

Ecological site R103XY015MN

Depressional Marsh

Last updated: 10/04/2023
Accessed: 08/31/2026

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): 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 Minnesota Department of Natural Resources MRp83 Prairie Mixed Cattail Marsh

Ecological site concept

The Depressional Marsh ecological site is extensive (>100,000 acres) in MLRA 103 and occurs in the central prairie region and the northeastern Big Woods ecoregion. Hydrologic interaction with adjacent sloping ground classifies this site as a recharge wetland. Landscape positions include slightly concave (depressional) to linear segments. Soils are very poorly drained, frequently ponded, and have a relatively high organic matter content in the surface and near surface horizons. Plant species dominance is influenced by water depth.

Associated sites

R103XY001MN	Loamy Wet Prairies The Loamy Wet Prairies ecological site is located on inter-depressional linear slopes and slight depressions on till plains, moraines, and short-lived lakeplains. Soil parent materials are loamy till and lacustrine materials. The drainage class is poorly drained but the site does not flood or pond.
R103XY009MN	Calcareous Rim Prairies The Calcareous Rim Prairies ecological site is characterized by landscape position (rim), calcareous soils, low slope (0-2%), and poorly drained soils. This site is hydrologically connected to adjacent ponded depressions. This site does not pond.

R103XY005MN	Clayey Upland Prairies The Clayey Upland Prairies ecological site is located on uplands, including lakeplains, ground moraines, and till plains. Soils in this ecological site have a dark surface layer (mollic epipedon) and clayey textures. This site is not subject to flooding or ponding. Drainage class is somewhat poorly drained to well drained.
F103XY026MN	Clayey Upland Forests The Clayey Upland Forests ecological site is located on uplands. The soils are derived from clayey till and lacustrine (lake) materials, and drainage class ranges from somewhat poorly drained to well drained. The soils have a thin or moderately thick mollic (dark) surface.
R103XY003MN	Sandy Upland Prairies The Sandy Upland Prairies ecological site is located on uplands including outwash plains and valley trains along modern river valleys. Soils are formed from sandy and coarse loamy outwash and loamy-mantled outwash. Sites do not flood or pond. The reference state site concept is a mesic native prairie.
F103XY028MN	Clayey Wet Forests The Clayey Wet Forests ecological site occurs on clayey textured soils that have a seasonal depth to soil saturation of 0 to 30 cm. This site is located on concave or linear low-slope areas, but no flooding or ponding usually occurs.

Similar sites

R103XY016MN	Organic Marsh The Organic Marsh ecological site occurs in the centers of medium to large-sized depressions and is typically surrounded by mineral soils associated with the Depressional Marsh ecological site. Soils are very poorly drained and ponded with deep water throughout the growing season in most years (i.e. semi-permanent wetlands). Soils are developed from organic parent materials.
--------------------	---

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Typha latifolia</i> (2) <i>Bolboschoenus fluviatilis</i>

Physiographic features

The Depressional Marsh ecological site is predominantly located in the prairie region and Big Woods ecoregion of MLRA 103. This site is partially defined by the hydrologic relationship with adjacent uplands that surround the depressions. This site may be quite linear in shape; however, “depression” best describes the overall landform. The shallow, bowl-type topography, along with prairie fires during dry periods, kept the soil organic accumulation to a minimum.

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

Figure 2. Distribution of the Depressional 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.

Figure 3. The Big Woods ecoregion shaded in dark green. (Minnesota Department of Natural Resources)

Table 2. Representative physiographic features

Landforms	(1) Till plain (2) Moraine (3) Lake plain (4) Outwash plain
Runoff class	Negligible to very low
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	210 – 560 m
Slope	0 %
Water table depth	0 – 90 cm
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 157 days, while the frost-free period is 134 days. The 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 areas. 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)	130-140 days
Freeze-free period (characteristic range)	160-160 days
Precipitation total (characteristic range)	740-860 mm
Frost-free period (actual range)	130-140 days

Freeze-free period (actual range)	150-160 days
Precipitation total (actual range)	710-910 mm
Frost-free period (average)	130 days
Freeze-free period (average)	160 days
Precipitation total (average)	810 mm

- (1) SPIRIT LAKE [USC00137859], Spirit Lake, IA
- (2) DASSEL [USC00212023], Dassel, MN
- (3) MARSHALL [USC00215204], Marshall, MN
- (4) OWATONNA [USC00216287], Owatonna, MN
- (5) LAKE PARK [USC00134561], Lake Park, IA
- (6) IOWA FALLS [USC00134142], Iowa Falls, IA
- (7) PERRY [USC00136566], Perry, IA

Influencing water features

The Depressional Marsh ecological site receives water from lateral subsurface flow or discharge, the regional groundwater table, direct precipitation, and runoff from uplands. Soils are classified as endosaturated and ponded during the spring. The water table may drop to as low as three feet during dry periods. In the hydrogeomorphic (HGM) classification system, this site is considered a part of a depressional complex, receiving discharge from associated upslope ecological sites (USDA-NRCS, 2008; Gilbert et al., 2006). This site has a Cowardin Hydrologic Regime of Palustrine, Emergent Wetland Persistent (PEMC). It also has a United States Army Corps of Engineers Wetland Plant Community of G; Shallow Marshes.

