

Ecological site R102AY037SD

Deep Marsh

Last updated: 5/05/2025
Accessed: 09/16/2026

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): 102A–Rolling Till Prairie

The Rolling Till Prairie (102A) is located within the Central Feed Grains and Livestock Land Resource Region. It spans 3 states (Minnesota 58 percent, South Dakota 42 percent, and small part in North Dakota), encompassing over 16,000 square miles (Figure 1). The elevation ranges from approximately over 2,000 feet above sea level (ASL) on the Prairie Coteau in Northeastern South Dakota to about 1,000 feet ASL on lowlands. The dominate landform in this area are stagnation moraines, end moraines, glacial outwash plains, terraces, and flood plains. The area is dominated by till covered moraines. The stagnation moraines are gently undulating to steep and have many depressions and poorly defined drainages. Small outwash areas are adjacent to the watercourses. The Cretaceous Pierre Shale underlies the till in the most of the area. Precambrian rocks also occur at depth. Granite is quarried near Milbank, South Dakota and outcrops of Sioux Quartzite are common. (USDA-NRCS 2006). The dominant soil order in this MLRA is Mollisols. The soils in the area dominantly have a frigid soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. They generally are very deep, well drained to very poorly drained. This area supports true prairie vegetation characterized by big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), porcupinegrass (*Hesperostipa spartea*), and green needlegrass (*Nassella viridula*). Prairie cordgrass (*Spartina pectinata*) commonly grows in wet areas. (USDA-NRCS 2006).

Classification relationships

Major Land Resource Area (MLRA): Rolling Till Prairie (102A) (USDA-NRCS 2006) USFS Subregions: North Central Glaciated Plains Section (251B); Upper Minnesota River-Des Moines Lobe Subsection (251Ba); Outer Coteau des Prairies Subsection (251Bb); Northwest Iowa Plains Subsection (251Bd); Minnesota and Northeast Iowa Morainal-Oak Savannah Section (222M); Alexandria Moraine-Hardwood Hills Subsection (222Ma) (Cleland et al. 2007). US EPA Level IV Ecoregion: Tewaukon/Big Stone Stagnation Moraine (46e), Prairie Coteau (46k), Prairie Coteau Escarpment (46l), Big Sioux Basin (46m), Minnesota River Prairie (46o), Des Moines Lobe (47b) , Lake Agassiz Plains (48d), Alexandria Moraines and Detroit Lakes Outwash Plain (51j) (USEPA 2013)

Ecological site concept

The Deep Marsh Ecological Site typically represents the central portion of a wetland basin or depression on a glaciated prairie landscape with standing water up to 5 feet deep, and at least some tall, emergent vegetation like cattails, bulrushes and reeds. In most years there is at least some standing water but in drought years the basin surface may dry out yet retain groundwater within 1 foot of the surface.

Associated sites

R102AY001SD	Shallow Marsh These sites occur in a basin or closed depression. Soils are very poorly drained and the site will pond water until early summer in most years. The central concept soil series is Parnell and Oldham, but other series are included.
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R102AY002SD	Linear Meadow These sites occur in drainageways or along the edges of closed depressions. Soils are poorly and very poorly drained which have a water table within 0 to 2 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. The central concept soil series are Vallers and Colvin, but other series are included.
R102AY006SD	Limy Subirrigated These sites occur along the edges of drainageways. Soils are somewhat poorly drained which have a water table within 2 to 5 feet of the soil surface that persists longer than the wettest part of the growing season typically until the month of August. Soils will effervesce with acid at or near the surface. The central concept soil series is Cubden, Hamerly, McKranz, but other series are included.
R102AY010SD	Loamy These sites occur on upland areas. The soils are well drained and have less than 40 percent clay in the surface and subsoil. The central concept soil series is Barnes, Forman, and Poinsett, but other series are included.

Similar sites

R102AY001SD	Shallow Marsh The Shallow Marsh site is in a similar landscape position, but the site ponds water until early summer in most years. The Shallow Marsh site will have none to very little cattails and more prairie cordgrass than a Deep Marsh site.
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Table 1. Dominant plant species

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

Physiographic features

This site occurs on nearly level to concave depressions on uplands and till plains.

Table 2. Representative physiographic features

Slope shape across	(1) Concave
Slope shape up-down	(1) Concave
Landforms	(1) Upland > Plain

Runoff class	Very low
Flooding duration	Brief (2 to 7 days) to very long (more than 30 days)
Flooding frequency	None to frequent
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	290 – 640 m
Slope	0 %
Ponding depth	20 – 120 cm
Water table depth	0 – 10 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 102A is considered to have a continental climate – cold winters and relatively hot summers, low to moderate humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the Northern Great Plains and air masses move freely across the plains and account for rapid changes in temperature.

Annual precipitation typically ranges from 25 to 28 inches per year. The average annual temperature is about 43°F. January is the coldest month with average temperatures ranging from about 5°F (Mahnomen 1 W, Minnesota (MN)), to about 14°F (Tracy, MN). July is the warmest month with temperatures averaging from about 69°F (Mahnomen 1 W, MN), to about 73°F (Tracy, MN). The range of normal average monthly temperatures between the coldest and warmest months is about 62°F. This large annual range attests to the continental nature of this area's climate. Hourly winds are estimated to average about 11 miles per hour (mph) annually, ranging from about 13 mph during the spring to about 10 mph during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 mph.

Growth of cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and continue to early or mid-September. Greenup of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3 Representative climatic features

Frost-free period (characteristic range)	120-130 days
Freeze-free period (characteristic range)	140-150 days
Precipitation total (characteristic range)	640-710 mm

Frost-free period (actual range)	110-130 days
Freeze-free period (actual range)	140-160 days
Precipitation total (actual range)	610-740 mm
Frost-free period (average)	120 days
Freeze-free period (average)	150 days
Precipitation total (average)	660 mm

- (1) FOSSTON 1 E [USC00212916], Fosston, MN
- (2) MAHNOMEN [USC00215012], Mahnommen, MN
- (3) ROTHSAY [USC00217149], Rothsay, MN
- (4) WADENA 3 S [USC00218579], Deer Creek, MN
- (5) FERGUS FALLS [USC00212768], Fergus Falls, MN
- (6) ORWELL DAM [USC00216228], Fergus Falls, MN
- (7) DALTON 3S [USC00212015], Dalton, MN
- (8) ALEXANDRIA MUNI AP [USW00014910], Alexandria, MN
- (9) MELROSE [USC00215325], Melrose, MN
- (10) GLENWOOD 2 WNW [USC00213174], Glenwood, MN
- (11) ARTICHOKE LAKE [USC00210287], Correll, MN
- (12) BENSON [USC00210667], Benson, MN
- (13) MILAN 1 NW [USC00215400], Milan, MN
- (14) SISSETON [USC00397742], Sisseton, SD
- (15) SISSETON MUNI AP [USW00094993], Sisseton, SD
- (16) BROWNS VALLEY [USC00211063], Beardsley, MN
- (17) WILMOT [USC00399337], Wilmot, SD
- (18) MILBANK 4 NW [USC00395536], Milbank, SD
- (19) MORRIS WC EXP STN [USC00215638], Hancock, MN
- (20) MONTEVIDEO 1 SW [USC00215563], Dawson, MN
- (21) NEW LONDON [USC00215842], New London, MN

Influencing water features

This ecological site is heavily influenced by hydrology. Water accumulates in this site from landscape position run off from above and provides the foundational soil and plant relationships found on this site.

Wetland description

This ecological site may be classified as a Palustrine Emergent Semi-permanently flooded to intermittently exposed wetland according to Cowardin et al, 1979.

Soil features

The soils of the Deep Marsh ecological site formed in alluvium in depressions on uplands and plains, they are very poorly drained and have very low runoff and slow to very slow permeability. The soils on this site often have a ponded phase. The major soil series included in this ecological site are the Bigstone, Southam, Rauville, and Urness Soil Series, among others.

Table 4. Representative soil features

Parent material	(1) Till
Surface texture	(1) Silt loam (2) Silty clay loam
Drainage class	Very poorly drained to poorly drained
Permeability class	Slow to very slow
Depth to restrictive layer	180 cm
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-152.4cm)	19.05 – 25.4 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.1 – 8.4
Subsurface fragment volume <=3" (0-101.6cm)	0 – 10 %
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

The Deep Marsh Ecological Site typically represents the central portion of a wetland basin or depression on a glaciated prairie landscape with standing water up to 5 feet deep, and at least some tall, emergent vegetation like cattails, bulrushes and reeds. In most years there is at least some standing water but in drought years the basin surface may dry out yet retain groundwater within 1 foot of the surface. Within other classification systems, this ecological site generally corresponds with Stewart and Kantrud’s (1971) “Type IV wetland basin,” also called a “semipermanent pond or lake”; and with the “Palustrine Emergent Semipermanently Flooded to Intermittently Exposed Wetland” of Cowardin, et al. (1979).

Most uncultivated wetland basins in this MLRA have concentric bands of distinctly different vegetation corresponding with changes in soil and water depth. For example, while the center of the basin supports deep marsh vegetation, it is often surrounded by a zone of shallow marsh vegetation, which is in turn surrounded by a zone of wet meadow vegetation, eventually grading outward into upland soils and vegetation. Degree of slope, type of soils, and nature of the local hydrology tend to dictate the number and width of these concentric zones of vegetation.

Given the climatic extremes of the Great Plains with precipitation that ranges from drought to deluge, Deep Marsh wetland basins undergo cycles of flooding and drawdown with corresponding changes in vegetation.

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 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 2.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Inventory data references

There is no NRCS clipping data and other inventory currently available for this site. Information presented here has been derived using field observations from range-trained personnel. Those involved in developing this site include: Stan Boltz, Range Management Specialist, NRCS; and Dave Ode, Botanist/Plant Ecologist (retired) State of South Dakota.

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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)	
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Contact for lead author	
Date	01/02/2025
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:
