech. Report WO-76D. U.S. Department of Agriculture, Forest Service, Washington, DC. (https://www.fs.fed.us/research/publications/misc/73326-wo-gtr-76d-cleland2007.pdf)

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. (https://www.natureserve.org/sites/default/files/pcom_2003_ecol_systems_us.pdf).

FGDC (Federal Geographic Data Committee). 2008. National Vegetation Classification Standard, Version 2. VGDC-STD-005-2008 (Version 2). FGDC Vegetation Subcommittee, Reston, Virginia. (https://www.fgdc.gov/standards/projects/vegetation/NVCS_V2_FINAL_2008-02.pdf).

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]. NatureServe, Arlington, VA. 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. (https://ohiodnr.gov/static/documents/wildlife/wildlife-management/OH_SWAP_2015.pdf).

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.

Soil Survey Staff-USDA-NRCS [United States Department of Agriculture, Natural Resources Conservation Service] 2016. National Soils Information Service (NASIS Data Model Version 7.3.4) Lincoln, NE. Available description:

https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/survey/tools/?cid=nrcs142p2_053552 (Accessed January 2020).

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. (https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051845.pdf).

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).

Zimmerman, E., T. Davis, G. Podniesinski, M. Furedi, J. McPherson, S. Seymour, B. Eichelberger, N. Dewar, J. Wagner, and J. Fike (editors). 2012. Terrestrial and Palustrine Plant Communities of Pennsylvania, 2nd Edition. Pennsylvania Natural Heritage Program, Pennsylvania Department of Conservation and Natural Resources, Harrisburg, PA.

Contributors

Nels Barrett, Ph.D.
Jason Teets

Approval

Greg Schmidt, 9/26/2024

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	06/30/2020
Approved by	Greg Schmidt
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):

---

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:**
