Ecological site F147XY013PA
Poorly Drained Calcareous 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. 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). Poorly Drained Calcareous Bottomland occurs in 67a of EPA Ecoregion IV – Northern Limestone/Dolomite Valleys (Woods et. al. 1996).

Ecological site concept

The Poorly Drained Calcareous Bottomland ecological sites occur in parts of the Great Valley on the eastern side of MLRA 147 on active floodplains of small to medium sized streams on calcareous parent material such as limestone, dolomite, calcareous sandstones, siltstones, shales, and marl. These landscapes are considered wetlands, but typically are a mosaic of wetland and non-wetland patches. The high pH of the underlying soils relative to other alluvial landscapes, and the association with marl, is what distinguishes this site from other floodplains in MLRA 147. These areas are subject to frequent flooding as classified by the National Soil Survey Handbook (USDA 2016). This is defined as more than a 50 percent chance of flooding in any year. These landscapes have largely been cleared for agricultural purposes or used as wetland wildlife habitat. The successional vegetation community may be composed of a patchwork of wetland shrubs and grasses; typical species include Salix spp. (willows), Cornus amomum (silky dogwood), Alnus spp. (alders), Spirea alba (white meadowsweet), Carex spp. (sedges), and Juncus spp. (rushes). Calcareous herbaceous species that may be present include Carex tetanica (rigid sedge), Carex prairea (prairie sedge), and Eleocharis erythropoda (bald spikerush). Trees are generally absent but may include Acer rubrum (red maple) and Fraxinus pennsylvanica (green ash).

Associated sites

F147XY012PA	**Calcareous Loamy Bottomland** Calcareous Loamy Bottomland

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Carex tetanica* (2) *Carex prairea*

Physiographic features

The Poorly Drained Calcareous Bottomland ecological sites are found on flood plains, heads of springs, and toeslopes in limestone valleys in MLRA 147, the Northern Appalachian Ridges and Valleys. The ecological site develops in calcium carbonate rich soils. Parent material is alluvium derived from marl and mixed sedimentary rocks of limestone, sandstone, siltstone, and shale. The sites are nearly level, the seasonal high water table is at the soil surface. Depth to bedrock is greater than 60 inches (152 cm). These areas are subject to flooding which can be of brief to long duration, 7 days or longer. Ponding for 7 days or more may also occur. The overall characteristic is that of a wetland, although, there may be non wetland areas included on microtopographic highs. This ecological site is not of large extent.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Lake plain
Runoff class	Very low to low
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	30 – 310 m
Slope	0 %
Ponding depth	0 – 50 cm
Water table depth	0 – 60 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)	130-140 days
Freeze-free period (characteristic range)	180-190 days
Precipitation total (characteristic range)	990-1,040 mm
Frost-free period (actual range)	120-150 days
Freeze-free period (actual range)	180-190 days
Precipitation total (actual range)	970-1,070 mm
Frost-free period (average)	140 days
Freeze-free period (average)	180 days
Precipitation total (average)	1,020 mm

- (1) KEARNEYSVILLE [USC00464763], Kearneysville, WV
- (2) CHAMBERSBURG 1 ESE [USC00361354], Chambersburg, PA
- (3) WINCHESTER 7 SE [USC00449186], Winchester, VA

Influencing water features

The Poorly Drained Calcareous Bottomland Ecological Site is considered a wetland in that it periodically supports plants which are able to grow in water saturated conditions (called hydrophytes), has a predominance of undrained (hydric) soils, and is periodically saturated or covered by shallow water at some time during the growing season (Cowardin 1979). Wetlands are important habitats for many species of wildlife and perform flood protection, pollution control and a variety of other important functions. Because of the importance of wetlands, the U.S. Fish and Wildlife Service developed a National Wetlands Inventory (NWI) to provide reliable information on the status and extent

of wetland resources (Cowardin 1979). Within the NWI, wetlands are classified according to five major systems – Marine, Estuarine, Riverine, Lacustrine, and Palustrine. The Palustrine system includes all nontidal wetlands dominated by trees, shrubs, and persistent emergent plants in freshwater environments. The Poorly Drained Calcareous Bottomland Ecological Site classifies as a Palustrine Forested Broad-leaved Deciduous Seasonally flooded/saturated wetland (PFO1E) (Cowardin, 1979).

The hydrogeomorphic (HGM) wetland classification system was developed as a way to group wetlands that function similarly (Smith 1995) based on the landscape and hydrology. This is in contrast to the Cowardin system that groups wetlands in broad systems and vegetatively. The Poorly Drained Calcareous Bottomland classifies as Riverine Upper Perennial (Smith 1995; Brooks, Brinson et. al., 2013). Riverine wetlands occur in floodplains and riparian corridors in association with stream channels. Dominant water sources are overbank flow from the stream channel or subsurface hydraulic connections between the channel and wetlands. Additional water sources may be occasional overland flow from adjacent uplands, tributary inflow, and precipitation. At their headwaters, the upper perennial riverine wetlands may intergrade with slope or depressional wetlands as the channel (bed) and bank disappear, or they may intergrade with poorly drained flats or uplands.

Wetland description

Palustrine Forested Broad-leaved Deciduous Seasonally flooded/saturated wetland (PFO1E) (Cowardin, 1979).

Soil features

The representative soil series associated with this site are Warners and Fairplay which are poorly drained hydric soils that contain calcium carbonate. The somewhat poorly drained McGary soils are also included. The parent material is alluvium and lacustrine material derived from marl and mixed sedimentary geologies of limestone, sandstone, siltstone, and shale. These soils are hydric and are inundated or saturated through much of the growing season. They are slightly to moderately alkaline. Surface textures are silt loams, and subsoils are loamy with textures ranging from silt loam, loam, silty clay loam, sandy loam, clay loam, or clay. These soils are of limited extent. 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 – argillaceous limestone (2) Lacustrine deposits – sandstone and shale
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Very poorly drained
Permeability class	Moderate to rapid
Soil depth	160 – 200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified

Available water capacity (0-101.6cm)	18.03 – 18.54 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 90 %
Soil reaction (1:1 water) (0-101.6cm)	10 – 8.2
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 USDA Plants database was used to verify species' scientific and common names (USDA 2017).

The Poorly Drained Calcareous Bottomland ecological site is of limited extent. It is found where calcium rich groundwater seeps onto toeslopes, floodplains, backwater areas, and heads of springs in limestone valleys and results in the accumulation of calcium carbonate. Parent material is composed of alluvium derived from this calcium rich sediment, or where it has formed in place, as in the case of marl.

Most of this ecological site has been cleared for pasture or agriculture or is used for wetland wildlife habitat. The reference plant community is part of the Laurentian-Acadian Wet Meadow Shrub Swamp System CES201.82 (NatureServe 2009; Landfire 2010). This system encompasses shrub swamps and wet meadows on mineral soils of the Northeast and upper Midwest. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The system can have a patchwork of shrub and grass species dominance. Trees are generally absent and, if present, are scattered. Some areas are described as fens which are wetlands that are primarily fed by mineral rich groundwater and tend to accumulate peat. Other areas are slightly drier and are described as meadows, although the soil may remain saturated to the surface throughout most of the year.

A few plant communities unique to these calcareous areas and composed of species more commonly found in the Midwest have been described on these landscapes. Variations of the vegetation association known as the Shenandoah Valley Wet Prairie (CEGL006170, NatureServe 2015) have been described in Virginia and West Virginia and may occur in Pennsylvania. This calcareous, herbaceous community occurs in saturated areas on level alluvium with somewhat poorly to poorly drained soils.

Vegetation is a graminoid-dominated wetland with

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 3.1 plant community composition

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

Table 8. Community 4.1 plant community composition

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

Table 9. Community 4.2 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	08/29/2026
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):**

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

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

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

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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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:**
