USDA Natural Resources Conservation Service

Ecological site F147XY007PA
Loamy To Coarse Terrace

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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): 147X–Northern Appalachian Ridges and Valleys

Major Land Resource Area 147 is in the Middle section of the Valley and Ridge Province of the Appalachian Highlands. Characteristic features include folded and faulted parallel ridges and valleys that are carved out of anticlines, synclines, and thrust blocks. The variability of weathering of the underlying bedrock has resulted in resistant sandstone and shale ridges separated by less resistant limestone and shale narrow to moderately broad valleys. The ridges are strongly sloping to extremely steep and have narrow, rolling crests, and the valleys are mainly level to strongly sloping. The Great Valley is a salient feature of the eastern portion and runs the entire length of the MLRA where it is called the Shenandoah Valley in the south. The western side of the MLRA is dominantly hilly to very steep and is rougher and much steeper than the rolling hills to the east. Parts of the northernmost section of the MLRA were subjected to pre-Illinoian glaciation (>770,000 years ago). Anthracite coal underlies some areas in the north and has been mined since the 1700's.

Elevation in MLRA 147 generally ranges from 330 to 985 feet (100 to 300 meters) in the valleys and from 1,310 to 2,625 feet (400 to 800 meters) on the ridges and mountains. It is as high as 2,955 feet (900 meters) on some mountain crests and is nearly 4,430 feet (1,350 meters) on a few isolated, linear mountain ridges. Local relief in the valleys is about 15 to 165 feet (5 to 50 meters). The ridges rise about 660 feet (200 meters) above the adjoining valleys. (USDA, 2006).

Classification relationships

This ecological site is found in Major Land Resource Area 147- Northern Appalachian Ridges and Valleys, 148. MLRA 147 is located within Land Resource Region S - Northern Atlantic Slope Diversified Farming Region (USDA 2006), and in United States Forest Service ecoregion M221 – Central Appalachian Broadleaf Forest-Coniferous Forest-Meadow Province (Bailey 1995). In addition, MLRA 147 falls within area #67 of EPA Ecoregion Level III – the Ridge and Valley (US EPA 2013). The Loamy to Coarse Terrace ecological site occurs within 67a, 67b, 67c, and 67d of EPA Ecoregion IV - Northern Limestone/Dolomite Valleys, Northern Shale Valleys, Northern Sandstone Ridges, and Northern Dissected Ridges and Knobs respectively (Woods et. al. 1996).

Ecological site concept

The Loamy to Coarse Terrace ecological sites are found on old stream terraces along large and medium sized streams and rivers. The parent material is alluvium derived from a mixture of sedimentary geology including acidic shale, sandstone, siltstone, limestone, dolomite, quartzite, and even coal. The soils that underlie this site are predominantly well drained, but may include areas that are moderately well and somewhat poorly drained. These areas are not on active floodplains and therefore only rarely flood. This distinguishes the Loamy to Coarse Terrace Ecological Site from the Loamy Mixed Floodplains.

The associated vegetation is highly variable depending on the fertility of the alluvial sediments. Some areas have more calcareous soils with greater influence from limestone and calcareous bedrock, while others are derived from

acidic sandstones, siltstones, and shales. Richer sites may be dominated by Acer saccharam (Sugar maple) and *Tilia americana* (American Basswood), while more nutrient poor dry sites may have an oak dominated forest, most commonly *Quercus rubra* (Northern red oak). Various pine species may also be present like *Tsuga canadensis* (Eastern hemlock), and *Pinus strobus* (Eastern white pine). This ecological site will most likely be split as more field investigation continues. The majority of these areas are cleared for agricultural production or have experienced other extensive human disturbance. Existing woodland and forest generally contain *Acer saccharum* (Sugar maple) and Tilia Americana (American basswood) as the dominant canopy tree species. Fraxinus Americana (White ash) is frequent but not necessarily abundant. *Acer rubrum* (Red maple), *Fagus grandifolia* (American beech), and *Prunus serotina* (Black cherry) are typical associates. These mid to lower slope ecological sites are rich relative to the acidic shale and sandstone uplands, and contain more moisture compared to the Limestone Uplands.

Associated sites

F147XY001PA	**Poorly Drained Fine Alluvial Terrace** Fine Poorly Drained Alluvial Terrace

Table 1. Dominant plant species

Tree	(1) *Acer saccharum* (2) *Fraxinus americana*
Shrub	(1) *Carpinus caroliniana*
Herbaceous	(1) *Podophyllum peltatum*

Physiographic features

The Loamy to Coarse Terrace ecological sites are found on old stream terraces along large and medium sized streams and rivers. The overall landscapes are hills, valleys, karst valleys, and mountainous areas. The parent material is alluvium derived from a mixture of sedimentary geology including acidic shale, sandstone, siltstone, limestone, dolomite, quartzite, and even coal. Other landforms associated with this ecological site include backslopes, footslopes, some toeslope positions as well as backswamps, depressions, drainageways, relict lakebeds, alluvial fans and outwash terraces. The loamy to coarse terraces are heterogeneous with varying permeability, drainage classes, and soil texture classes. They are only very rarely subjected to flooding and the duration of which is usually brief. Flooding is unlikely but is possible under extremely unusual weather conditions; less than 1 percent chance of flooding in any year or less than 1 time in 100 years but more than 1 time in 500 years (USDA 2016). This ecological site landscape is predominantly well drained, but may contain small areas of moderately well and somewhat poorly drained soils where the high water table is between 12 to 36 inches (30 to 91 cm).

Some areas will have a dense subsoil layer called a fragipan that impedes the downward growth of roots and movement of water. The fragipans start at depths from 20 to 34 inches (51 to 86 cm). Slopes are generally flat to moderately sloping.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Hill (3) Alluvial fan
Runoff class	Very low to very high
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to very rare
Ponding frequency	None
Elevation	98–3,500 ft
Slope	0–25%
Water table depth	6–60 in

Aspect	Aspect is not a significant factor

Climatic features

The climate of this region is temperate and humid. The Ridge and Valley Province is not rugged enough for a true mountain type of climate but it does have many of the characteristics of such a climate (Daily 1971). The influence of the high and low topography on air movement causes somewhat greater temperature extremes than are experienced in the Piedmont region to the east. The differences in elevation also affect the length of the frost free season on the ridges verses that in the valleys. The cooler temperatures and the shorter freeze-free periods occur at the higher elevations and in the more northern latitudes. The maximum precipitation occurs from early spring through mid-summer, and the minimum occurs in January and February. The average annual snowfall ranges from 16 to more than 51 inches (40 to 130 centimeters). The average annual temperature is 44 to 57 degrees F (7 to 14 degrees C). A portion of this region that extends from Maryland southward through most of the Shenandoah Valley in Virginia falls within a rain shadow cast by the Appalachian Mountains to the west and the Blue Ridge Mountains to the east. The mountains on either side block moist flowing air from either the east or the west causing the valleys to be drier. Average annual precipitation in this shadow area can average 34 to 36 in/year (86 to 91cm) compared to 40 to 42 in/year (102 - 107 cm) for the rest of the region (PRISM 2013).

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 5 weather stations throughout MLRA 147 in proximity to this ecological site. All climate station monthly averages for maximum and minimum temperature and precipitation were then added together and averaged to make this table.

Table 3. Representative climatic features

Frost-free period (characteristic range)	142-154 days
Freeze-free period (characteristic range)	177-199 days
Precipitation total (characteristic range)	40-41 in
Frost-free period (actual range)	141-167 days
Freeze-free period (actual range)	174-205 days
Precipitation total (actual range)	39-42 in
Frost-free period (average)	150 days
Freeze-free period (average)	188 days
Precipitation total (average)	41 in