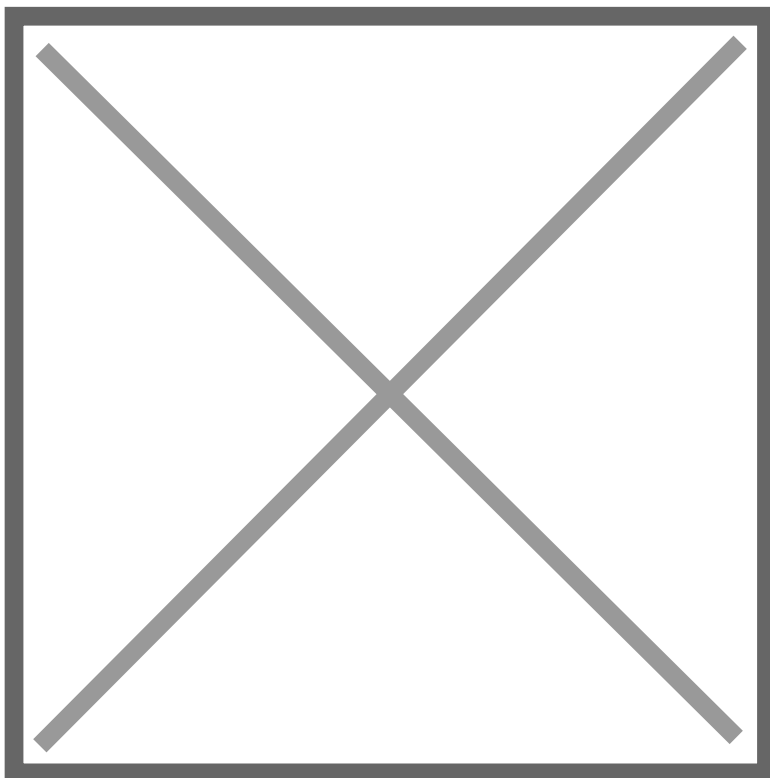


Figure 10. Hydrologic representation of a typical Des Moines Lobe (MLRA 103) Depressional Marsh and associated Ecological Sites.

Soil features

The soil series associated this ecological site are Glencoe, Okoboji, Biscay, Calcousta, Dassel, Granby, Hanska, Isanti, Knoke, Lanyon, Lundlake, Lura, Mayer, Oldham, Quam, Romnell, Shandep, Urness, Spicer, and Wacousta. These soils are relatively rich in organic matter and were developed under hydric vegetation and ponded conditions. They are mineral soils and can have a thin (8 inches) histic cap. Glencoe and Okoboji are central to the site concept.

Soil drainage class is very poorly drained. The surface texture is variable at silty clay loam, clay loam, silt loam, silty clay, or mucky analogues of these textures. The subsurface group is classified primarily as fine-loamy (with 18 to 35% clay) and fine (greater than 35 % clay), but also includes coarse-loamy (with less than 18% clay), silty (less than 15% sand and 35% clay) and sandy (less than 15% clay and 30% silt). These soils were formed under saturated conditions that produced anaerobic conditions during much of the year. The anaerobic conditions inhibit decomposition of the organic matter which enriches the surface horizons. Since this site formed in ponded or intermittently ponded conditions in low areas, a certain amount of sediment tended to wash into the depressions. In some scenarios, these soils formed in lacustrine environments and tend to be finer. Most of the soils in this group are cumelic, which means they have mollic epipedons that are less than 24 inches thick.

Due to soil saturation, the variety of subsurface textures affect plant growth less than in other, upslope ecological sites. The high water table is a factor that overrides other soil properties (such as texture) in influencing the plant community composition.

Table 4. Representative soil features

Parent material	(1) Glaciofluvial deposits (2) Slope alluvium (3) Till (4) Outwash (5) Lacustrine deposits
Surface texture	(1) Silty clay loam (2) Clay loam (3) Silt loam (4) Silty clay (5) Muck
Drainage class	Very poorly drained
Permeability class	Slow to rapid
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified

Available water capacity (0-152.4cm)	12.7 – 33.02 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 30 %
Soil reaction (1:1 water) (0-101.6cm)	5.1 – 8.4
Subsurface fragment volume <=3" (0-101.6cm)	0 – 40 %
Subsurface fragment volume >3" (0-101.6cm)	0 – 10 %

Ecological dynamics

The Depressional Marsh ecological site state and transition model (STM) has three states: the Reference State, the Degraded State, and the Tillage State. The Reference State describes a native, hydrophytic plant community with natural hydrology and no human disturbance triggers. State 2 is a Degraded Marsh State in which human disturbances have modified the plant community. Common triggers include cattle grazing, invasive species, absence of natural fire, and hydrological modifications. State 3 is the Tillage State which describes intensive agricultural production. These sites were primarily transitioned agriculture prior to current wetland protection regulations. This is the most common state in MLRA 103 for this site.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

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

Table 6. Community 2.1 plant community composition

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

Table 7. Community 3.1 plant community composition

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

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.

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.

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.

Contributors

Clayton Johnson (Clayton.Johnson@usda.gov), Soil Survey Office Leader, USDA-NRCS, Albert Lea, MN
Myles Elsen (Myles.Elsen@usda.gov), Soil Scientist, USDA-NRCS, Albert Lea, MN
Anita Arends (Anita.Arends@usda.gov), USDA-NRCS, Springfield, IL

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	08/31/2026
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:
