USDA Natural Resources Conservation Service

Ecological site F139XY010OH
Great Lakes Marsh

Last updated: 6/04/2024
Accessed: 05/10/2025

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): 139X–Lake Erie Glaciated Plateau

This area is mostly the northwest portion of the Allegheny Plateau, which is a gently to strongly rolling, and dissected glaciated highland. Along the north escarpment is a narrow band of flat plains along Lake Erie. Stream valleys are narrow and are not deeply incised, but the valley walls are typically steep. In some areas the interfluves are broad and nearly level. Elevation ranges from 174 m on Lake Erie to 663 m (570 to 2175 ft) increasing from north to south. Local topographic relief averages 20 m and ranges up to 267 m (65 to 875 ft) (unpublished analysis of digital elevation model downloaded from USGS, 2015).

Most of the rivers in this MLRA flow north to Lake Erie. Other rivers flowing south are part the Ohio River system, including headwaters of the Ohio River, in the northeast corner of this area, in Pennsylvania. The headwaters of the Muskingum River are in the central part of the area, in Ohio. The Grand River is designated as a National Wild and Scenic River in northeastern Ohio.

The bedrock in this area consists mostly of alternating beds of sandstone, siltstone, and shale of upper Devonian, Mississippian, and Pennsylvanian age (USDA-NRCS, 2022). Shale units are dominant closer to the surface along Lake Erie and the western edge of the area. The surface is mantled with glacial till, outwash of unconsolidated sand and gravel, glacial lake sediments, and stratified drift deposits (kames and eskers). The outwash, lake sediments, and stratified drift deposits that fill valleys are important sources of ground water. Younger stream deposits cover the glacial deposits in some of the river valleys.

The dominant soil order in this MLRA is Alfisols (USDA-NRCS, 2022). The soils in the area dominantly have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed or illitic mineralogy. They are very deep, well drained to poorly drained, and loamy or clayey. The calcareous till on the northwestern lowland till plains have generally higher clay content and are dominated by Epiaqualfs (Mahoning series). Hapludalfs formed in outwash deposits on outwash plains, terraces, kames, and beach ridges (Chili series), and in till on till plains (Ellsworth series).

In contrast, the southeastern plateau has till capped with loess which is lower in carbonates and lower in clay relative to silt. Here fragipans commonly develop into Fragiudalfs (Canfield, Rittman, and Wooster series) and Fragiaqualfs (Frenchtown, Platea, Ravenna, Sheffield, Venango, and Wadsworth series) formed in till. This low carbonate/low clay trend combined with increased slope results in otherwise loamy soils with less clay film development, Dysdrudepts (Allard), becoming more common eastward. The southeast edge of the region was not glaciated during the most recent (Wisconsin) glaciation. Accordingly, the till deposits are more highly weathered and depleted of their bases as Fragiaquults (Alvira) and Fragiudults (Hanover). Due to the shallow nature of the glacial drift (plus any residuum and colluvium) towards the southeastern extreme of the MLRA, some of the soil series have bedrock within 50 cm and are thereby classified in Lithic subgroups, which are otherwise rare. The southern MLRA boundary is marked by unglaciated colluvium and residuum (mostly Dysdrudepts and Hapludults).

This area supports a matrix of North-Central Interior Beech-Maple Forest on the west across a wide range of

upland substrates and drainage classes, but mostly on flat to rolling, somewhat poorly drained fine tills (Landfire, 2017; Whitney, 1982). The matrix forest type transitions to Appalachian (Hemlock) Northern Hardwood Forest to the east (a function of increased precipitation and elevations, and decreasing calcium in the till). The transition to northern hardwoods may be geographically approximated with a separate ecological inference area starting near the Pennsylvania state line, eastward. The extensive flat interfluve areas of fragipans and episaturated poorly drained tills may have patches of North-Central Interior Wet Flatwoods, whereas wetlands on loamy outwash lowlands are Central Interior and Appalachian Swamp Systems. Larger streams and river floodplains host Central Interior and Appalachian Floodplain Systems, but smaller creek margins may be more consistent with Central Interior and Appalachian Riparian Systems. In more rugged topography, concave slopes, particularly in older till areas is convergent with the concept of South-Central Interior Mesophytic Forest of unglaciated areas to the south. Northeastern Interior Dry-Mesic Oak Forest feathers into the area near Native American village sites due to local fire use, but also on convex slopes, coarser parent material, and older, more weathered till and residuum. Some outliers of Allegheny-Cumberland Dry Oak Forest and Woodland and Central Appalachian Dry Oak-Pine Forest may occur along sandstone outcrops and convex slopes on thin drift toward the southeastern edge of the area.

About three-fourths of this area is in farms. Feed grains (corn, soybeans, winter wheat, and oats) and forage (grass-legume hay, tall fescue pasture, and alfalfa hay) for dairy cattle are the main crops in the western part of the area. Similar crops are grown in the eastern part, where there are many part-time farms and many rural residences. The area has some cow-calf operations. Some areas are used for potatoes or small fruit crops. A large amount of the milk produced in the area is converted to cheese. The areas of hardwood forest in the MLRA are mainly in farm woodlots. Sawlogs for rough construction, firewood, and some high-quality sawlogs for specialty uses are harvested from the numerous farm woodlots. Some large holdings are used for watershed protection. Cuyahoga Valley National Park, Pymatuning State Park (Pennsylvania), Presque Isle State Park (Pennsylvania), and Erie National Wildlife Refuge are among the more notable conservation lands.

Summary of existing land use (USGS, 2011):
Upland Forest (39%)
Hardwood (33%)
Conifer (3%)
Conifer-Hardwood (3%)
Agricultural (30%)
Developed (24%)
Swamps and Marshes (5%)

Classification relationships

The USFS ecoregion classification for the majority of MLRA 139 is the Humid Temperate Domain, Hot Continental Division, Eastern Broadleaf Forest Province 222, Western Glaciated Allegheny Plateau Section 221F (Cleland et al, 2007). The ecoregion subsection composition is 221Fa (Allegheny Plateau), 221Fb (Grand River-Pymatuning Lowlands), and 221Fc (Akron Kames). Along Lake Erie the land is classified as Midwest Broadleaf Forest Province, Erie and Ontario Lake Plain Section 222I. This narrow strip is subsection 222Ia (Lake Erie Plain). The southeast extreme or MLRA 139 that is of older glacial till and into the adjacent unglaciated MLRAs is classified as Warm Continental Division, Northeastern Mixed Forest Province 211, Northern Unglaciated Allegheny Plateau Section 211G. This small area is subsection 211Ga.

A majority of MLRA 139 is occupied by the EPA ecoregion 61c (Low Lime Drift Plain) with inclusions of 61b (Mosquito Creek/Pymatuning Lowlands), 61d (Erie Gorges), and 61e (Summit Interlobate Area). The northern strip along Lake Erie is 83a (Erie/Ontario Lake Plain) (Omernik and Griffith, 2014). The EPA ecoregions 62d (Unglaciated High Allegheny Plateau) and 70c (Pittsburgh Low Plateau) overlap the older till southern fringe of MLRA 139.

Ecological site concept

The central concept of Great Lakes Marsh is marshes located at river mouths and shallow bays of the Great Lakes, subject to storm surge and annual and decadal fluctuation in water levels.

Associated sites

F139XY009OH	**Wet Floodplain**

Similar sites

F099XY010MI	**Great Lakes Marsh**

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Typha latifolia* (2) *Schoenoplectus tabernaemontani*

Physiographic features

Site occurs at the mouths of rivers draining into a large lake.

Table 2. Representative physiographic features

Landforms	(1) Estuary
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days) to very long (more than 30 days)
Flooding frequency	Occasional to very frequent
Elevation	568–577 ft
Water table depth	0–10 in
Aspect	Aspect is not a significant factor

Climatic features

Mean annual extreme minimum temperatures range from -28.5 to -18.5 °C (-19 to -1 °F), or hardiness zones 5a to 6b (USDA, 2009). The warmest summer and winter temperatures, longer growing seasons, and less extreme highs and lows occur in the lowlands adjacent to Lake Erie. Temperatures inland decrease with elevation. Rainfall occurs as high-intensity, convective thunderstorms during the summer. Mean annual snowfall ranges from 0.4 to 5.6 m (15 to 220 in) (NOAA Climate Normals, 1981-2010). Maximum snowfall occurs on the higher hills at the northern edge of the Allegheny Plateau adjacent to Lake Erie, where air moistened by the lake is uplifted and cooled into narrow intense bands of lake effect snow. The higher elevations of the eastern plateau with its generally cooler summers and much higher precipitation to potential evapotranspiration ratios (>2.0, perhumid), warrants consideration as a separate ecological inference area.