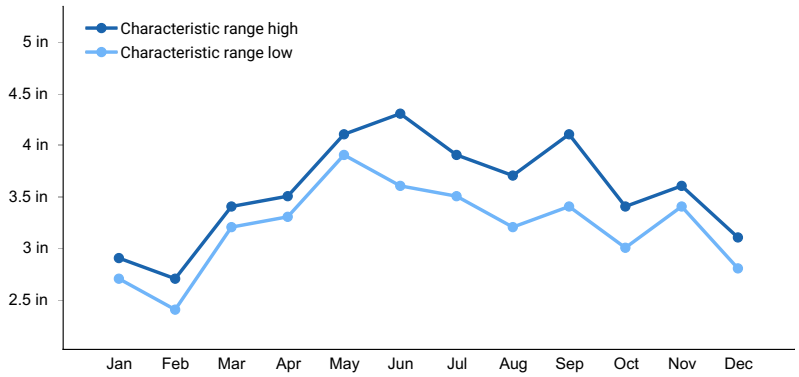


Figure 1. Monthly precipitation range

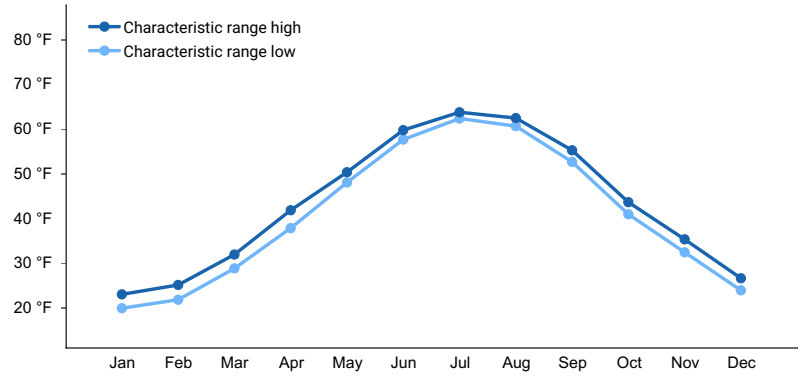


Figure 2. Monthly minimum temperature range

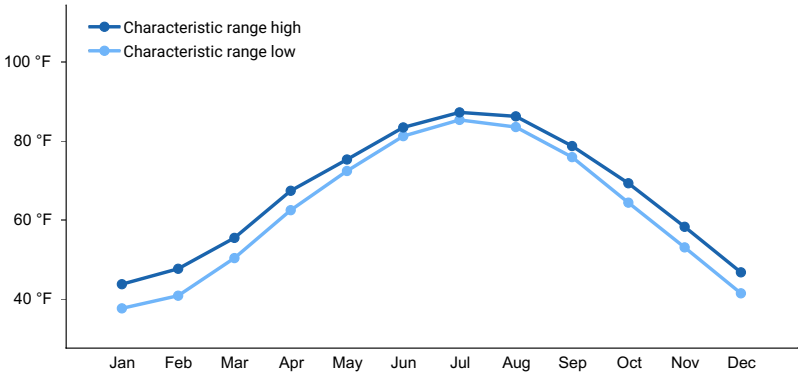


Figure 3. Monthly maximum temperature range

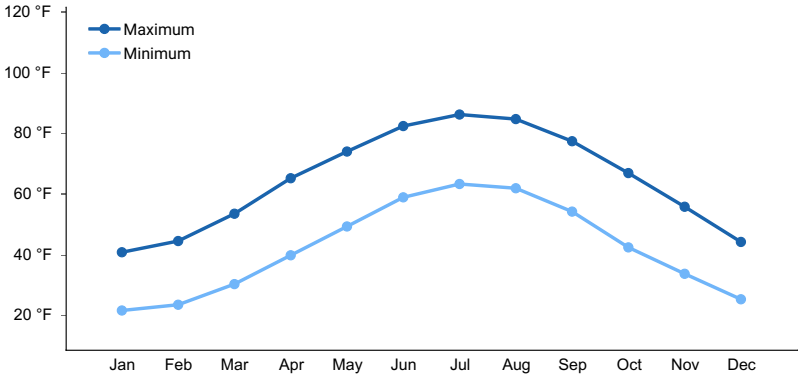


Figure 4. Monthly average minimum and maximum temperature

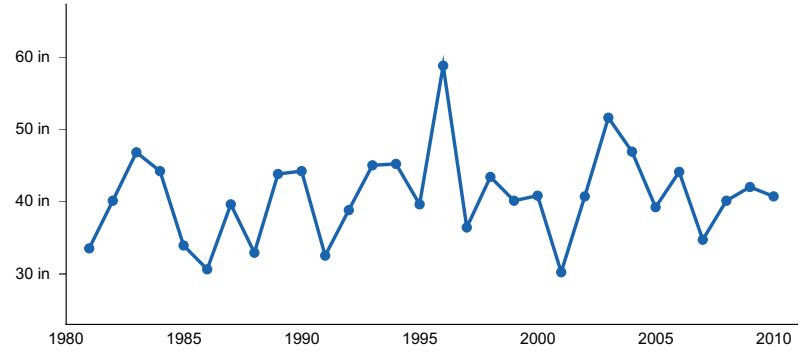


Figure 5. Annual precipitation pattern

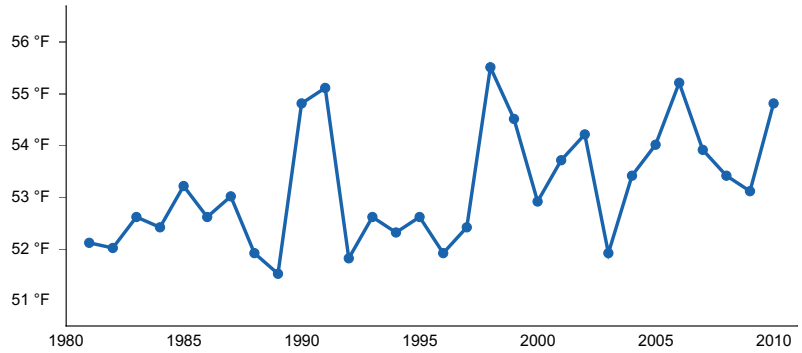


Figure 6. Annual average temperature pattern

Climate stations used

- (1) SELINSGROVE 2 S [USC00367931], Port Trevorton, PA
- (2) FRONT ROYAL [USC00443229], Front Royal, VA
- (3) HANCOCK [USC00184030], Hancock, MD
- (4) LEXINGTON [USC00444876], Lexington, VA
- (5) HARRISBURG CPTL CY AP [USW00014751], New Cumberland, PA

Influencing water features

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

Soil features

The representative soil series currently associated with this site are: Zoar, Wyoming, Wheeling, Walkersville, Unison, Unadilla, Tyler, Tygart, Toms, Sugarhol, Shottower, Sherando, Shenval, Rigley, Raritan, Pekin, Nicelytown, Moomaw, Monongahela, Library, Lawrenceville, Lakin, Guyan, Gibraltar, Duncannon, Dryrun, Downsville, Coursey, Cottonbend, Cotaco, Chenango, Chavies, Captina, Burketown, Braddock, Botetourt, Birdsboro, Ashton, Alonzville, and Allegheny. They are derived from transported materials, mostly alluvium but also some colluvium, eolian deposits (wind blown), or even old glacial outwash. The parent material from which these transported materials have weathered include acidic shales, limestone, dolomite, sandstone, siltstone, quartzite, and in some cases coal. Soils data were obtained from the Natural Resources and Conservation Service (NRCS) National Soils Information System database (USDA 2015).

The soils that underlie this site are predominantly well drained, but may include patches that are moderately well and somewhat poorly drained. Some areas may have a dense subsoil layer called a fragipan that will impede the downward growth of roots and the movement of water. Fragipan depths for these soil usually starts between 20 to 34 inches (51 to 86 cm) below the soil surface. Surface textures are predominantly silt loams and loams with some fine sandy loams. Depth to bedrock is usually greater than 40 inches (102 cm) but can range from 18 to 99 inches (46 to 251 cm).

Table 4. Representative soil features

Parent material	(1) Alluvium–shale (2) Colluvium–limestone (3) Eolian deposits–sandstone and siltstone
Surface texture	(1) Silt loam (2) Gravelly loam (3) Cobbly fine sandy loam
Family particle size	(1) Sandy
Drainage class	Somewhat poorly drained to excessively drained
Permeability class	Very slow to rapid
Soil depth	60–99 in

Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	2%
Available water capacity (0-40in)	2.6–8.2 in
Soil reaction (1:1 water) (0-40in)	4.6–6.5
Subsurface fragment volume <=3" (Depth not specified)	0–42%
Subsurface fragment volume >3" (Depth not specified)	0–55%

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).

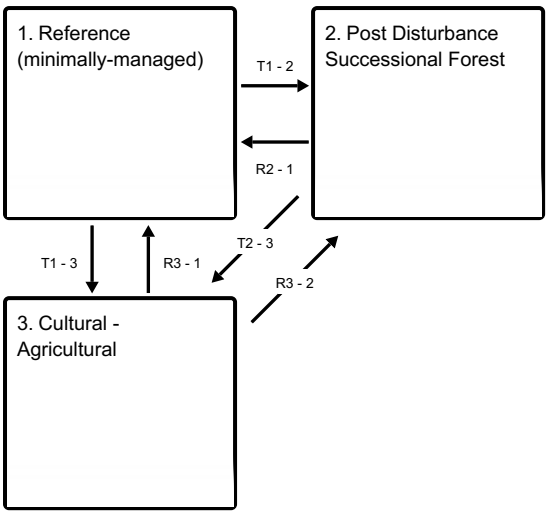
The Loamy to Coarse Terrace Ecological Site is located in the Ridge and Valley region of the Appalachian Highlands, an area that has undergone extensive human disturbance since pre and post-European settlement times (Braun 1950). Terraces of the Ridge and Valley are highly variable, some containing soil material weathered from calcareous limestone geology while others are derived from acidic sandstone, siltstone, and shale, or a mixture of all. Many plant associations occur within these landscapes. Differences can be attributed to natural and human disturbances both locally and regionally that affect the overall hydrology of an area, the land use history of a particular parcel of land, and variations in soils and climate. The reference forest community is predominantly part of the Central Appalachian River Floodplain Forest (CES202.608) or the Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) as described by NatureServe (NatureServe 2009).

The associated vegetation is highly variable depending on the fertility of the alluvial sediments. Some areas have more calcareous soils with greater influence from limestone and calcareous bedrock, while others are derived from acidic sandstones, siltstones, and shales. Richer sites may be dominated by Acer saccharam (Sugar maple) and *Tilia americana* (American Basswood), while more nutrient poor dry sites may have an oak dominated forest, most commonly *Quercus rubra* (Northern red oak). Various pine species may also be present like *Tsuga canadensis* (Eastern hemlock), and *Pinus strobus* (Eastern white pine). This ecological site will most likely be split as more field investigation continues. Existing woodland and forest generally contain *Acer saccharum* (Sugar maple) and Tilia Americana (American basswood) as the dominant canopy tree species. Fraxinus Americana (White ash) is frequent but not necessarily abundant. *Acer rubrum* (Red maple), *Fagus grandifolia* (American beech), and *Prunus serotina* (Black cherry) are typical associates. These mid to lower slope ecological sites are rich relative to the acidic shale and sandstone uplands, and contain more moisture compared to the Limestone uplands.

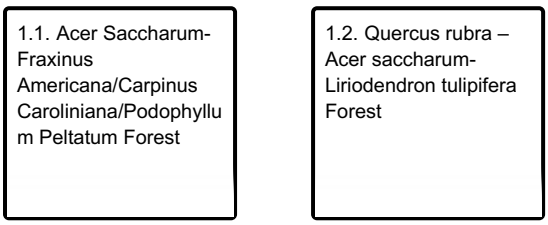
Much of the Loamy to Coarse Terrace ecological site has been cleared for agriculture or for other development. A ruderal *Liriodendron tulipifera* (Tuliptree) community exists as a successional alternate state on abandoned farmland and town sites, old clearcuts, burned areas and places where the canopy was removed or heavily disturbed. These woodland/forests tend to be heavily colonized by invasive species such as *Microstegium vimineum* (Nepalese browntop), Alliaria petiola (Garlic mustard), *Rosa multiflora* (Multiflora rose), Berberis japonica (Japanese barberry), various Lonicera (Honeysuckle), and Rubus (Blackberry).

State and transition model

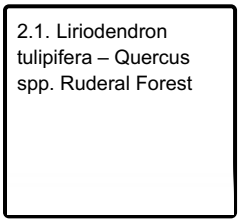
Ecosystem states



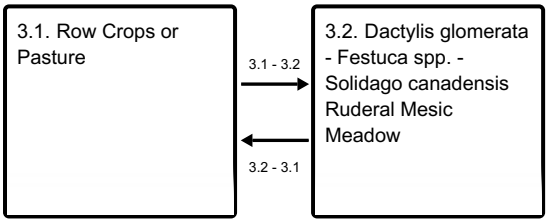
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference (minimally-managed)

The reference state is a combination of several vegetation associations of the Central Appalachian River Floodplain Forest (CES202.608) and the Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) as described by NatureServe (NatureServe 2009). As a result of the 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. Due to the heterogeneity and the broadness of this provisional ecological unit, the vegetation associations listed are not intended to cover every situation nor the full range of conditions and species. There are no transition pathways designated between the communities in the reference state because the differences in vegetation are more controlled by landscape position or inherent soil fertility than management or disturbance. Agriculture is the dominant land use.

Community 1.1
Acer Saccharum-Fraxinus Americana/Carpinus Caroliniana/Podophyllum Peltatum Forest

The Sugar Maple-White Ash/American Hornbeam/Mayapple Forest also known as the Mid-Atlantic High Terrace Hardwood Floodplain Forest (CEGL006459; NatureServe 2015), occurs where soils are slightly acidic to alkaline, and not regularly flooded. The canopy is closed to somewhat open, and a subcanopy is often present. Shrubs are typically sparse but may range up to about 30% cover. The herb layer is well-developed, fairly diverse, and seasonally variable, with spring ephemerals giving way to taller ferns, graminoids and forbs. Bryoids are very minor. The canopy dominants are usually some combination of *Acer saccharum* (Sugar maple), Fraxinus Americana (White ash) and sometimes *Carya cordiformis* (Bitternut hickory). Canopy associates include *Quercus rubra* (Northern red oak), *Juglans nigra* (Black walnut), *Prunus serotina* (Black cherry), *Fraxinus nigra* (Black ash), *Liriodendron tulipifera* (Tuliptree), Ulmus Americana (American elm), Tilia Americana (American basswood) and *Fagus grandifolia* (American beech). *Carpinus caroliniana* (American hornbeam) is often present as a small tree, along with *Acer saccharum* (Sugar maple). *Lindera benzoin* (Spice bush) is the most common shrub; *Asimina triloba* (Pawpaw) is characteristic in the southern portion of this type's range. Vines such as *Toxicodendron radicans* (Poison ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are frequent but usually at low cover. The herb layer usually features spring ephemerals, including *Claytonia virginica* (Virginia spring beauty), Dicentra Canadensis (Squirrel corn) and *Erythronium americanum* (Dogtooth violet) followed by a mixture of ferns, forbs and graminoids. Characteristic species include *Arisaema triphyllum* (Jack in the pulpit), *Caulophyllum thalictroides* (Giant blue cohosh), *Carex laxiculmis* (Spreading sedge), *Deparia acrostichoides* (Silver false spleenwort), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (Riverbank wildrye), *Onoclea sensibilis* (Sensitive fern), and *Podophyllum peltatum* (Mayapple). Exotic species, such as *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (Ground ivy) and *Alliaria petiolata* (Garlic mustard) may be abundant, especially in disturbed areas.

Community 1.2
Quercus rubra – Acer saccharum-Liriodendron tulipifera Forest

The Northern Red Oak-sugar Maple-Tuliptree Forest, also known as the High Allegheny Rich Red Oak-Sugar Maple forest (CEGL006125; NatureServe 2015) occurs on terraces and flats where soils are slightly acidic and of intermediate fertility. The closed-canopy tree layer is dominated by a mixture of oaks, primarily *Quercus alba* (White oak) and *Quercus rubra*, (Northern red oak) with other hardwoods including *Acer saccharum* (Sugar maple), *Acer rubrum* (Red maple), and *Liriodendron tulipifera* (Tuliptree). *Carya ovata* (Shagbark hickory), *Carya tomentosa* (Mockernut hickory), *Nyssa sylvatica* (Blackgum) and *Quercus velutina* (Black oak) are possible associates. Carya spp. (Hickory) may share dominance in some stands. Dominance by *Acer rubrum* (Red maple) or *Liriodendron tulipifera* (Tuliptree) may indicate a past disturbance history. A wide variety of more mesic associates, such as *Betula alleghaniensis* (Yellow birch), *Betula lenta* (Sweet birch), *Fagus grandifolia* (American beech), Fraxinus Americana (White ash), and *Tilia americana* (American basswood) could occur but are negligible in dominance. In addition to sugar maple reproduction, some understory species may include *Carpinus caroliniana* (American hornbeam), Cercis Canadensis (Eastern redbud), *Cornus florida* (Flowering dogwood), and *Ostrya virginiana* (Hophornbeam). Shrub and vine species include *Amelanchier laevis* (Allegheny serviceberry), *Amelanchier arborea* (Common serviceberry), Cornus spp. (Dogwood), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (Spicebush), *Viburnum acerifolium* (Mapleleaf viburnum), *Viburnum recognitum* (Southern arrowwood), and *Vitis riparia* (Riverbank grape). Ericaceous shrubs, such as *Kalmia latifolia* (Mountain laurel), *Vaccinium angustifolium* (Lowbush blueberry) and *Vaccinium pallidum* (Blue Ridge blueberry), may also be present but are not abundant. The ground layer species are highly variable but include *Caulophyllum thalictroides* (Blue cohosh), *Ageratina altissima* (White snakeroot), *Dennstaedtia punctilobula* (Eastern hayscented fern), *Podophyllum peltatum* (Mayapple), *Maianthemum racemosum* (Feathery false lily of the valley), *Medeola virginiana* (Indian cucumber), *Thelypteris noveboracensis* (New York fern), *Dryopteris marginalis* (Marginal woodfern), *Dryopteris intermedia* (Intermediate woodfern), Actaea spp. (Bugbane), and *Uvularia sessilifolia* (Sessile bellwort). Exotic species, including *Rosa multiflora* (Multiflora rose) and Alliaria petiolate (Garlic mustard), may be present in the shrub and herb layers of disturbed stands.

State 2
Post Disturbance Successional Forest

Community 2.1
Liriodendron tulipifera – Quercus spp. Ruderal Forest

The Tuliptree-Oak species Ruderal Forest (CEGL007221; NatureServe2015) is a common post settlement and post

logging or agriculture successional forest in areas with well drained, somewhat acidic soils. Examples are common across large areas of the upland landscape which have previously been disturbed. The canopy of this ruderal association is dominated by *Liriodendron tulipifera* (Tuliptree). Quercus species including *Quercus alba* (White oak), *Quercus rubra* (Northern red oak), and *Quercus velutina* (Black oak) are often present; additional associates may include *Acer rubrum* (Red maple), Carya spp. (Hickories), *Fagus grandifolia* (American beech), *Nyssa sylvatica* (Blackgum), *Cornus florida* (Flowering dogwood), and *Robinia pseudoacacia* (Black locust). *Betula lenta* (Sweet birch) is a common associate at the northern range limit. Shrub layers may include saplings of the canopy species and *Acer pensylvanicum* (Striped maple), *Amelanchier arborea* (Common serviceberry), *Hamamelis virginiana* (American witchhazel), *Lindera benzoin* (Spicebush), and *Vaccinium pallidum* (Blue ridge blueberry). Herbs vary across the range but may include *Actaea racemosa* (Black bugbane), *Dichanthelium clandestinum* (Deertongue), *Dioscorea quaternata* (Four leaf yam), *Galium circaezans* (Licorice bedstraw), *Geranium maculatum* (Spotted geranium) , *Goodyera pubescens* (Downy rattlesnake plantain), *Medeola virginiana* (Indian cucumber), *Potentilla simplex* (Common cinquefoil), *Scutellaria serrata* (Showy skullcap), *Thelypteris noveboracensis* (New York fern), and *Uvularia perfoliata* (Perfoliate bellwort). *Lycopodium digitatum* (Fan clubmoss) may be abundant in some stands.

State 3
Cultural - Agricultural

Community 3.1
Row Crops or Pasture

The agricultural state is planted either to row crops like corn and soybeans, or in managed pastures of non-native forages. Non-native grasses may include cool season species such as *Schedonorus arundinaceus* (Tall fescue), Phleum pretense (Timothy) and *Dactylis glomerata* (Orchardgrass). Other species included *Sorghum halepense* (Johnsongrass), Setaria spp. (Foxtails), Panicum spp. (Panic grass), Amaranthus spp. (Amaranth), *Taraxacum officinale* (Common dandelion), and *Cirsium arvense* (Canada thistle).

Community 3.2
Dactylis glomerata - Festuca spp. - Solidago canadensis Ruderal Mesic Meadow

The Orchardgrass - Fescue species - Canada Goldenrod Ruderal Mesic Meadow Alliance (A1190, NatureServe 2017) is a broadly defined community which includes mesic abandoned pastures and agricultural fields and is largely composed of non-native cool-season grasses and herbs (generally of European origin) in the early stages of succession. Species composition varies from site to site, depending on land-use history and perhaps soil type, but in general this vegetation is quite wide-ranging in northeastern and midwestern states. Dominant grasses vary from site to site but generally include the exotic grasses *Agrostis stolonifera* (Creeping bentgrass), *Agrostis hyemalis* (Winter bentgrass), *Anthoxanthum odoratum*, (Sweet vernalgrass), *Bromus inermis* (Smooth Bromegrass), *Bromus tectorum* (Cheatgrass), *Dactylis glomerata* (Orchardgrass), Schedonorus arundinaceum (Tall fescue), *Lolium perenne* (Perennial ryegrass), Phleum pretense (Timothy) as well as weedy natives such as *Elymus repens* (Quackgrass), *Poa pratensis* (Kentucky bluegrass), and, less commonly, *Schizachyrium scoparium* (Little bluestem) and *Tridens flavus* (Purpletop). Herbaceous species may be minor or dominant and include various Solidago spp. (goldenrods), Sympyotrichum spp. (asters), and other native and non-native species. *Juniperus virginiana* (Eastern redcedar), is a woody species that has been observed in old fields of this ecological site. In wetter areas, *Phalaris arundinacea* (Reed canarygrass) is common.

Pathway 3.1 - 3.2
Community 3.1 to 3.2

Cessation of cropping or active pasture management; occasional mowing to prevent establishment of trees and shrubs.

Pathway 3.2 - 3.1
Community 3.2 to 3.1

Tillage, follow a conservation plan, plant row crops.

Transition T1 - 2
State 1 to 2

Historically logged and cleared; possibly plowed, pastured, and grazed. Long term succession; no longer grazed.

Transition T1 - 3
State 1 to 3

Clearcutting; tillage; conversion to agricultural land; fertilizer and lime application; active management.

Restoration pathway R2 - 1
State 2 to 1

Remove understory, plant native seeds and seedlings, and eliminate and manage nonnative species. Return to the reference or post logged minimally managed state may require a very long term series of costly management options and stages. Many species may need to be planted or seeded to restore the system. Herbivory can be a problem as well as competition from faster growing species. Depending on the existing seed bank and the proximity of a mature forest from which to recruit seeds, ruderal forests may regain a mixed forest stand. Nevertheless, sites that have been cleared and tilled have significant soil disturbance which may include compaction, erosion, loss of native soil structure, loss of soil organic matter, disruption of soil microorganisms, all which affect the soil's nutrient availability and water holding capacity (Duiker and Myers, 2005). These characteristics favor recolonization by plant species that have wind dispersed seeds (verses those that propagate through underground roots called rhizomes, or which have heavy seeds that stay near the parent tree), are shade intolerant, have rapid to moderate growth rates, and drought tolerance (Dyer, 2010). Aggressive control of nonnative species and invasive species will be ongoing. The following conservation practices from the Natural Resources Conservation Service Field Office Technical Guide can be used for restoration efforts (FOTG-USDA): Brush Management-314; Critical Area Planting-342; Early Successional Habitat Development-647; Fence-382; Forest Stand Improvement-666; Herbaceous Weed Control-315; Tree/Shrub site Preparation-490; Upland Wildlife habitat management-645; Riparian Forest Buffer-39.

Conservation practices

Brush Management
Critical Area Planting
Fence
Riparian Forest Buffer
Tree/Shrub Site Preparation
Upland Wildlife Habitat Management
Early Successional Habitat Development/Management
Forest Stand Improvement
Herbaceous Weed Control

Transition T2 - 3
State 2 to 3

Clearcutting; tillage; conversion to agricultural land; fertilizer and lime application; active management.

Restoration pathway R3 - 1
State 3 to 1

Return to the reference or post logged minimally managed state may require a very long term series of costly management options and stages. Many species may need to be planted or seeded to restore the system. Herbivory can be a problem as well as competition from faster growing species. Depending on the existing seed bank and the proximity of a mature forest from which to recruit seeds, ruderal forests may regain a mixed forest stand. Nevertheless, sites that have been cleared and tilled have significant soil disturbance which may include compaction, erosion, loss of native soil structure, loss of soil organic matter, disruption of soil microorganisms, all

which affect the soil's nutrient availability and water holding capacity (Duiker and Myers, 2005). These characteristics favor recolonization by plant species that have wind dispersed seeds (verses those that propagate through underground roots called rhizomes, or which have heavy seeds that stay near the parent tree), are shade intolerant, have rapid to moderate growth rates, and drought tolerance (Dyer, 2010). Aggressive control of nonnative species and invasives will be ongoing. The following conservation practices from the Natural Resources Conservation Service Field Office Technical Guide can be used for restoration efforts (FOTG-USDA): Brush Management-314; Critical Area Planting-342; Early Successional Habitat Development-647; Fence-382; Forest Stand Improvement-666; Herbaceous Weed Control-315; Tree/Shrub site Preparation-490; Upland Wildlife habitat management-645; Riparian Forest Buffer-39.

Conservation practices

Brush Management
Critical Area Planting
Fence
Riparian Forest Buffer
Tree/Shrub Site Preparation
Upland Wildlife Habitat Management
Early Successional Habitat Development/Management
Forest Stand Improvement
Herbaceous Weed Control

Restoration pathway R3 - 2
State 3 to 2

Abandonment of pasture or old field. Discontinue mowing and do not allow grazing. Allow natural regeneration.

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.

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Approval

Nels Barrett, 9/27/2024

Acknowledgments

This current draft provisional ecological site (PES) report is a generalized description of landform, climate, physiography, soils and associated vegetation. Future work is needed to validate this information and further refine the report into an ecological site description (ESD). An ESD will include detailed plant floristic inventory data on the reference state and most commonly occurring alternate states, interpretations for different land use, site productivity data, as well as descriptions of the ecological dynamics. Development of ESDs will require field data collection of soils and vegetation and subsequent data analysis. Production of ESDs will begin after draft provisional ecological site reports have been completed for most soil survey areas. The target completion date for PES is 2020, therefore the development of ESDs will not start until 2021. ESD development prioritization will be based on national priorities, state priorities, soil survey regional priorities, and funding and staffing limitations.

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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	05/11/2025
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:**

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

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

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

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

---

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):**

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

---

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

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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:**