USDA Natural Resources Conservation Service

Ecological site F147XY012PA
Calcareous Loamy Bottomland

Accessed: 07/18/2024

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): 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 Calcareous Loamy Bottomland is predominantly located in 67a of EPA Ecoregion IV – Northern Limestone/Dolomite Valleys (Woods et. al., 1996).

Ecological site concept

The Calcareous Loamy Bottomland Ecological Site occurs in the Great Valley and Shenandoah Valley in the eastern side of MLRA 147 on floodplains, terraces, and alluvial fans along small to large rivers and streams. The parent material is alluvium weathered from calcareous parent material such as limestone, dolomite, calcareous sandstones, siltstones, and shales, and marl. Areas are well drained to moderately well drained with the seasonal high water table mostly occurring below 40 inches (102 cm) but can be within 20 inches (51 cm) of the surface in wetter areas. These landscapes are generally flat, with 0 to 3 percent slope. Depth to bedrock is 70 inches (178 cm) or more. The flat slopes with generally well-drained and nutrient rich silt loam and fine sandy loam soils are conducive to agriculture, and many of these areas have been cleared for crop production. The high pH of the underlying soils relative to other alluvial landscapes, and the association with marl, is what distinguishes this site from other floodplain ecological sites in MLRA 147. These areas are subject to occasional flooding as classified by the National Soil Survey Handbook (USDA 2016). This is defined as a 5 to 50 percent chance of flooding in any

year or 5 to 50 times in 100 years.

Where forest exists, the vegetation is often a mosaic of forest, woodland, shrubland, and herbaceous communities. Common trees include *Platanus occidentalis* (American Sycamore), *Acer negundo* (box elder) and *Acer saccharinum* (silver maple). *Juglans nigra* (black walnut), *Robinia pseudoacacia* (black locust), and *Liriodendron tulipifera* (tuliptree) may also be common, and indicate successional species after significant disturbance like human settlement and agriculture.

Table 1. Dominant plant species

Tree	(1) *Platanus occidentalis* (2) *Acer negundo*
Shrub	(1) *Asimina triloba*
Herbaceous	(1) *Mertensia virginica*

Physiographic features

This ecological site is found on floodplains, stream terraces, and drainageways in the Great Valley and Shenandoah Valley. These areas are underlain primarily by limestone. The parent material is loamy alluvium derived from mixed sedimentary geology of limestone, dolomite, interbedded limestone, shale, siltstone, and sandstone, calcareous shale and some marl. Most sites are well and moderately well drained with the seasonal high water table occurring between 20 and 60 inches (51 to 152 cm). Slopes are relatively flat, and depth to bedrock is greater than 60 inches (152 cm). This ecological site is subject to occasional flooding, usually for brief (2 to 7 days) periods of time. In some areas, ponding can occur. Much of this ecological site has been cleared and cropped.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Elevation	27–213 m
Slope	0–4%
Water table depth	46–155 cm
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 3 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 (average)	154 days
Freeze-free period (average)	182 days
Precipitation total (average)	1,016 mm

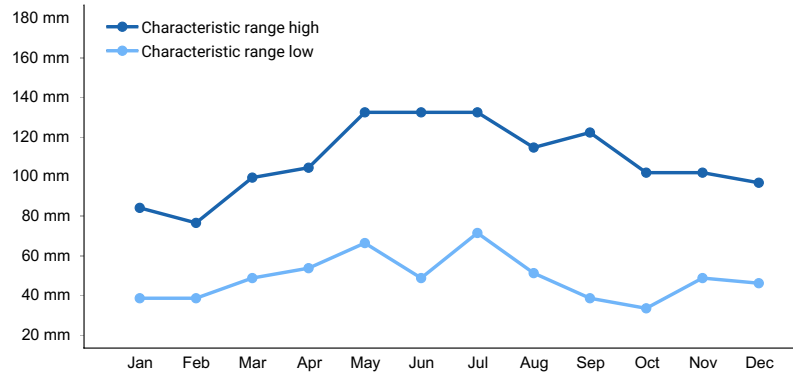


Figure 1. Monthly precipitation range

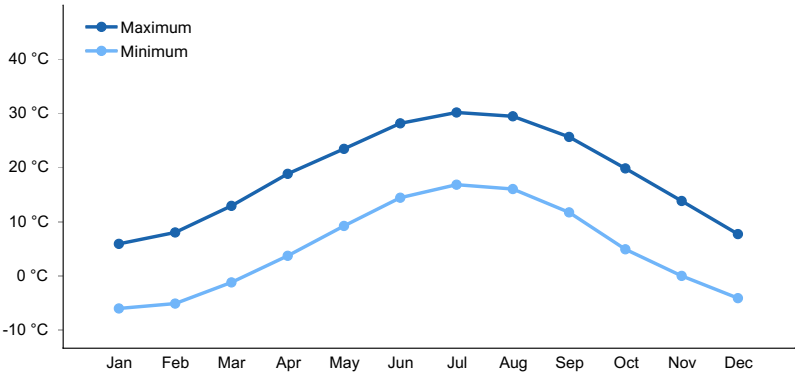


Figure 2. Monthly average minimum and maximum temperature

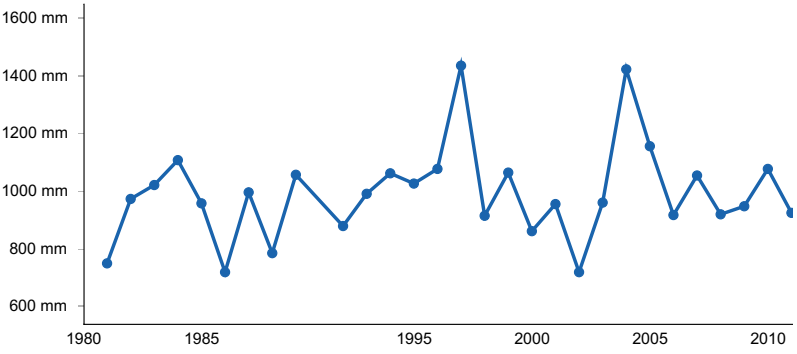


Figure 3. Annual precipitation pattern

Climate stations used

- (1) DALE ENTERPRISE [USC00442208], Dayton, VA
- (2) LEXINGTON [USC00444876], Lexington, VA
- (3) KEARNEYSVILLE [USC00464763], Kearneysville, WV

Influencing water features

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

Soil features

The soil series associated with this site are: Weaver, Massanetta, Lappans, and Buckton. These soils are formed from recent alluvium derived from a mixture of geologies including marl, sandstone, siltstone, shale, limestone, dolomite, calcareous shale, and interbedded limestone. They are on floodplains subjected to occasional flooding. Depth to high water table is mostly below 40 inches (102 cm), but can include areas that are wetter. Surface textures are loams, silt loams, and fine sandy loams. Subsoil textures are loamy. Permeability is moderate to rapid. Depth to bedrock is over 60 inches (152 cm). Some soils may have lenses of sands and gravels. The soils that make up the Calcareous Loamy Bottomland ecological site are not currently mapped in Pennsylvania, but occur in the Great Valley and Shenandoah Valley portions of Maryland, Virginia, and West Virginia. Soils data was obtained from the Natural Resources and Conservation Service (NRCS) National Soils Information System database (USDA 2015).

Marl has been defined as a ‘soft, loose, earthy, material that consists of varying amounts of calcium carbonate, clay, and silt and is formed primarily in freshwater conditions’ (Hubbard and Herman, 1990). Marl deposits are limited in extent but are found in parts of the limestone valleys in the Ridge and Valley region. The calcium carbonate in the marl was developed through the accumulation of carbonate by certain algae species (Chara sp.) (Shaw and Rabenhorst 1997). The accumulations occurred in ponds which are now extinct.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone (2) Lacustrine deposits–dolomite
Surface texture	(1) Marly silt loam (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to rapid
Soil depth	127–188 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	16.51–22.61 cm
Calcium carbonate equivalent (0-101.6cm)	0–85%
Soil reaction (1:1 water) (0-101.6cm)	7.5–7.9
Subsurface fragment volume <=3" (Depth not specified)	0–13%
Subsurface fragment volume >3" (Depth not specified)	0–3%

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 Calcareous Loamy Bottomland Ecological Site occurs in the Great Valley and Shenandoah Valley in the eastern side of MLRA 147 on floodplains, terraces, and alluvial fans along small to medium rivers and streams. The parent material is alluvium weathered from calcareous parent material such as limestone, dolomite, calcareous sandstones, siltstones, and shales, and marl. Areas are well drained, moderately well drained, to somewhat poorly drained with the seasonal high water table mostly occurring below 40 inches (102 cm) but can be within 12 inches (30 cm) of the surface in wetter areas. These landscapes are generally flat, with deep soils that are nutrient rich. The high pH of the underlying soils relative to other alluvial landscapes, and the association with marl, is what distinguishes this site from other floodplain ecological sites in MLRA 147.

The reference forest community is part of the Central Appalachian River Floodplain system (CES202.608) (NatureServe 2009) which encompasses floodplains of medium to large rivers in Atlantic drainages from southern New England to Virginia. This system can include a complex of wetland and upland vegetation and includes floodplain forests in which *Acer saccharinum* (silver maple), *Populus deltoides* (eastern cottonwood), and *Platanus occidentalis* (American sycamore) are characteristic, as well as herbaceous sloughs, shrub wetlands, riverside prairies and woodlands. Most areas are underwater each spring. Microtopography determines how long the various habitats are inundated.

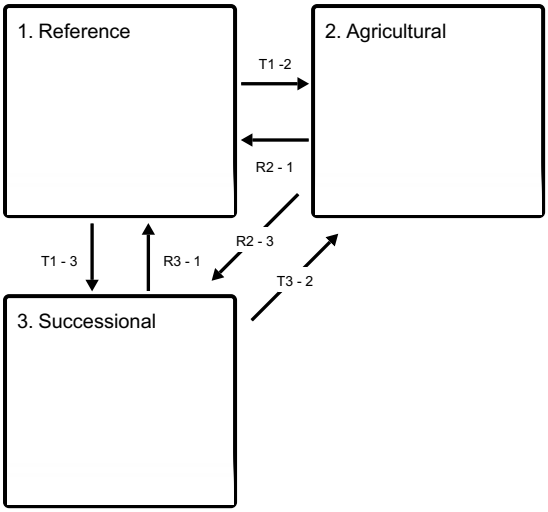
Although most areas have been cleared for crops or pasture, the minimally managed, naturalized community of the Calcareous Bottomland ecological site can be represented by the *Platanus occidentalis - Acer negundo - Juglans nigra* / *Asimina triloba*/ *Mertensia virginica* Forest (American sycamore-Box elder-Black walnut/Pawpaw/Virginia bluebells Forest), also known as the Piedmont/Central Appalachian Rich Floodplain Forest (CEGL004073) (NatureServe 2017). This vegetation association and similar ones dominated by sycamore, occupy floodplains, berms, and low terraces of rivers which drain areas of nutrient-rich substrates. Typical species include *Platanus occidentalis* (American sycamore), *Juglans nigra* (Black walnut), *Carya cordiformis* (Bitternut hickory), *Celtis occidentalis* (Common hackberry), Ulmus Americana (American elm), *Fraxinus pennsylvanica* (Green ash), *Liriodendron tulipifera* (Tuliptree) and *Quercus shumardii* (Shumard's oak). The most prevalent alternate states of the Calcareous Bottomlands are cropland and pasture. *Juglans nigra* (Black walnut) and *Verbesina alternifolia* (Wingstem) are dominant species in post agricultural successional forests. Ash trees which are common in floodplains and wetland forests have been heavily impacted by the emerald ash borer (Agrilus planipennis).

Wet areas associated with this ecological site will support bottomland oaks and/or mixed hardwoods like *Quercus palustris* (Pin oak), *Quercus bicolor* (Swamp white oak), *Acer rubrum* (Red maple), *Fraxinus pennsylvanica* (Green ash), Ulmus Americana (American elm), and Carya spp. (hickories). These communities may constitute a separate ecological site similar to/or part of the Poorly Drained Fine Mixed Floodplain ecological site that also occurs within the Ridge and Valley region.

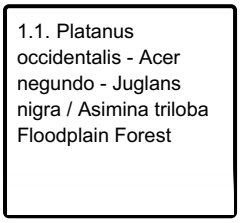
The information presented is representative of very complex vegetation communities. Key indicator plants and ecological processes are described to help inform land management decisions. Plant communities will differ across the major land resource region because of the naturally occurring variability in weather, soils, and aspect. The reference plant community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site. The USDA Plants database was used to verify species' scientific and common names (USDA 2017).

State and transition model

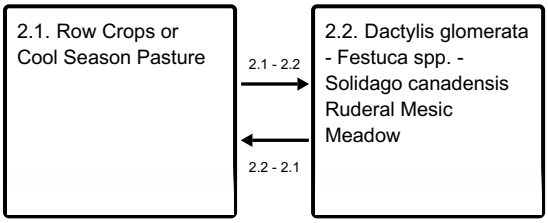
Ecosystem states



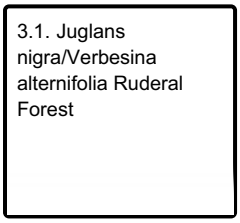
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference

The reference forest state described is one of several similar vegetation communities within the Central Appalachian River Floodplain Systems as defined by NatureServe (NatureServe 2009). Due to the long history of human activity, the associations listed below may in reality reflect the current naturalized, minimally managed post disturbance state rather than the historic, pre-European settlement condition. These areas will have a mixture of typical floodplain species like sycamore, maple, and ash.

Community 1.1
Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba Floodplain Forest

The American Sycamore - Box-elder - Black Walnut / Pawpaw / Virginia Bluebells Floodplain Forest also known as the Piedmont-Central Appalachian Rich Floodplain Forest (CEGL004073; NatureServe 2017), occupy floodplains, berms, and low terraces of major and medium-sized rivers which drain areas of nutrient-rich substrates. Typical species include *Platanus occidentalis* (American sycamore), *Juglans nigra* (black walnut), *Carya cordiformis* (bitternut hickory), *Celtis occidentalis* (common hackberry), Ulmus Americana (American elm), *Fraxinus*

pennsylvanica (Green ash), *Liriodendron tulipifera* (Tuliptree) and *Quercus shumardii* (Shumard's oak). *Acer saccharinum* (silver maple) is codominant in a minority of stands but absent or unimportant in many others. *Acer negundo* (Box elder) is strongly dominant in the subcanopy. *Asimina triloba* (Pawpaw) and/or *Lindera benzoin* (Spice bush) dominate a moderately dense to dense shrub layer. The herb layer is rich in spring ephemerals and other nutrient-demanding species, including *Mertensia virginica* (Virginia bluebells), *Asarum canadense* (Canadian wildginger), *Chaerophyllum procumbens* (Spreading chervil), *Hydrophyllum canadense* (Bluntleaf waterleaf), *Viola striata* (Striped cream violet), Phlox divaricate (Wild blue phlox), *Podophyllum peltatum* (Mayapple), *Erythronium americanum* (Dogtooth violet), Dicentra Canadensis (Squirrel corn), *Sanicula odorata* (Clustered blacksnakeroot), *Packera aurea* (Golden ragwort), *Claytonia virginica* (Spring beauty), *Festuca subverticillata* (Nodding fescue), *Carex jamesii* (James' sedge), *Carex grisea* (Inflated narrow-leaf sedge), *Floerkea proserpinacoides* (False mermaidweed), *Osmorhiza longistylis* (Longstyle sweetroot), and *Ranunculus abortivus* (Littleleaf buttercup). Invasive exotics, especially *Alliaria petiolata* (Garlic mustard), *Veronica hederifolia* (Ivyleaf speedwell), Duchesnea indica (Indian strawberry), *Urtica dioica* (Stinging nettle), *Microstegium vimineum* (Nepalese browntop) and *Glechoma hederacea* (Ground ivy) are usually abundant.

State 2
Agricultural

Community 2.1
Row Crops or Cool Season Pasture

This is the dominant state that exists either in row crops like corn and soybeans, or in managed pastures planted with non-native forages.

Community 2.2
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 2.1 - 2.2
Community 2.1 to 2.2

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

Pathway 2.2 - 2.1
Community 2.2 to 2.1

Active management of conservation cropping system or pasture; maintenance of drainage systems if applicable.

State 3
Successional

Community 3.1
Juglans nigra/Verbesina alternifolia Ruderal Forest

The Black Walnut/Wingstem Ruderal Forest also known as the Successional Black Walnut Forest (CEGL007879) (NatureServe2009) occurs in a variety of habitats from ridgetops to floodplains. Associated trees are *Liriodendron tulipifera* (Tuliptree), *Juglans cinerea* (Butternut), *Robinia pseudoacacia* (Black locust), Fraxinus Americana (White ash), Ulmus Americana (American elm), *Platanus occidentalis* (American sycamore), *Acer saccharum* (Sugar maple), *Acer nigrum* (Black maple), *Morus rubra* (Red mulberry), and *Aesculus flava* (Yellow buckeye). Additional tree species in the subcanopy can include *Carya cordiformis* (Bitternut hickory) and *Celtis occidentalis* (Common hackberry). *Sassafras albidum* (Sassafras) and/or *Carpinus caroliniana* (American hornbeam) may be present as small trees. The shrub layer may or may not be well-developed; common species include *Asimina triloba* (Pawpaw), *Viburnum prunifolium* (Blackhaw), *Lindera benzoin* (Spicebush), Corylus Americana (American hazelnut), and the exotic invasive *Rosa multiflora* (Multiflora rose). The herb layer is variable, often with one or a few species providing most of the cover. *Verbesina alternifolia* (Wingstem) and *Ageratina altissima* (White snakeroot) are characteristic and may be dominant; other herbs include *Ambrosia trifida* (Great ragwood), *Amphicarpaea bracteata* (American hogpeanut), *Agrimonia pubescens* (Soft agrimony), Apios Americana (Groundnut), Cryptotaenia Canadensis (Canadian honewort), *Galium triflorum* (Fragrant bedstraw), *Osmorhiza longistylis* (Longstyle sweetroot), *Dichanthelium clandestinum* (Deertongue), *Packera aurea* (Golden ragwort), *Polygonum virginianum* (Jumpseed), *Rudbeckia laciniata* (Cutleaf coneflower), *Podophyllum peltatum* (Mayapple), *Impatiens capensis* (Jewelweed), *Circaea lutetiana* (Broadleaf enchanter's nightshade), *Viola striata* (Striped cream violet), and *Ambrosia trifida* (Great ragweed). The invasive exotics *Microstegium vimineum* (Nepalese browntop), *Alliaria petiolata* (Garlic mustard), *Rosa multiflora* (Multiflora rosa), and Polygonum caespitosum (Oriental lady's thumb) can be common in this community.

Transition T1 -2
State 1 to 2

Logging, clearing, tillage and conversion to agricultural practices like row cropping or managed pasture. Installation of drainage systems in wetter areas.

Transition T1 - 3
State 1 to 3

Logging, agricultural conversion, or other significant human disturbance. Natural regeneration is allowed to occur. Fire suppression may allow more fire sensitive species to become established verses oaks. However, the role of fire is not well understood in bottomland and floodplain forests.

Restoration pathway R2 - 1
State 2 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 R2 - 3
State 2 to 3

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

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 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 T3 - 2
State 3 to 2

Logging, clearing, tillage and then establishment of agricultural practices. Wet areas may benefit from installation of

drainage ditches.

Additional community tables

Other references

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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.

The following people assisted with the development of this provisional ecological site report:

Yuri Plowden, Ecological Site Specialist, NRCS, Mill Hall, PA
Aron Sattler, 6-MIL Soil Survey Project Leader, NRCS, Mill Hall, PA
Mike McDevitt, Soil Scientist, NRCS, Mill Hall, PA
Nels Barrett, Ph.D, Regional Ecological Site Specialist, NRCS, Amherst, MA
Ephraim Zimmerman, Ecological Assessment Manager, Western PA Conservancy, Pittsburgh, PA
Don Flegel, Resource Soil Scientist, NRCS, Harrisonburg, VA

Kevin Godsey, Ecological Site Specialist, NRCS, Springfield, MO

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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

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

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

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

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

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

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:**

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