Table 3. Representative climatic features

Frost-free period (characteristic range)	153-164 days
Freeze-free period (characteristic range)	187-202 days
Precipitation total (characteristic range)	37-42 in
Frost-free period (actual range)	153-173 days
Freeze-free period (actual range)	184-204 days
Precipitation total (actual range)	34-42 in
Frost-free period (average)	160 days
Freeze-free period (average)	194 days
Precipitation total (average)	39 in

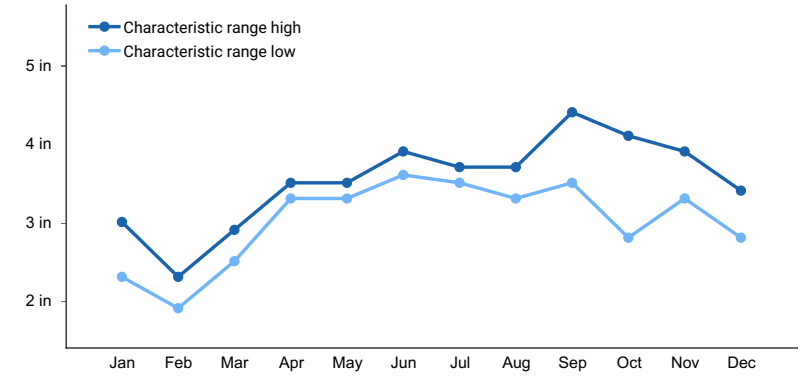


Figure 1. Monthly precipitation range

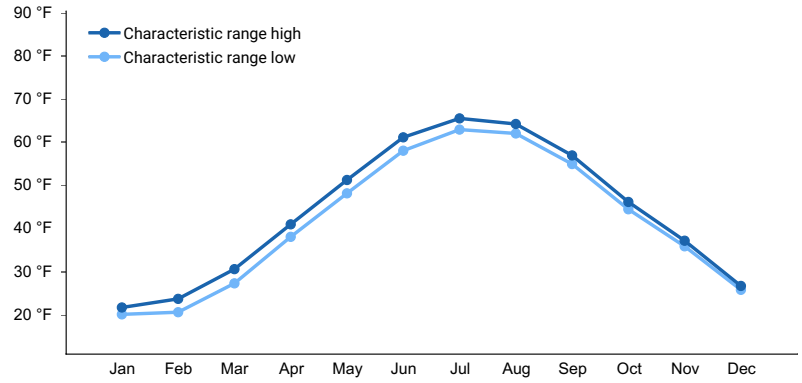


Figure 2. Monthly minimum temperature range

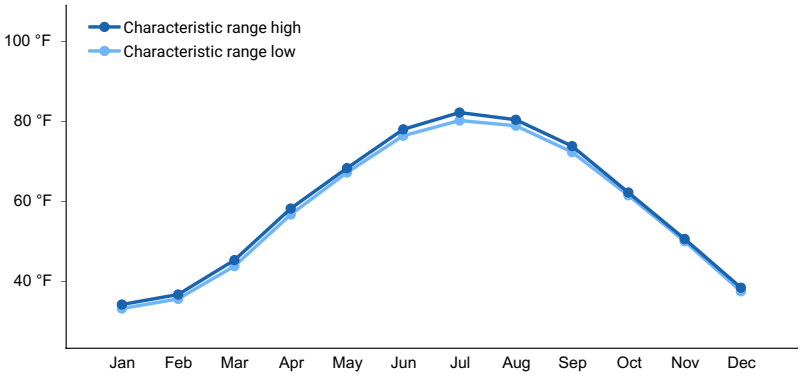


Figure 3. Monthly maximum temperature range

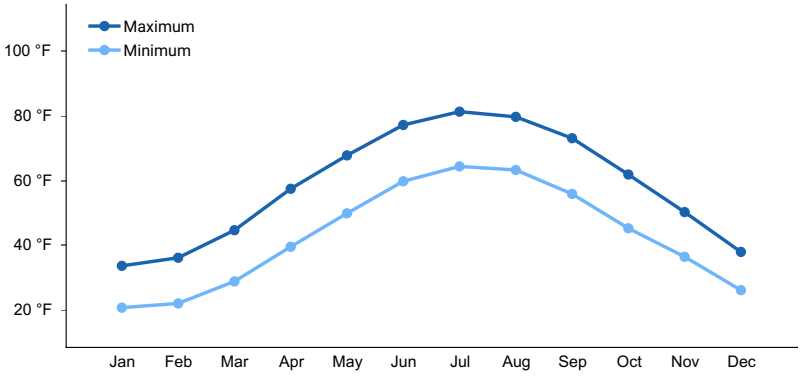


Figure 4. Monthly average minimum and maximum temperature

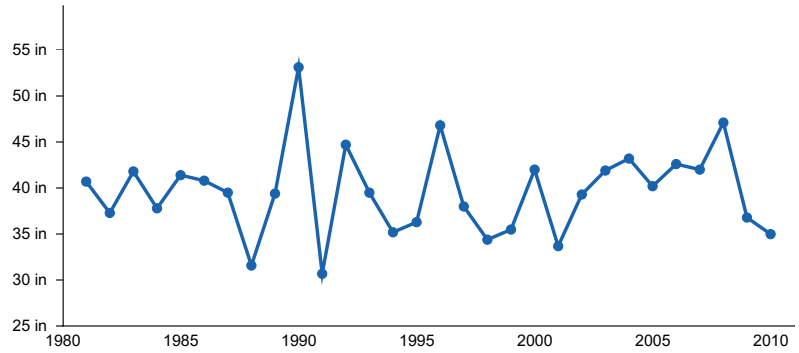


Figure 5. Annual precipitation pattern

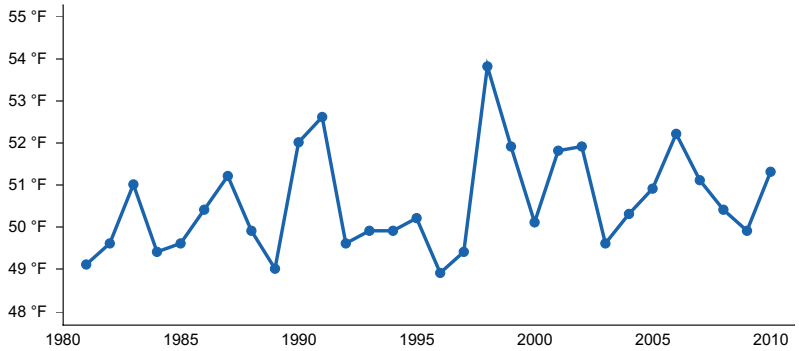


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ERIE INTL AP [USW00014860], Erie, PA
- (2) ASHTABULA [USC00330264], Ashtabula, OH
- (3) CLEVELAND [USW00014820], Cleveland, OH
- (4) SANDUSKY [USW00014846], Sandusky, OH

Influencing water features

Surface waters of the Great Lakes have the greatest influence on this site, though groundwater seeps may occur inland. See ecological dynamics for details on water level variability.

Soil features

Soils are poorly drained to subaqueous muck, sand, and loam. They are not commonly classified, and are commonly mapped as water components or conflated with other wet soils.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Lacustrine deposits
Surface texture	(1) Sand (2) Silt (3) Muck
Drainage class	Subaqueous to poorly drained
Permeability class	Slow to moderately rapid
Soil depth	79 in
Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0–1%

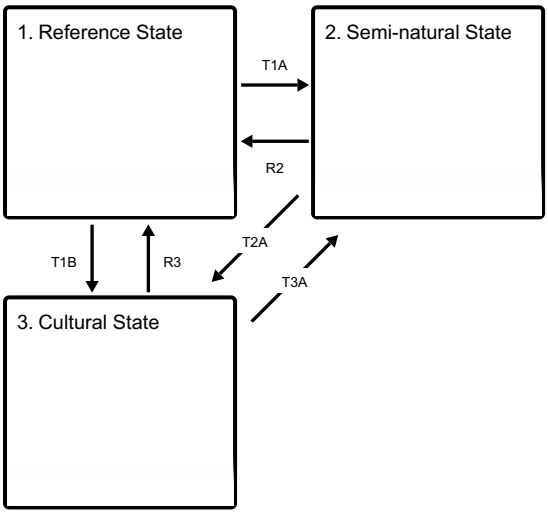
Available water capacity (0-39.4in)	1.97–9.84 in
Soil reaction (1:1 water) (0-19.7in)	5.5–7
Subsurface fragment volume <=3" (0-59.1in)	0–5%
Subsurface fragment volume >3" (0-59.1in)	0–1%

Ecological dynamics

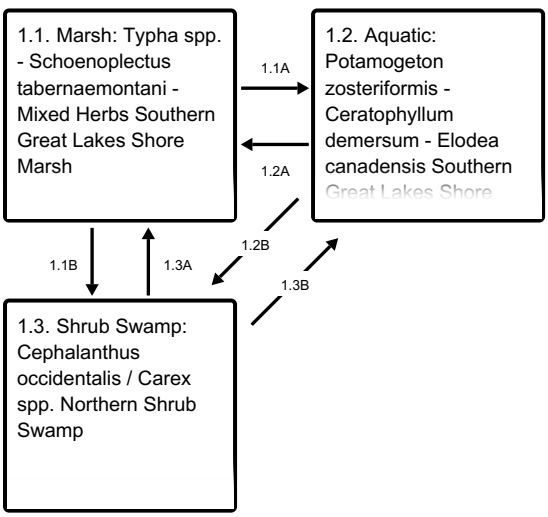
Great Lakes Marsh tends to share the same ecological dynamics as Natureserve/Landfire systems, Great Lakes Freshwater Estuary or Delta or Northern Great Lakes Coastal Marsh (Landfire, 2017). Site is subject to prolonged periods of deep inundation, rendering fire a rare event. Astronomical tides are insignificant (about 2 cm daily), but atmospheric disturbances (i.e. storm surge) may raise or lower water levels by 0.25-1 m (NOAA, 2019a). After a storm passes, water levels recover gradually after oscillating (seiches) with a period of up to half a day depending on direction of the original disturbance relative the axis of the lake. Water levels rise and fall on annual cycles of about a 30 cm, peaking in summer. Average water levels vary more than 1 m over periods of 20 years or more due to trends in basin wide precipitation and evaporation. Maximum range within the last century has been about 2 m. Species of sedges (Cyperaceae) and rushes (Juncaceae) and cattails (Typhaceae) dominate the emergent marshes.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities

2.1. Exotic Ruderal Marsh: Phragmites australis ssp. australis Eastern Ruderal Marsh

State 3 submodel, plant communities

3.1. Marina, Boat Launch, Seawall, Dredged Channel, etc.

State 1
Reference State

The Reference State consists of plant-community-types in settings where natural ecological processes are operating that are unmanaged or only minimally-managed by land-use conditioning, e.g., ranging from old-growth plant community-types (sometimes construed as mature, or pre-settlement vegetation) to inherent transitional ruderal plant community-type phases.

Dominant plant species

- rice cutgrass (*Leersia oryzoides*), grass
- softstem bulrush (*Schoenoplectus tabernaemontani*), grass

Community 1.1
Marsh: Typha spp. - Schoenoplectus tabernaemontani - Mixed Herbs Southern Great Lakes Shore Marsh

Community 1.2
Aquatic: Potamogeton zosteriformis - Ceratophyllum demersum - Elodea canadensis Southern Great Lakes Shore Aquatic Vegetation

Community 1.3
Shrub Swamp: Cephalanthus occidentalis / Carex spp. Northern Shrub Swamp

Pathway 1.1A
Community 1.1 to 1.2

Lake level rises; emergent herbaceous plant mortality.

Pathway 1.1B
Community 1.1 to 1.3

Lake level drop; shrubs established.

Pathway 1.2A
Community 1.2 to 1.1

Lake level drop; emergents established.

Pathway 1.2B

Community 1.2 to 1.3

Lake level drop; shrubs established.

Pathway 1.3A
Community 1.3 to 1.1

Lake level rise; shrub mortality; emergent herbaceous established.

Pathway 1.3B
Community 1.3 to 1.2

Lake level rises; shrub mortality.

State 2
Semi-natural State

The Semi-natural State consists of plant community-types in settings where natural ecological processes are primarily still operating but with some land-use conditioning in the past or present, e.g., varieties of managed sites with replacement plant community-types such as results of harvests or planting, or settings that possess a significant artifact of land management e.g., predominately invasive plants.

Community 2.1
Exotic Ruderal Marsh: Phragmites australis ssp. australis Eastern Ruderal Marsh

State 3
Cultural State

The Cultural State includes settings where natural ecological processes are absent or eclipsed by significant land-use conditioning and the conversion/transformation of plant cover is considered as Cultivated/Pasture/Plantation.

Community 3.1
Marina, Boat Launch, Seawall, Dredged Channel, etc.

Transition T1A
State 1 to 2

Filling or dredging.

Transition T1B
State 1 to 3

Invasive species established.

Restoration pathway R2
State 2 to 1

Conservation practices

Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Wetland Restoration

Transition T2A
State 2 to 3

Abandoned; invasive species established.

Restoration pathway R3
State 3 to 1

Remove invasive species; reestablish native plants.

Conservation practices

Restoration and Management of Rare and Declining Habitats
Wetland Wildlife Habitat Management
Wetland Restoration
Wetland Enhancement
Herbaceous Weed Control

Transition T3A
State 3 to 2

Filling or dredging.

Additional community tables

Inventory data references

Future work, as described in a project plan, to validate the information in this provisional ecological site description is needed. This will include field activities to collect low and medium intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the project plan are to be conducted by the Ecological Site Technical Team.

Other references

References consulted for MLRA 139 PES:

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Whitney, G.G., 1982. Vegetation-site relationships in the presettlement forests of northeastern Ohio. Botanical Gazette, 143(2):225-237.

Contributors

Greg J. Schmidt

Approval

Nels Barrett, 6/04/2024

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	05/10/2025
Approved by	Nels Barrett
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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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):**

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:**