USDA Natural Resources Conservation Service

Ecological site R103XY035MN
Organic Floodplain Marsh

Last updated: 10/04/2023
Accessed: 05/05/2024

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): 103X–Central Iowa and Minnesota Till Prairies

MLRA 103 is in Minnesota (56 percent) and Iowa (44 percent) and consists of approximately 18 million acres. It is in the Western Lake Section of the Central Lowland Province of the Interior Plains in an area known as the "Des Moines Lobe" of the Wisconsin-age ice sheet. The MLRA is mostly on a young, nearly level to gently rolling, glaciated till plain that has moraines and glacial lake plains in some areas. The plain is covered with glacial till, outwash, and glacial lake deposits. Recent alluvium consisting of clay, silt, sand, and gravel fill the bottoms of most of the major river valleys. Paleozoic bedrock sediments, primarily shale and limestone, underlie the glacial deposits in most of the area.

The annual precipitation increases from northwest to southeast. Most of the rainfall occurs as high-intensity, convective thunderstorms during the summer. Two-thirds or more of the precipitation falls during the freeze-free period. Snowfall is common in winter. Ground water supplies are adequate for the domestic, livestock, municipal, and industrial needs. Nearly all of this area is farmland, and about four-fifths is cropland.

Classification relationships

Major Land Resource Area (MLRA): Central Iowa and Minnesota Till Prairies (103) (USDA Handbook 296, 2006)

USFS Subregions: North Central Glaciated Plains Section (251B); Upper Minnesota River-Des Moines Lobe (251BA) and Southern Des Moines Lobe (251Be) Subsections (Cleland et al. 2007)

Relationship to Other Established Classifications:
The reference state shares similarities with the Minnesota Department of Natural Resources MRp93 Prairie Bulrush – Arrowhead Marsh

Ecological site concept

The Organic Floodplain Marsh ecological site is located on floodplains and depressions primarily in the northern portion of MLRA 103. This site is influenced by its hydrologic relationship with the adjacent river or stream and is located in back swamps. Depth to saturation mostly fluctuates with the level of the river or stream. Dominant vegetation in the reference state includes softstem bulrush (*Schoenoplectus tabernaemontani*) and multiple species of sedge (Carex spp.).

Associated sites

F103XY032MN	**Loamy Floodplains** The Loamy Floodplains ecological site is located on medium textured alluvium throughout MRLA 103. Soils textures include loam, silt loam, sandy loam and fine sandy loam. Some areas within this ecological site will exhibit long-term flooding (7-30 days).

Similar sites

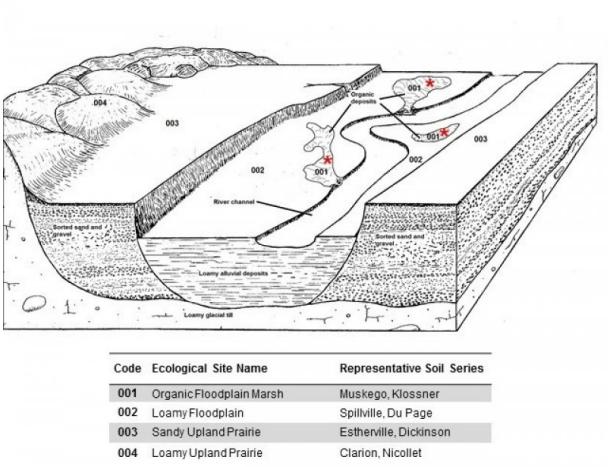
R103XY034MN	**Floodplain Marsh** The Floodplain Marsh ecological site is located on floodplains and depressions. Soils are fine or medium textured and very poorly drained. Flooding on this site ranges from none to frequent with some areas flooding up to 30 days. Ponding is also variable (none to frequent) with areas inundated longer than 30 days. Herbaceous plant communities usually dominate.

Table 1. Dominant plant species

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

Physiographic features

The Organic Floodplain Marsh ecological site is influenced by its hydrologic relationship with the adjacent river or stream, as the depth to saturation mostly fluctuates with the level of the waterbody. This site is often located away from the highly active river channel, such as back swamps. Flooding and ponding can be frequent and long term.



Code	Ecological Site Name	Representative Soil Series
001	Organic Floodplain Marsh	Muskego, Klossner
002	Loamy Floodplain	Spillville, Du Page
003	Sandy Upland Prairie	Estherville, Dickinson
004	Loamy Upland Prairie	Clarion, Nicollet

Figure 1. Block diagrams of the representative Organic Floodplain Marsh and associated ecological sites.

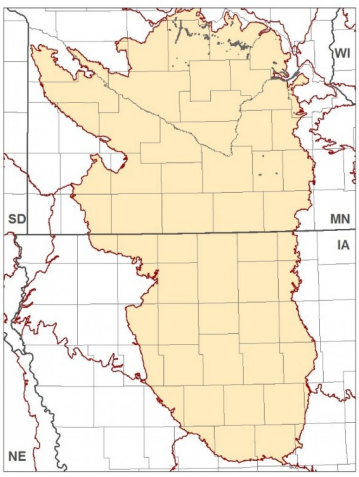


Figure 2. Distribution of the Organic Floodplain Marsh ecological site within MLRA 103. In many cases, the data set is not spatially consistent across political boundaries due to the method by which soils were mapped; e.g. due to county subsets.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Depression
Runoff class	Negligible to very low
Flooding duration	Long (7 to 30 days)
Flooding frequency	Frequent
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	689–1,837 ft
Slope	0–1%
Water table depth	0–36 in
Aspect	Aspect is not a significant factor

Climatic features

The soil temperature regime of MLRA 103 is classified as “mesic” (i.e., mean annual soil temperature between 46 and 59°F). The average freeze-free period of this site is 150 days, while the frost-free period is 131days. Average mean annual precipitation is 32 inches, which includes rainfall plus the water equivalent from snowfall. Cold air drainage from above and the fact that wet soils are generally colder than dry soils make this site colder than adjacent, upslope sites. As a result, snow and frost remain longer in the spring, thus resulting in shorter growing seasons than the adjacent uplands.

Table 3. Representative climatic features

Frost-free period (characteristic range)	128-134 days
Freeze-free period (characteristic range)	147-152 days
Precipitation total (characteristic range)	30-33 in
Frost-free period (actual range)	124-136 days
Freeze-free period (actual range)	147-153 days
Precipitation total (actual range)	30-35 in
Frost-free period (average)	131 days
Freeze-free period (average)	150 days
Precipitation total (average)	32 in

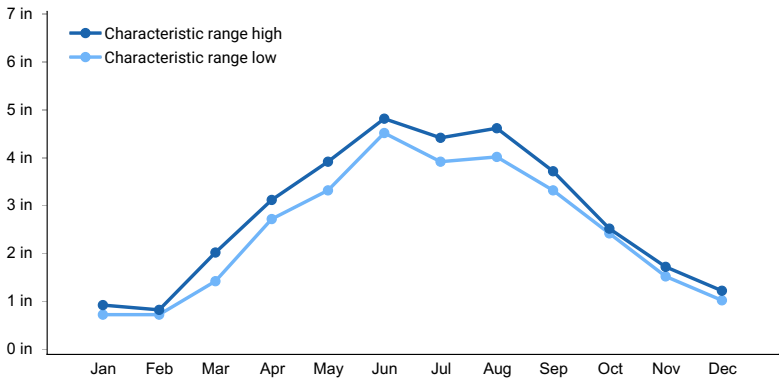


Figure 3. Monthly precipitation range

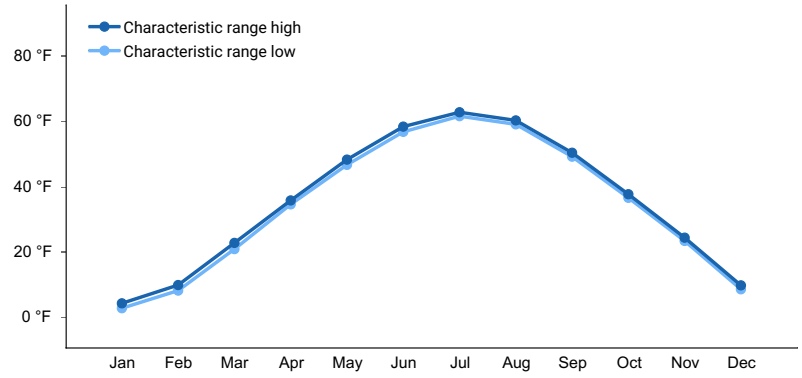


Figure 4. Monthly minimum temperature range

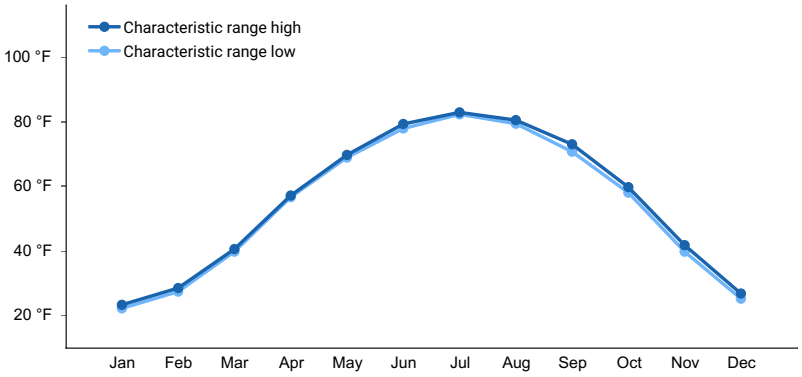


Figure 5. Monthly maximum temperature range

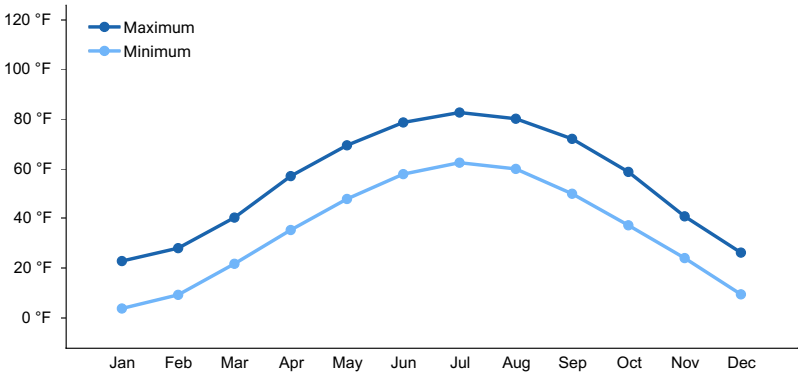


Figure 6. Monthly average minimum and maximum temperature

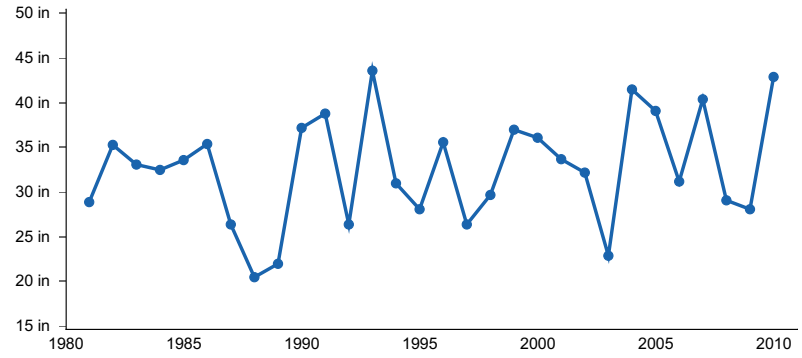


Figure 7. Annual precipitation pattern

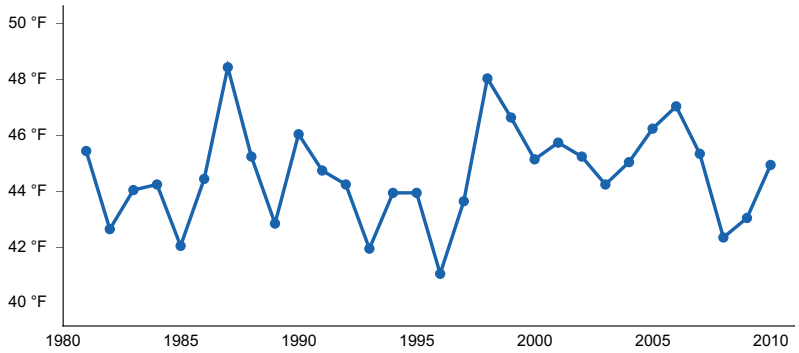


Figure 8. Annual average temperature pattern

Climate stations used

- (1) DASSEL [USC00212023], Dassel, MN
- (2) DELANO [USC00212088], Delano, MN
- (3) WASECA EXP STN [USC00218692], Waseca, MN
- (4) WELLS [USC00218808], Wells, MN
- (5) BUFFALO 2NE [USC00211107], Buffalo, MN

Influencing water features

The Organic Floodplain Marsh ecological site is hydrologically related to a stream or river. With natural hydrology intact, the depth to saturation is influenced by the water level of the waterbody. During most months, especially the warmer ones, this site receives precipitation and runoff, even though this is a minor water source compared to the adjacent river or stream. During the spring months these soils are frequently flooded and ponded.

The soils are classified as endosaturated. The water table is typically above the soil surface during the spring months due to flooding and/or ponding and may drop to as low as three feet later in the growing season during dry periods. Because organic soil materials can hold water stronger than gravity can pull it out, these soils can often stay saturated for a delayed period after the flooding of the main river channel has subsided. In the hydrogeomorphic (HGM) classification system, this site is considered a part of a riverine complex. This site has a Temporarily Flooded Cowardin Hydrologic classification of Palustrine, Emergent Wetland, Persistent, Seasonally Flooded (Cowardin, 2013). The site is a United States Army Corps of Engineers Wetland Plant Community of A; Seasonally Flooded Basins.

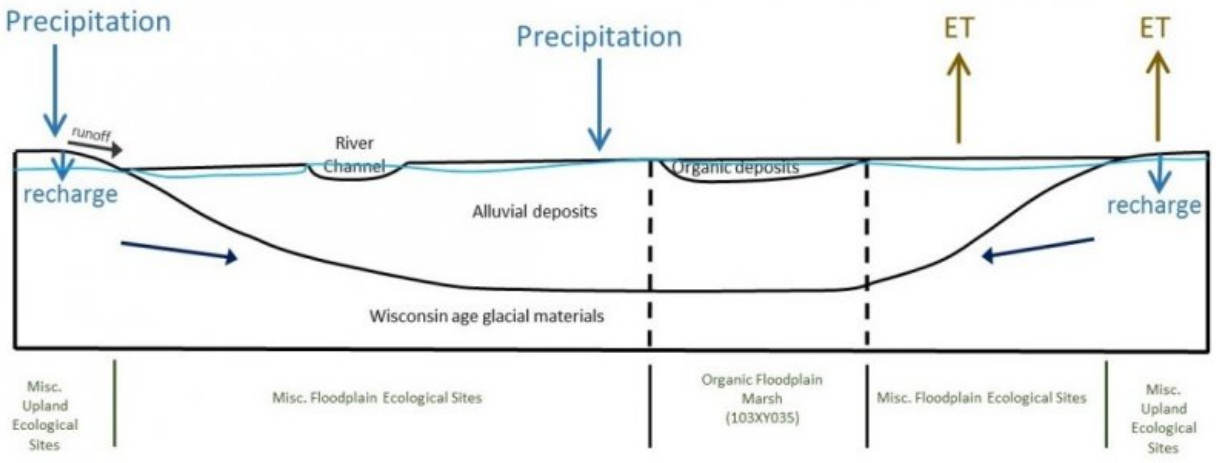


Figure 9. Representation of hydrological factors in a typical area of the Organic Floodplain Marshes and associated ecological sites on the Des Moines Lobe (MLRA 103).

Soil features

Organic Floodplain Marsh soils are rich in organic matter and developed under hydrophytic vegetation with

flooded/ponded conditions. Organic soils have thick, dark histic horizons composed mainly of organic matter, mostly the remains of plants. A histic horizon consists of organic material that is saturated with water for 30 consecutive days or more in most years (unless artificially drained). Terric, Limnic, and Typic Histosols are central to the Organic Floodplain Marsh ecological site. Terric Histosols have a mineral substratum within the range of 16-51 inches and Typic/Limnic Histosols have a mineral substratum below 51 inches. Soil drainage class is very poorly drained. The surface texture is muck, and organic horizons above the mineral soil substratum have around 65 percent organic matter. The subsurface textural group below the organic material, when present within the series control section, is classified primarily as fine-loamy (with 18 to 35 percent clay) but also includes coarse-loamy (with less than 18 percent clay) and sometimes sandy (less than 15 percent clay and 30 percent silt). Klossner is the most extensive Terric Histosol in this ecological site, while Houghton and Muskego are the more extensive deeper Histosols. Houghton is a Typic Haplosaprist and Muskego is a Limnic Haplosaprist. Muskego has limnic materials (sedimentary, non-herbaceous peat) between 16 and 51 inches.

Organic soils, such as Muskego which have limnic material, often form in conditions that are prone to being ponded after flooding. The organic soils lacking limnic materials likely formed in a place that has been more prone to flooding without ponding.

All these soils were formed under saturated conditions that produced anaerobic conditions during much of the year. The anaerobic conditions inhibit the decomposition of the organic matter which accumulates to form organic soils.

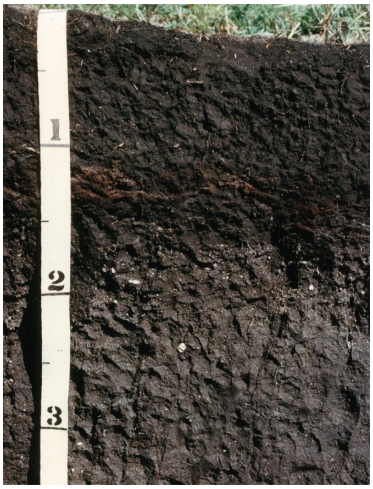


Figure 10. A Muskego soil with limnic material at around 2’

Table 4. Representative soil features

Parent material	(1) Organic material (2) Alluvium
Surface texture	(1) Muck
Family particle size	(1) Fine-loamy (2) Coarse-loamy (3) Coarse-silty (4) Fine-silty (5) Sandy
Drainage class	Very poorly drained
Permeability class	Slow to very rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-60in)	7–27 in
Calcium carbonate equivalent (0-40in)	0–80%

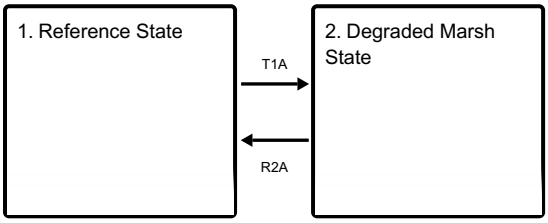
Soil reaction (1:1 water) (0-40in)	6.1–8.4
Subsurface fragment volume <=3" (0-40in)	0–15%
Subsurface fragment volume >3" (0-40in)	0–5%

Ecological dynamics

The Organic Floodplain Marsh ecological site is characterized by soils hydrologically related to an adjacent stream or river. Vegetation is native, wet-tolerant grasses. Today, many of these sites have been disturbed either by the establishment of invasive species or through changes to hydrology. The state and transition model (STM) consists of two states: Reference State and the Degraded Marsh State. State 1 describes a natural community with wet-tolerant native bulrushes and sedges. State 2 is the degraded marsh in which disturbances have altered the natural plant community composition and structure. Drainage, unmanaged grazing, and invasive species are common triggers.

State and transition model

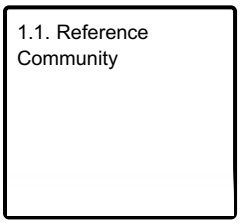
Ecosystem states



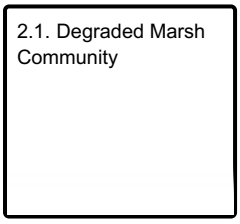
T1A - Disturbances alter the plant community composition

R2A - Management inputs to restore site

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference State

The Organic Floodplain Marsh ecological site is characterized by a native, wet tolerant, plant community. Dominant species will depend on depth of ponding and flooding. The most common month for flooding/ponding of this site is April. Water depth and flooding will create inherent plant variations on this site. Shallow marsh areas will be dominated by broadleaf cattail (*Typha latifolia*) and river bulrush (*Bolboschoenus fluviatilis*). Deeper marsh zones will be dominated by softstem bulrush (*Schoenoplectus tabernaemontani*) and multiple species of sedges (Carex spp.), including hairy sedge (*Carex lacustris*). Open water, when present, will include American white waterlily (*Nymphaea odorata*) and coon's tail (*Ceratophyllum demersum*).

Dominant plant species

- softstem bulrush (*Schoenoplectus tabernaemontani*), grass
- hairy sedge (*Carex lacustris*), grass
- river bulrush (*Bolboschoenus fluviatilis*), grass
- broadleaf cattail (*Typha latifolia*), grass
- American white waterlily (*Nymphaea odorata*), other herbaceous
- coon's tail (*Ceratophyllum demersum*), other herbaceous

Community 1.1
Reference Community

The reference community, with natural hydrology intact, is dominated by native, hydrophytic species tolerant of frequent flooding and ponding. The composition and structure of the plant community will depend on the hydrology.

Dominant plant species

- softstem bulrush (*Schoenoplectus tabernaemontani*), grass
- hairy sedge (*Carex lacustris*), grass
- river bulrush (*Bolboschoenus fluviatilis*), grass
- broadleaf cattail (*Typha latifolia*), grass
- American white waterlily (*Nymphaea odorata*), other herbaceous
- coon's tail (*Ceratophyllum demersum*), other herbaceous

State 2
Degraded Marsh State

The Degraded Marsh State is characterized by one or more disturbance triggers. These disturbances could be hydrologic alterations, non-native plants species, cattle grazing, or an increase woody plant species. Common species include narrowleaf cattail, hybrid cattail, reed canarygrass, common reed, and various shrubs and tree saplings. Plant community composition will be influenced by the type, severity, and duration of disturbances as well as the depth of flooding and ponding. Some sites in this state may be in conservation easements. Areas not in a conservation program are assumed to be jurisdictional wetlands, making it very unlikely they will be transitioned to agriculture due to various wetland programs and laws, including the Swampbuster provision of the Food Security Act of 1985 (P.L. 99-198, as amended by P.L. 115-25) and the Minnesota Wetland Conservation Act (WCA) of 1991 (M.R. 8420.0100, as amended in 2009).

Dominant plant species

- narrowleaf cattail (*Typha angustifolia*), grass
- hybrid cattail (*Typha ×glauca*), grass
- reed canarygrass (*Phalaris arundinacea*), grass
- common reed (*Phragmites australis*), grass

Community 2.1
Degraded Marsh Community

The Degraded Marsh Community is characterized by various disturbances such as hydrological modifications, non-native invasive plants, cattle grazing, and an increase in woody species. A variety of invasive woody plants and grasses can become dominant on this site. Typical species include hybrid cattail, reed canarygrass, common reed, and various woody plants. Plant community composition will be influenced by the severity and type of disturbances and the duration and depth of ponding.

Dominant plant species

- narrowleaf cattail (*Typha angustifolia*), grass
- hybrid cattail (*Typha ×glauca*), grass
- reed canarygrass (*Phalaris arundinacea*), grass
- common reed (*Phragmites australis*), grass

Transition T1A
State 1 to 2

Disturbances such as cattle grazing and invasive species will alter the reference plant community composition and structure.

Restoration pathway R2A
State 2 to 1

Restoration activities may include the eliminate of invasive plant species, establishment of desired native species, and protection of the site from disturbances such as cattle grazing. Complete restoration is only possible if the natural hydrology still exists.

Additional community tables

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in ecological site description.

Other references

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC.

Cowardin, L. M., V. Carter, F. C. Golet, and E.T. LaRoe. 1979 (revised 2013). Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31, U.S. Department of Interior-Fish and Wildlife Service, Washington, D.C.

Gilbert, M.C., P.M. Whited, E.J. Clairain, Jr., and D.R. Smith. 2006. A Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Prairie Potholes. ERDC/EL TR-06-5, U.S. Army Corps of Engineers, Vicksburg, MS.

Gleason, R. A., N. H. Euliss Jr., D. E. Hubbard, and W. G. Duffy. 2004. Invertebrate Egg Banks of Restored, Natural, and Drained Wetlands in the Prairie Pothole Region of the United States. Wetlands 24:3, 562-572.

H.R. 2100 – 99th Congress: Food Security Act of 1985, Pub. L. No. 99-198, Stat 1504, Sec. 1221-1223.

Minnesota Department of Natural Resources. 2005. Field Guide to the Native Plant Communities of Minnesota: the Prairie Parkland and Tallgrass Aspen Parklands Provinces. Ecological Land Classification Program, Minnesota County Biological Survey, and Natural Heritage and Nongame Research Program. St. Paul, Minnesota.

Minnesota Rules, part 8420.0100, subpart 1, item A-D (2009).
Ojakangas, R.W. and C.L. Matsch. 1982. Minnesota’s Geology. University of Minnesota Press. Minneapolis, MN.

USDA-NRCS. 2008. Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service. Technical Note No. 190–8–76. Washington D.C.

USDA-NRCS. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean and the Pacific Basin. United States Department of Agriculture Handbook 296.

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Approval

Suzanne Mayne-Kinney, 10/04/2023

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	10/04/2023
Approved by	Suzanne Mayne-Kinney
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:**