USDA Natural Resources Conservation Service

# Ecological site F139XY012OH
# Wet Acidic Depression

Last updated: 10/03/2019
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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.


**Figure 1. Mapped extent**

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

## 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 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).

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 National Wild and Scenic River in northeastern Ohio. Geology The bedrock in this area consists mostly of alternating beds of sandstone, siltstone, and shale of upper Devonian, Mississippian, and Pennsylvanian age. 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. 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 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. 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 margin 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:
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. 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). 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 the Wet Acidic Depressions is soils with low base saturation (pHs <5.5 or Spodosols) and seasonal high water tables (poorly drained and very poorly drained). Such sites support vegetation composed of mostly wetland species of which tolerate low nutrient conditions. Characteristic species include red maple, pin oak, and black gum in forested sites with ferns, heaths, and peat moss in the understory. Open sites tend to have various grasses, sedges, and rushes and buttonbush.

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Tsuga canadensis*<br>(2) *Betula alleghaniensis* |
| Shrub | (1) *Ilex verticillata* |
| Herbaceous | Not specified |

## Physiographic features

Site is in depressions over acidic till.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Depression |

## Climatic features

Mean July temperatures range from 18.6 to 23.4 °C (65 to 74 °F). Mean January temperatures range from -6 to -1.8 °C (21 to 29 °F). Average 0 °C (32 °F) frost-free season ranges from 113 to 192 days. Average -2 °C (28 °F) freeze-free season is 142 to 213 days. Mean annual extreme minimum temperatures range from -28.5 to -18.5 °C (-19 to -1 °F), or hardiness zones 5a to 6b. 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. Mean annual precipitation ranges from 838 to 1312 mm (33 to 52 in). 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). 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 (average) | 149 days |
| Freeze-free period (average) | 175 days |
| Precipitation total (average) | 1,092 mm |

## Climate stations used

- (1) ASHLAND 2 SW [USC00330256], Ashland, OH
- (2) ASHTABULA [USC00330264], Ashtabula, OH
- (3) CANFIELD 1 S [USC00331245], Canfield, OH
- (4) ELYRIA 3 E [USC00332599], North Ridgeville, OH
- (5) HIRAM [USC00333780], Garrettsville, OH
- (6) NORWALK WWTP [USC00336118], Norwalk, OH
- (7) GREENVILLE 2 NE [USC00363526], Greenville, PA
- (8) MERCER [USC00365651], Mercer, PA
- (9) CLEVELAND [USW00014820], Cleveland, OH
- (10) JAMESTOWN 4 ENE [USC00304207], Jamestown, NY
- (11) CHARDON [USC00331458], Chardon, OH
- (12) MANSFIELD 5 W [USC00334874], Mansfield, OH
- (13) WARREN 3 S [USC00338769], Niles, OH
- (14) WOOSTER EXP STN [USC00339312], Wooster, OH
- (15) CORRY [USC00361790], Corry, PA
- (16) MEADVILLE 1 S [USC00365606], Meadville, PA
- (17) ERIE INTL AP [USW00014860], Erie, PA
- (18) AKRON [USC00330061], Akron, OH
- (19) MILLPORT 4 NE [USC00335315], Lisbon, OH
- (20) MINERAL RIDGE WTR WKS [USC00335356], Mineral Ridge, OH
- (21) FRANKLIN [USC00363028], Franklin, PA
- (22) NEW CASTLE 1 N [USC00366233], New Castle, PA
- (23) SPRINGBORO 3 WNW [USC00368361], Springboro, PA
- (24) DORSET [USC00332251], Dorset, OH
- (25) KIRTLAND-HOLDEN 2 [USC00334260], Chardon, OH
- (26) OBERLIN [USC00336196], Oberlin, OH
- (27) JAMESTOWN 2 NW [USC00364325], Jamestown, PA
- (28) LINESVILLE 1 S [USC00365050], Linesville, PA
- (29) TITUSVILLE WTR WKS [USC00368888], Titusville, PA
- (30) YOUNGSTOWN RGNL AP [USW00014852], Vienna, OH
- (31) AKRON CANTON RGNL AP [USW00014895], North Canton, OH

## Influencing water features

Site has seasonal high water table within 0-25 cm of the surface. Some sites may have a perched water table or ponding due to the impermeability of finer textures.

## Soil features

Soils are poorly drained to very poorly drained loam and silt loam. They are commonly classified Aeric Epiaquepts, Typic Fragiaqualfs, and Aeric Haplaquepts, and commonly mapped as Mill, Frenchtown, and Allis series or components. The upper 50 cm has a typical pH of 5.1 and is 20% sand. In the upper 150 cm, there is 1% organic matter, 25% sand, and 25% clay. The pH ranges up to 6.9 with depth. Depth to impeded hydraulic conductivity or root restrictive layers averages 45 cm. Depth to carbonates averages 180 cm. Depth to seasonal high water table averages 10 cm.

## Ecological dynamics

Wet Acidic Depression tends to share the same ecological dynamics as Natureserve/Landfire system, North-Central Appalachian Acidic Swamp. Depending on vegetation phase and wetness, stand replacing fires occurred every 550-2000 years, while light surface fires happened rarely. Overstory converged upon late successional species like hemlock (*Tsuga canadensis*) with swamp yellow birch (*Betula alleghaniensis*). Characteristic understory wetland shrubs include winterberry (*Ilex verticillata*).

## State and transition model

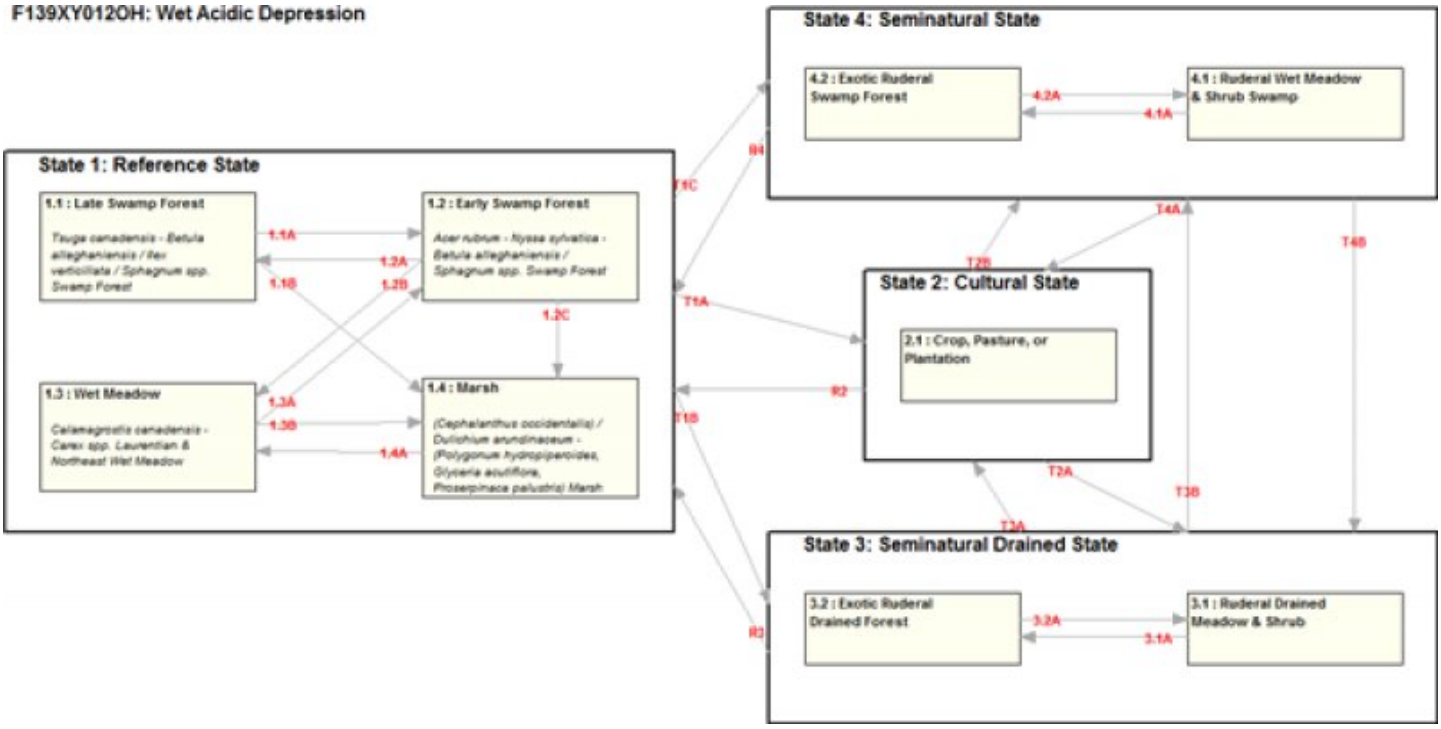


**Figure 6. stm**

# Legend

| | |
|---|---|
| T1A | Drain; clear vegetation; cultivate domesticated species |
| T1B | Drain; clear vegetation, invasive species introduced |
| T1C | Clear vegetation, invasive species introduced |
| 1.1A | Blowdown/clearcut |
| 1.1B | Wetter; blowdown |
| 1.2A | Succession |
| 1.2B | Blowdown; fire |
| 1.2C | Wetter; blowdown |
| 1.3A | Succession |

| | |
|---|---|
| 1.3B | Wetter; blowdown |
| 1.4A | Drier |
| R2 | Restore hydrology; remove domesticate species; restore native species |
| T2A | Abandoned, succession |
| T2B | Restore hydrology; abandoned; succession |
| R3 | Restore hydrology; control invasive species; restore native species |
| T3A | Clear vegetation; cultivate domesticated species |
| T3B | Restore hydrology |
| 3.1A | Succession |
| 3.2A | Blowdown/clearcut |
| R4 | Control invasive species; restore native species |
| T4A | Drain; clear vegetation; cultivate domesticated species |
| T4B | Drain |
| 4.1A | Succession |
| 4.2A | Blowdown/clearcut |

**Figure 7. legend**

### State 1
### Reference State

### Community 1.1
### Swamp Forest: Tsuga canadensis - Betula alleghaniensis / Ilex verticillata / Sphagnum spp. Swamp Forest

### Community 1.2
### Wet Meadow

### Community 1.3
### Shrub-Thicket

### Community 1.4
### Emergent Marsh

### Community 1.5
### Inundated Shrub Swamp

### Pathway 1.1A
### Community 1.1 to 1.2

Temporary prolonged inundation.

### Pathway 1.1B
### Community 1.1 to 1.3

Clearcut/Blowdown.

**Conservation practices**

| |
|---|
| Early Successional Habitat Development/Management |
| Forest Stand Improvement |

### Pathway 1.2A
### Community 1.2 to 1.1

Succession.

**Conservation practices**

| |
|---|
| Tree/Shrub Site Preparation |
| Tree/Shrub Establishment |

### Pathway 1.2B
### Community 1.2 to 1.3

Succession.

**Conservation practices**

| Tree/Shrub Site Preparation |
| --- |
| Tree/Shrub Establishment |

### Pathway 1.2D
### Community 1.2 to 1.4

Permanent inundation.

### Pathway 1.2E
### Community 1.2 to 1.5

Shrub establishment; permanent inundation.

**Conservation practices**

| Tree/Shrub Establishment |
| --- |

### Pathway 1.3A
### Community 1.3 to 1.1

Succession.

**Conservation practices**

| Tree/Shrub Site Preparation |
| --- |
| Tree/Shrub Establishment |

### Pathway 1.3B
### Community 1.3 to 1.2

Temporary prolonged inundation.

### Pathway 1.3C
### Community 1.3 to 1.4

Permanent inundation.

### Pathway 1.3C
### Community 1.3 to 1.5

Permanent inundation.

### Pathway 1.4A
### Community 1.4 to 1.2

Drop water table.

### Pathway 1.4C
### Community 1.4 to 1.5

Temporary drop water table; shrub establishment.

### Pathway 1.5A
### Community 1.5 to 1.2

Drop water table; shrub mortality.

**Conservation practices**

| |
|---|
| Brush Management |

### Pathway 1.5C
### Community 1.5 to 1.4

Temporary drought; shrub mortality.

## State 2
## Cultural State

### Community 2.1
### Sustainable Crop, Pasture, or Plantation

### Community 2.2
### Unsustainable Cultural Phase

### Community 2.3
### Conservation Feature

Can be a grassed waterway, conservation reserve, a small patch pollinator garden, or other land taken out of its primary cultural production to mitigate or reduce impacts of adjacent land use, and is not by itself a permanent restoration of a complete native biological community and associated ecosystem services.

### Pathway 2.1A
### Community 2.1 to 2.2

Revert to unsustainable cultural practices.

### Pathway 2.1B
### Community 2.1 to 2.3

Establish conservation feature.

**Conservation practices**

| |
|---|
| Conservation Cover |
| Grassed Waterway |

### Pathway 2.2A
### Community 2.2 to 2.1

Implement sustainable cultural practices.

**Conservation practices**

| |
|---|
| Conservation Crop Rotation |
| Cover Crop |
| Nutrient Management |
| Integrated Pest Management (IPM) |

### Pathway 2.2B
### Community 2.2 to 2.3

Establish conservation feature.

**Conservation practices**

| |
|---|
| Conservation Cover |
| Grassed Waterway |

### Pathway 2.3A
### Community 2.3 to 2.1

Implement sustainable cultural practices.

**Conservation practices**

| |
|---|
| Conservation Crop Rotation |
| Cover Crop |
| Nutrient Management |
| Integrated Pest Management (IPM) |

### Pathway 2.3B
### Community 2.3 to 2.2

Revert to unsustainable cultural practices.

## State 3
## Seminatural Drained State

### Community 3.1
### Ruderal Drained Meadow & Shrub

### Community 3.2
### Exotic Ruderal Drained Forest

### Pathway 3.1A
### Community 3.1 to 3.2

Succession

### Pathway 3.2A
### Community 3.2 to 3.1

Blowdown/clearcut.

**Conservation practices**

| |
|---|
| Early Successional Habitat Development/Management |
| Forest Stand Improvement |

## State 4
## Seminatural State

### Community 4.1
### Ruderal Wet Meadow & Shrub Swamp

### Community 4.2
### Exotic Ruderal Swamp Forest

### Pathway 4.1A
### Community 4.1 to 4.2

Succession.

### Pathway 4.2A
### Community 4.2 to 4.1

Blowdown/clearcut.

**Conservation practices**

| |
|---|
| Early Successional Habitat Development/Management |
| Forest Stand Improvement |

### Transition T1A
### State 1 to 2

Drain; clear vegetation; cultivate domesticated species.

### Transition T1B
### State 1 to 3

Drain; clear vegetation, invasive species introduced.

### Transition T1C
### State 1 to 4

Clear vegetation, invasive species introduced.

### Restoration pathway R2
### State 2 to 1

Restore hydrology; remove domesticated species; restore native species.

**Conservation practices**

| |
|---|
| Brush Management |
| Restoration and Management of Rare and Declining Habitats |
| Wetland Wildlife Habitat Management |
| Wetland Restoration |
| Herbaceous Weed Control |

### Transition T2A
### State 2 to 3

Abandon, succession.

### Transition T2B
### State 2 to 4

Restore hydrology; abandon; succession.

**Conservation practices**

| |
|---|
| Wetland Restoration |

### Restoration pathway R3
### State 3 to 1

Restore hydrology; control invasive species; restore native species

**Conservation practices**

| |
|---|
| Brush Management |
| Restoration and Management of Rare and Declining Habitats |
| Wetland Wildlife Habitat Management |
| Wetland Restoration |
| Herbaceous Weed Control |

### Transition T3A
### State 3 to 2

Clear vegetation; cultivate domesticated species.

### Transition T3B
### State 3 to 4

Restore hydrology.

**Conservation practices**

| |
|---|
| Wetland Restoration |

### Restoration pathway R4
### State 4 to 1

Control invasive species; restore native species.

**Conservation practices**

| |
|---|
| Brush Management |
| Restoration and Management of Rare and Declining Habitats |
| Wetland Wildlife Habitat Management |
| Herbaceous Weed Control |

### Transition T4A
### State 4 to 2

Drain; clear vegetation; cultivate domesticated species.

### Transition T4B

### State 4 to 3

Drain.

## Additional community tables

## Other references

A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a major land resource area (MLRA) based on the similarities in response to management. A provisional ecological site is a first approximation based on a cursory literature review, personal experience, and limited field reconnaissance. As more adequate literature review, expert opinion, and intensive plot data are collected, the site concept is subject to shifting, broadening, narrowing, subdivision, or re-aggregation in definition. Likewise, the community dynamics will be more elaborate in content, and may also change in structure, upon reaching approved status.

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.

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## Contributors

Greg J. Schmidt

## Approval

Nels Barrett, 10/03/2019

## 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:**