Ecological site F147XY012PA
Calcareous Loamy Bottomland

Last updated: 9/27/2024
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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 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 sites occur 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.

Associated sites

F147XY013PA	**Poorly Drained Calcareous Bottomland** Poorly Drained Calcareous Bottomland

Table 1. Dominant plant species

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

Physiographic features

The Calcareous Loamy Bottomland ecological sites are 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
Runoff class	Very low to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Elevation	30 – 210 m
Slope	0 %
Water table depth	50 – 160 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 (characteristic range)	130-150 days
Freeze-free period (characteristic range)	170-180 days
Precipitation total (characteristic range)	970-1,020 mm
Frost-free period (actual range)	120-150 days
Freeze-free period (actual range)	170-180 days
Precipitation total (actual range)	940-1,020 mm
Frost-free period (average)	140 days
Freeze-free period (average)	180 days
Precipitation total (average)	990 mm

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

Influencing water features

This ecological site may be influenced by flood events.

Soil features

The representative 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	130 – 190 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	16.51 – 22.61 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 90 %
Soil reaction (1:1 water) (0-101.6cm)	7.5 – 7.9
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %

Subsurface fragment volume >3" (Depth not specified)	Not specified

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

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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. 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	05/30/2026
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):**

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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:

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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:**
