

Ecological site F147XY011PA

Poorly Drained Fine Mixed Floodplain

Last updated: 9/27/2024
Accessed: 09/07/2026

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 Poorly Drained Fine Mixed Floodplain ecological site occurs within several EPA Level IV regions, primarily in 67b, Northern Shale Valleys, and 67a, Northern Limestone/Dolomite Valleys (Woods et. al., 1996).

Ecological site concept

The Poorly Drained Fine Mixed Floodplain ecological sites occur throughout MLRA 147 on active floodplains of small to medium sized streams. These landscapes are considered wetlands, but typically are a mosaic of wetland and non-wetland patches. Being part of an active floodplain environment is what distinguishes this ecological site from Poorly Drained Fine Alluvial Terraces, although the plant communities are the same or very similar. Both contain a mix of bottomland oaks and hardwoods. The soil material is composed of silt, clay, and fine-sand sized particles that are deposited in back swamp areas where flood waters tend to pond and overland water flow slows in velocity allowing smaller soil particles in suspension to settle out. Sediments are derived from mixed geology, primarily from acidic sandstone, shales, siltstones, and some limestone and calcareous shales. Many areas have been cleared and drained for agriculture as soils are fertile and slopes are flat. These areas are subject to frequent flooding 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.

Associated sites

F147XY009PA	Loamy Mixed Floodplain
	Loamy Mixed Floodplain

F147XY010PA	Coarse Mixed Floodplain Coarse Mixed Floodplain
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Table 1. Dominant plant species

Tree	(1) <i>Acer rubrum</i> (2) <i>Fraxinus pennsylvanica</i>
Shrub	Not specified
Herbaceous	(1) <i>Boehmeria cylindrica</i>

Physiographic features

The Poorly Drained Fine Mixed Floodplain ecological sites are found on poorly drained floodplains in river and stream valleys throughout MLRA 147, Northern Appalachian Ridges and Valleys province. It may also be found in backswamp areas, depressions, drainageways, toeslopes, and terraces. The parent material is fine-textured alluvium derived from mixed sedimentary geology of sandstone, siltstone, shale, limestone, and dolomite. These sites formed in slow-moving and slack water deposits away from the immediate shores of a stream or river. The slopes are generally flat and concave, and subject to frequent flooding and ponding of brief to long duration (over 7 days). The overall characteristic of this ecological site is that of a wetland, although some areas may be a patchwork of wetland and non-wetland inclusions. The non-wetland spots occupy microtopographic highs that have just enough room above the water table to allow for non hydrophytic plants to grow. Depth to bedrock is greater than 60 inches (152 cm).

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Backswamp (3) Depression
Runoff class	Very low to very high
Flooding duration	Very long (more than 30 days)
Flooding frequency	None to frequent
Ponding duration	Very brief (4 to 48 hours) to very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	30 – 460 m
Slope	0 – 10 %

Ponding depth	0 – 40 cm
Water table depth	0 – 180 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 (characteristic range)	130-150 days
Freeze-free period (characteristic range)	170-190 days
Precipitation total (characteristic range)	940-1,040 mm
Frost-free period (actual range)	130-170 days
Freeze-free period (actual range)	160-200 days
Precipitation total (actual range)	860-1,070 mm
Frost-free period (average)	140 days
Freeze-free period (average)	180 days
Precipitation total (average)	990 mm

- (1) HANCOCK [USC00184030], Hancock, MD
- (2) SELINGSGROVE 2 S [USC00367931], Port Trevorton, PA
- (3) MOOREFIELD 1 SSE [USC00466163], Moorefield, WV
- (4) WHITE SULPHUR SPRINGS [USC00469522], White Sulphur Springs, WV
- (5) HARRISBURG CPTL CY AP [USW00014751], New Cumberland, PA

Influencing water features

The Poorly Drained Fine Mixed Floodplain 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 Fine Mixed Floodplain Ecological Site classifies as a Palustrine Broad-leaved Deciduous seasonally saturated Forested wetland (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. Due to the heterogeneity of alluvial landscapes, the Poorly Drained Fine Mixed Floodplain Ecological Site can be described by at least two hydrogeomorphic (HGM) classifications: Riverine (nonperennial) – a wetland associated with an intermittent or ephemeral stream; and, Riverine (upper perennial) – a wetland associated with a 1st or 2nd order perennial stream. Brooks further refined the HGM classification for wetlands occurring in the Mid Atlantic region (Brooks et. al. 2013). Under their system, this ecological site would classify as a Riverine Floodplain complex (R2c) which are wetlands that are part of a mosaic dominated by floodplain features (former channels, depressions) that may include slope wetlands supported by ground water.

