Ecological site F147XY009PA
Loamy Mixed Floodplain

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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 Mixed Floodplain ecological site occurs within 67a, 67b, and 69a of EPA Ecoregion IV - Northern Limestone/Dolomite Valleys, Northern Shale Valleys, and Forested Hills and Mountains respectively (Woods et. al., 1996).

Ecological site concept

The Loamy Mixed Floodplain Ecological Site occurs throughout MLRA 147 on floodplains, terraces, and alluvial fans in river and stream valleys. Currently, this ecological site encompasses small to large rivers and streams including both high and low gradient systems. This ecological site will most likely be split as more field investigation continues. The parent material is relatively fine-textured recent alluvium weathered from sandstones, siltstones, and shales. Areas are generally well drained to moderately well-drained with the seasonal high water table occurring below 40 inches (102 cm) although wet patches may have a water within 20 inches (51 cm) of the surface. Landscapes are predominantly flat with 0 to 3 percent slope. Depth to bedrock is 70 inches (178 cm) or more. The flat slopes, well-drained and nutrient rich loamy soils are conducive to agriculture, and most of these areas have been cleared for crop production, although flooding can be rare to frequent as classified by the National Soil Survey

Handbook (USDA 2016). Frequent flooding is defined as more than a 50 percent chance of flooding in any year. Rare flooding is defined as 1 to 5 percent chance of flooding in any year or nearly 1 to 5 times in 100 years.

Where forest exists, the vegetation is often a mosaic of forest, woodland, shrubland, and herbaceous communities. Common trees include *Betula nigra* (River birch), *Platanus occidentalis* (American Sycamore), and *Acer negundo* (Box elder). *Acer saccharinum* (Silver maple) and *Populus deltoides* (Eastern cottonwood) may also be characteristic in the larger floodplain systems. On high terraces or where flood-control structures have reduced the frequency and severity of flood events, *Liriodendron tulipifera* (Tuliptree), *Quercus rubra* (Northern red oak), *Quercus alba* (White oak), *Pinus strobus* (Eastern white pine), and *Acer rubrum* (Red maple) are additional species that can become established.

Table 1. Dominant plant species

Tree	(1) *Acer saccharinum* (2) *Acer negundo*
Shrub	(1) *Ageratina altissima* (2) *Laportea canadensis*
Herbaceous	Not specified

Physiographic features

This ecological site is found on floodplains and alluvial fans in river and stream valleys throughout Major Land Resource Area 147, the Northern Appalachian Ridges and Valleys. The parent material is recent alluvium weathered from sandstones, siltstones, shales, limestone, dolomite, calcareous shale, as well as some metamorphic geology associated with the Blue Ridge Mountains to the east. These areas are subject to brief (2 to 7 days) flooding, but occasional or no ponding. They are distinguished from the natural stream bank levees of coarser textured gravelly soils directly next to the rivers and from the fine textured poorly drained back swamp areas furthest from the river banks. Areas are mostly well-drained to moderately well-drained with the seasonal high water table occurring below 40 inches (102 cm). The seasonal high water table in wetter inclusions may occur less than 20 (51 cm) inches of the surface. These landscapes are generally flat, with 0 to 3 percent slope. Included in this ecological site are areas that approach wetland status but are not ponded or inundated long enough to be true wetlands. Depth to bedrock is 70 inches (178 cm) or more. Most areas are cleared for cropland or pasture. In steeper valleys, these will be the flattest spots, making them highly conducive for human development. Flooding frequency is frequent to rare; up to a 50 percent chance of flooding in any year (USDA 2016).

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Alluvial fan (3) Stream terrace
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Rare to frequent
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to occasional
Elevation	34–914 m
Slope	0–3%
Ponding depth	0–38 cm
Water table depth	38–201 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 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 (average)	162 days
Freeze-free period (average)	190 days
Precipitation total (average)	1,067 mm

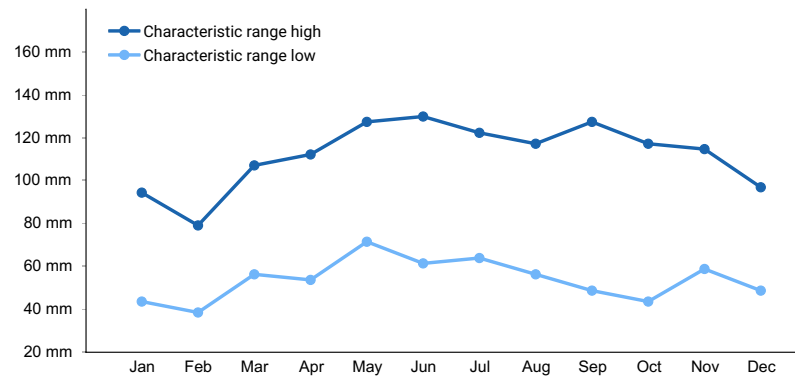


Figure 1. Monthly precipitation range

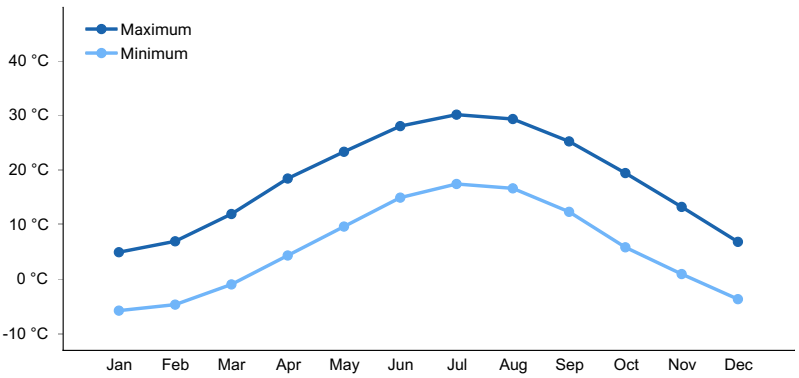


Figure 2. Monthly average minimum and maximum temperature

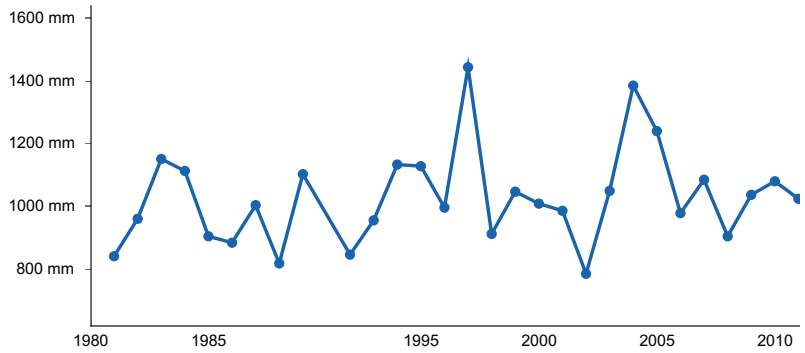


Figure 3. Annual precipitation pattern

Climate stations used

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

Influencing water features

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

Soil features

The soil series associated with this site are: Wolfgap, Tioga, Speedwell, Sindion, Sensabaugh, Pope, Philo, Pagebrook, Ogles, Nomberville, Nolin, Middlebury, Lobdell, Lindside, Linden, Jugtown, Irongate, Ingledove, Huntington, Gladehill, Funkstown, Feedstone, Derroc, Deposit, Combs, Chagrin, Caverns, Broadway, Biltmore, Bigpool, Basher, and Barbour. This ecological site includes areas mapped as Udifluvents. These soils are formed from recent alluvium derived from a mixture of geologies including sandstone, siltstone, shale, limestone, dolomite, calcareous shale, interbedded limestone, as well as some metamorphic geology associated with the Blue Ridge Mountains to the east. They are on floodplains subjected to rare to frequent 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. Soils data was obtained from the Natural Resources and Conservation Service (NRCS) National Soils Information System database (USDA 2015).

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale
Surface texture	(1) Gravelly loam (2) Very cobbly fine sandy loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to well drained
Permeability class	Slow to rapid
Soil depth	102–229 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	1–2%
Available water capacity (0-101.6cm)	5.33–23.11 cm

Soil reaction (1:1 water) (0-101.6cm)	4.6–7
Subsurface fragment volume <=3" (Depth not specified)	0–55%
Subsurface fragment volume >3" (Depth not specified)	0–37%

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 Mixed Floodplain 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). Floodplains of the Ridge and Valley are highly variable. NatureServe describes many plant associations 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, variations in soils, and climate. The reference forest community may be part of the Central Appalachian River Floodplain system (CES202.608) or the Central Appalachian Stream and Riparian System (CES202.609) as described by NatureServe (NatureServe 2009).

The Central Appalachian River Floodplain system 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 on deep alluvial deposits and scoured vegetation on depositional bars and on bedrock where rivers cut through resistant geology. This complex 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.

The Central Appalachian Stream and Riparian System ranges from southern New England to Virginia and West Virginia and occurs over a wide range of elevations. It develops on floodplains and shores along river channels that lack a broad flat floodplain due to steeper sideslopes, higher gradient, or both. It may include communities influenced by flooding, erosion, or groundwater seepage. The vegetation is often a mosaic of forest, woodland, shrubland, and herbaceous communities. Common trees include *Betula nigra* (River birch), *Platanus occidentalis* (American sycamore), and *Acer negundo* (Boxelder). Open, flood-scoured rivershore prairies feature *Panicum virgatum* (Switchgrass) and *Andropogon gerardii* (Big bluestem), and *Carex torta* (Twisted sedge) is typical of wetter areas near the channel. This system is a high-gradient system unlike the Central Appalachian River Floodplain system.

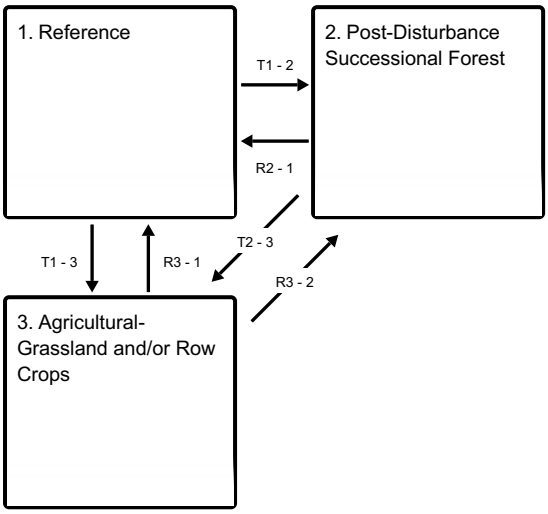
In stream valleys and higher terraces where floodplains are relatively narrow before transitioning to uplands, the vegetation community will more closely resemble the Mixed Sedimentary Lower Slope ecological site with the inclusion of upland species like *Quercus rubra* (Northern red oak), *Quercus alba* (white oak), *Liriodendron tulipifera* (Tuliptree), *Pinus strobus* (Eastern white pine), and Tsuga Canadensis (Eastern hemlock).

Much of the Loamy Mixed Floodplain ecological site has been cleared for agriculture or for other development. Successional forests that recolonize former agricultural fields or other disturbed areas are often dominated by

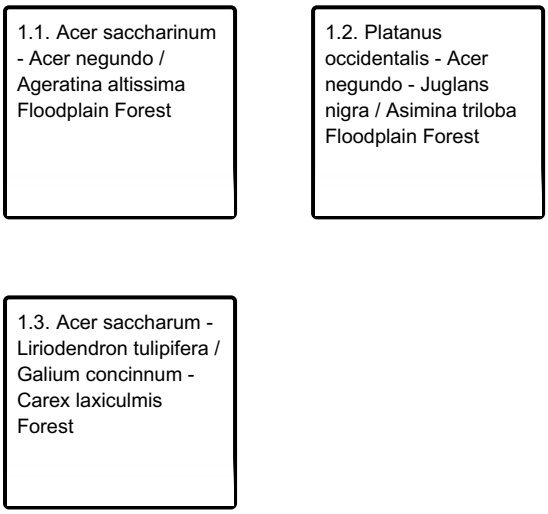
Juglans nigra (Black walnut) but can also contain *Liriodendron tulipifera* (Tuliptree), *Robinia pseudoacacia* (Black locust), Fraxinus Americana (white ash), Ulmus Americana (American elm), *Platanus occidentalis* (American sycamore), and *Acer saccharum* (Sugar maple). The subcanopy may include *Carya cordiformis* (Bitternut hickory), *Celtis occidentalis* (Common hackberry), *Sassafras albidum* (Sassafras), and *Carpinus caroliniana* (American hornbeam). The shrub layer may include *Asimina triloba* (Pawpaw), *Viburnum prunifolium* (Blackhaw), *Lindera benzoin* (Spicebush), and a host of exotic invasives including *Rosa multiflora* (Multiflora rose), *Microstegium vimineum* (Nepalese browntop), Alliaria petiolate (Garlic mustard), and Persicaria longiseta (Smartweed).

State and transition model

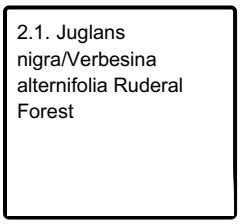
Ecosystem states



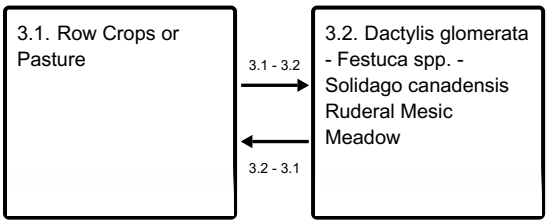
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference

The reference state is a combination of several vegetation associations of the Central Appalachian River Floodplain Forest (CES202.608) and the Central Appalachian Stream and Riparian System (CES202.609) (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 and inherent soil fertility than management or disturbance. Agriculture is the dominant land use for the Loamy Mixed Floodplain Ecological Site.

Community 1.1
Acer saccharinum - Acer negundo / Ageratina altissima Floodplain Forest

The Silver Maple - Box-elder / White Snakeroot - Canadian Woodnettle - (Virginia Wildrye) Floodplain Forest, also known as the Piedmont-Central Appalachian Silver Maple Floodplain Forest (CEGL006217; NatureServe 2015), occurs typically on large river floodplains and occupies banks and first bottoms of major rivers with nutrient-rich silt loams, sand loams, and sands that are temporarily inundated, annually or less often, in major flood events. In the Ridge and Valley, this community is observed on small to medium river floodplains, where flooding intensity is low, and water recedes relatively slowly allowing fine sands and silts to be deposited. Canopies are closed and dominated by *Acer saccharinum* (Silver maple), with *Acer negundo* (Boxelder) dominating a subcanopy layer. Other minor overstory and understory associates include *Populus deltoides* (Eastern cottonwood), *Celtis occidentalis* (Common hackberry), *Fraxinus pennsylvanica* (Green ash), *Ulmus americana* (American elm), and *Juglans nigra* (Black walnut). The shrub layer ranges from sparse to dense but is usually dominated by *Lindera benzoin* (Spice bush). Characteristic species of the herb layer are *Ageratina altissima* (White snakeroot), Laportea Canadensis (Canadian woodnettle), *Impatiens pallida* (Pale touch-me-not), *Viola sororia* (Common blue violet), *Leersia virginica* (Whitegrass), *Verbesina alternifolia* (wingstem), *Urtica dioica* (stinging nettle), *Elymus virginicus* (Virginia wildrye), *Elymus riparius* (Riverbank wildrye), *Geum canadense* (White avens), *Pilea pumila* (Canadian clearweed), *Rudbeckia laciniata* (Cutleaf coneflower), and Cryptotaenia Canadensis (Canadian honewort). Vines of *Toxicodendron radicans* (Poison ivy) and *Parthenocissus quinquefolia* (Virginia creeper) are common. Early-successional stands are usually strongly dominated by even-aged *Acer saccharinum* (Silver maple). Invasive introduced species such as *Alliaria petiolata* (Garlic mustard), *Stellaria media* (Common chickweed), *Microstegium vimineum* (Nepalese browntop), *Glechoma hederacea* (Ground ivy), *Urtica dioica* (Stinging nettle), and *Humulus japonicus* (Japanese hop) are often rampant in this vegetation type. Early-successional stands are assigned to the same type and are usually strongly dominated by even-aged *Acer saccharinum* (Silver maple).

Community 1.2
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 2015) occurs where soil fertility is high relative to the Silver Maple forest described above. Soil texture is variable, ranging from silty-clay loams to loams over much of the range, and samples collected from plots had high base status. This vegetation type is a closed forest with mixed overstory dominance by *Platanus occidentalis* (American sycamore), *Juglans nigra* (Black walnut), *Carya cordiformis* (Bitternut hickory), *Celtis occidentalis* (Common hackberry), Ulmus Americana (American elm), and, locally, *Fraxinus pennsylvanica* (Green ash), *Liriodendron tulipifera* (Tuliptree), and *Quercus shumardii* (Shumard's oak). 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.

Community 1.3
Acer saccharum - Liriodendron tulipifera / Galium concinnum - Carex laxiculmis Forest

The Sugar Maple - Tuliptree / Shining Bedstraw - Spreading Sedge Forest, also known as the Central Appalachian Ridge and Valley Floodplain Forest (CEGL006473; NatureServe 2015), has been documented to occur on the Loamy Mixed Floodplain ecological site primarily on well drained floodplains of small to medium-sized streams. This forest occurs in areas underlain by sandstone and shale with soils of relatively low base status. The vegetation is a predominantly deciduous forest with mixed and variable over story dominance by combinations of *Liriodendron tulipifera* (Tuliptree), *Acer saccharum* (Sugar maple), Fraxinus Americana (White ash), *Quercus alba* (White oak), Tilia Americana (American basswood), and *Quercus rubra* (Northern red oak). *Pinus strobus* (Eastern white pine), *Acer rubrum* (Red maple), *Platanus occidentalis* (American sycamore), and *Magnolia acuminata* (Cucumber tree) are relatively minor species. *Lindera benzoin* (Spicebush), *Hamamelis virginiana* (American witch hazel), and *Carpinus caroliniana* (American hornbeam) are the most constant understory species. The herb layer is moderately diverse, with *Eurybia divaricata* (White wood aster), *Polystichum acrostichoides* (Christmas fern), *Cardamine concatenata* (Cutleaf toothwort), *Claytonia virginica* (Virginia spring beauty), *Carex laxiculmis* var. laxiculmis (Spreading sedge), *Ageratina altissima* (White snakeroot), *Maianthemum racemosum* (Feathery false lily of the valley), *Galium concinnum* (Shining bedstraw), *Uvularia sessilifolia* (Sessileleaf bellwort), *Solidago caesia* (Wreath goldenrod), and *Carex digitalis* (Slender woodland sedge).

State 2
Post-Disturbance Successional Forest

Community 2.1
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.

State 3
Agricultural-Grassland and/or Row Crops

Community 3.1
Row Crops or 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. 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). Low organic matter content and soil acidity make agriculture harder to maintain in a healthy, productive state on this ecological site.

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

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
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

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

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 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

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

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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.

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Rangeland health reference sheet

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

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

Indicators

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

_____

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

_____

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

_____

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

_____

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

_____

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

_____

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

_____

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:**