Wetland description

Palustrine Broad-leaved Deciduous seasonally saturated Forested wetland (Cowardin 1979)

Soil features

The representative soil series associated with this site are the poorly drained Shelmadine, Melvin, Holly, Dunning, and Atkins soils; and the somewhat poorly drained Orrville, Newmarc, and Newark soils. They are derived from fine-textured alluvium, or in some cases glacial till that have weathered from mixed geology of sandstone, shale, siltstone, limestone, and dolomite. The soils are generally very poorly to poorly drained with the seasonal high water table occurring between 0 to 6 inches (0 to 15 cm) of the surface. Some areas are somewhat poorly drained where depth to the seasonal high water table is between 6 to 18 inches (15 to 46 cm). Most of these soils are very deep with bedrock occurring below 60 inches (152 cm). Data was obtained from the Natural Resources and Conservation Service (NRCS) National Soils Information System database (USDA 2015).

Surface textures range from silt loam to silty clay loam, fine sandy loam, and loam. The subsurface texture is mostly loamy, but some areas are sandy or clayey, and may have stratified sands and gravels within the soil profile. The soils are often grey with splotches of orange that are characteristic of very wet, anaerobic conditions.

Slopes are flat to concave. Soil permeability is generally slow, but can be moderately rapid. This ecological site is subject to ponding and frequent flooding 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.

Table 4. Representative soil features

Parent material	(1) Alluvium – sandstone and shale (2) Till – siltstone
Surface texture	(1) Silt loam (2) Gravelly silty clay loam (3) Loam

Family particle size	(1) Loamy
Drainage class	Very poorly drained to somewhat poorly drained
Permeability class	Slow to moderately rapid
Soil depth	50 – 230 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	11.94 – 21.08 cm
Soil reaction (1:1 water) (0-101.6cm)	4.6 – 6.7
Subsurface fragment volume <=3" (Depth not specified)	0 – 20 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

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 Poorly Drained Fine Mixed Floodplain ecological site occurs throughout MLRA 147 on active floodplains of small to medium sized streams and rivers. These landscapes are considered wetlands, but typically are a mosaic of wetland and non-wetland patches. Being part of an active floodplain environment is what distinguishes this ecological site from Poorly Drained Fine Alluvial Terraces, although the plant communities are the same or very similar. The soil material is composed of silt, clay, and fine-sand sized particles that are deposited in back swamp areas where flood waters tend to pond and overland water flow slows in velocity allowing smaller soil particles in suspension to settle out. Sediments are derived from mixed geology, primarily from acidic sandstone, shales, siltstones, and some limestone and calcareous shales. Many areas have been cleared and drained for agriculture as soils are fertile and slopes are flat.

The reference forest is part of the Central Appalachian River Floodplain System (CES202.608) (NatureServe 2009) which encompasses flood plains of medium to large rivers that drain into the Atlantic Ocean from southern New England to Virginia, and can include a complex of wetland and upland vegetation. Although the Central Appalachian River Floodplain Forest System includes a number of diverse plant communities, variations of a maple - ash association dominated by *Acer rubrum* (Red maple), *Fraxinus pennsylvanicus* (Green ash) and sometimes *Ulmus americanus* (American elm) were consistently observed on the Poorly Drained Fine Mixed Floodplain ecological site. Less frequently observed was an oak-mixed hardwood forest dominated by *Quercus palustris* (pin oak) and/or *Quercus bicolor* (swamp white oak).

It is difficult to determine if either the maple-ash-elm or the pin oak-swamp white oak communities existed in their current compositional form during pre-European settlement times. Since the early 1900s when Dutch elm disease (*Ceratocystis ulmi*) was introduced to the U.S., mature American elm trees have been virtually eliminated from lowland forests in much of eastern North America (Barnes 1976). They continue to grow and spread but the disease limits their age and size. Green ash has expanded its range across the eastern United States, probably as a result of the decline of American elm, but also because it has been extensively planted (Hanberry 2014). Green ash populations may eventually decline as a result of the Emerald Ash Borer (*Agrilus planipennis*). In the eastern United States, suppression of fire since the early 1900s is leading to the eventual replacement of oak-dominated forests with mesophytic species that are much more shade tolerant and firesensitive, particularly in uplands (Nowacki and Abrams, 2008; Abrams and Ruffner, 1995; Dey, 2002a; Hutch, 2000; Delcourt, 1997). However, it is not clear if this pertains to bottomland oak forests.

Alternate states observed on these ecological sites include wet meadows with patches of alder swamps, agricultural cropland or pasture, and an invaded woodland state where non-native species occupy significant areas of the understory. These non-natives may have detrimental effects on the reproduction and advanced recruitment of the reference tree species. One such invasive species is *Microstigeum vimineum* (Nepalese browntop) in the herbaceous layer. In some sites, Nepalese browntop creates a carpet of grass that effectively inhibited the growth of other plant seedlings.

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 (%)
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Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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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. 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, 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	09/07/2026

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):

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:
