

Ecological site R238XY407AK

Arctic Sedge Peat Depressions

Last updated: 6/05/2025

Accessed: 03/12/2026

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): 238X–Yukon-Kuskokwim Coastal Plain

Geography

The Yukon-Kuskokwim Coastal Plain area (MLRA 238x) consists of the broad, nearly level delta along the lower reaches of the Yukon and Kuskokwim rivers, where the rivers empty into the Bering Sea. The Yukon River runs along the northern edge of the area while the Kuskokwim River runs along the southern edge. This MLRA makes up 31,565 square miles. MLRA 238x is bordered by MLRA 240x (Nulato Hills-Southern Seward Peninsula Highlands) to the North, MLRA 237x (Ahklun Mountains) to the South, and MLRAs 230x (Yukon-Kuskokwim Highlands) and 229x (Interior Alaska Lowlands) to the East. Although the MLRA is mostly undeveloped wild land and is sparsely populated, there are 42 villages scattered along the coast or the banks of the Yukon and Kuskokwim Rivers. The principal communities are Aniak, Bethel, Emmonak, Hooper Bay, and Saint Mary's.

Physiography

Although primarily comprised of deltaic lowlands, in a few areas, isolated low hills rise above the surrounding coastal plain. Numerous low-gradient streams meander through this MLRA, many of which are tributaries or former channels of the Yukon and Kuskokwim Rivers. Depressions and shallow basins on the coastal plain are dotted with interconnecting stream channels, wetlands, and countless small and medium-size lakes. On the floodplains between channels and wetlands, low escarpments, meander scars, oxbow lakes, sloughs, and islands can be found. The coastline is broken by several large inlets and bays, including Baird Inlet, which forms a large inland sea behind Nelson Island.

Elevations generally range from sea level to 300 feet but reach heights of 2,342 feet at the

summit of Towak Mountain. A vast majority of the surface water from interior and western Alaska drains into the Bering Sea through MLRA 238x. Major rivers include the Yukon, Kuskokwim, Tovers, Black, Azun, Kashunuk, and Izaviknek Rivers. In addition to the various rivers and tributaries, lakes make up about 40 percent of this MLRA. This area is in the zone of discontinuous permafrost, where permafrost is thin to moderately thick and primarily occurs in fine textured soils. Permafrost does not generally occur on flood plains or in areas near bodies of water.

Geology

MLRA 238x was unglaciated during the Pleistocene, except for along the southern edge, where glaciers from the Ahklun mountains may have extended into portions of the lowlands. A majority of the sediments across the area are fine textured Holocene and Pleistocene deltaic deposits from the Yukon and Kuskokwim Rivers, and loamy and sandy Holocene fluvial deposits on flood plains and stream terraces. In the western part of the MLRA, low basalt hills, cinder cones, and volcanic craters from the Cretaceous and Tertiary can be found.

Climate

The climate of MLRA 238x is primarily maritime throughout the summer, and when Bering Sea ice pack forms in the winter, it becomes more characteristic of a continental climate. Summers are short, cloudy, and rainy while winters are long, cold, and foggy, especially in coastal areas. Windy conditions are common throughout the year. Mean annual precipitation is 12 to 30 inches and mean annual snowfall ranges from 40 to 90 inches. Freeze-free period range 116 to 150 days, but freezing temperatures can occur year-round, although rare in June, July, and August. This cold climate leads to MLRA 238x being included in the Arctic.

Soils

The dominant soil orders in MLRA 238x are Gelisols, Histosols, Inceptisols, and Entisols. Soils have a subgelic or cryic temperature regime, and an aquic or udic moisture regime. Fibristels, Hemistels, Histoturbels, and Aquiturbels are the most common Gelisol great groups. Fibristels and Hemistels have thick accumulations of organic material and occur in depressions and shallow basins. The Orthels and Turbels have comparably thinner surface organic material. The Histoturbels are common in elevated and convex areas and Aquiturbels are common on terraces and drainageways. Inceptisols, Entisols, and Histosols do not have permafrost within the soil profile. Histosols occur in depressions with thick accumulations of organic material. Inceptisols occur on the slopes of hills and mountains, swales, terraces, and flood plains. Entisols occur on shore complex and flood plains.

Vegetation

Lakes, ponds, and other types of surface water are common in this area and vegetation near these water bodies include wet sedge meadows, sedge-shrub meadows, and sedge-moss meadows. Low uplands support low and dwarf ericaceous shrubs, tussock-forming sedges, other hydrophytic plants, and mosses. Sites with higher local relief and better drainage support low ericaceous scrub with mosses, lichens, willows, and forbs. Low ericaceous shrubs, willow, alder, and mosses are understory associated in these forests and woodlands.

Land use

Residents use this area primarily for subsistence hunting, fishing, and gathering. Less than one percent of the MLRA is urban, and most communities are along the coast or major rivers and lakes. Disturbance of fragile permafrost soils is the major soil resource concern in this area, resulting from damage of insulating organic material that allows permafrost in upper soil layers to thaw. This can lead to ponding, soil subsidence, erosion, and altered hydrologic function. In order to slow the thawing of permafrost, management is needed to protect organic material and promote thermal balance of soils.

Classification relationships

Landfire Biophysical Settings:

16970 – Alaska Arctic Pendantgrass Freshwater Marsh

17050 – Alaska Arctic Sedge Freshwater Marsh

(LANDFIRE biophysical settings 2009)

Ecological site concept

- This arctic ecological site occurs in depressions on flood plains, stream terraces, and plains.
- Soils form in very thick layers of organic material over silty loess and/or alluvium.
- Soils pond frequently for long to very long durations. Soils have a very shallow water table throughout the growing season and are considered very poorly drained.
- Soils are very deep without permafrost.
- The reference plant community is characterized as wet sedge meadow tundra (Vioreck et al. 1992) with water sedge and tall cottongrass as common plants.

Associated sites

R238XY404AK	Arctic Loamy Frozen Tussock Tundra Ecological site 404 occurs on adjacent stream terraces and slopes but with wetter soils underlain by permafrost that supports tussock tundra.
R238XY405AK	Arctic Scrub Loamy Flood Plain Ecological site R238XY405AK occurs on adjacent flood plains and supports tall willow scrub and herbaceous communities.

Similar sites

R238XY101AK	<p>Arctic Silty Shore Complex</p> <p>Ecological site R238XY101AK occurs on shore complex that produces vegetation that can be described as a halophytic sedge meadow, similar to the wet sedge meadow produced within ecological site 407, peat depressions.</p>
R238XY408AK	<p>Arctic Scrub Loamy Frozen Swales and Drainageways</p> <p>Both ecological sites 407 and 408 support vegetation that can be described as wet sedge meadow. Differences in hydrology and soils are provisionally thought to result in different kinds and amounts of vegetation.</p>

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Carex aquatilis</i> (2) <i>Eriophorum angustifolium</i>

Physiographic features

- This ecological site is associated with depressions on floodplains, stream terraces, and plains.
- Elevations range from 10 to to 300 feet above sea level.
- Slope is nearly level and occur on all aspects.
- Flood plain depressions flood occasionally, while all other depression do not flood.
- Depressions pond frequently for long to very long durations of time. Ponding depth typically ranges from 2 to 6 inches but near open water can be much deeper.
- A water table occurs at very shallow depth throughout the growing season.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Depression (2) Alluvial plain > Flood plain (3) Alluvial plain > Stream terrace (4) Coastal plain > Depression (5) Coastal plain > Plain
Runoff class	Negligible
Flooding duration	Not specified
Flooding frequency	None
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	3–91 m

Slope	0%
Ponding depth	5–15 cm
Water table depth	0 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to occasional
Ponding duration	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–2%
Ponding depth	5–30 cm
Water table depth	Not specified

Climatic features

Sea ice strongly influences the climate of MLRA 238x, as it does throughout Western Alaska. The climate is characteristically maritime throughout the summer months, where cool, moist air moves from the Bering Sea into coastal lowlands. As sea ice forms in the winter, the climate becomes more characteristic of a continental climate. These cold year-round conditions is the reason MLRA 238x is considered Arctic despite being approximately 500 miles south of the Arctic circle.

Winters are cold and long, with average low temperatures between 0 and 4 degrees (F) December through February. Winter and early spring is the driest time of the year with less than an inch of precipitation per month falling January through April. Summers in this area are cool, short, and often cloudy and rainy. June through October are considerably wetter, with the most precipitation falling in August and September. This area receives, on average, 16 inches of precipitation and 116 frost free days per year.

Table 4. Representative climatic features

Frost-free period (characteristic range)	106-122 days
Freeze-free period (characteristic range)	129-142 days
Precipitation total (characteristic range)	381-457 mm
Frost-free period (actual range)	90-129 days

Freeze-free period (actual range)	116-150 days
Precipitation total (actual range)	305-762 mm
Frost-free period (average)	116 days
Freeze-free period (average)	136 days
Precipitation total (average)	406 mm

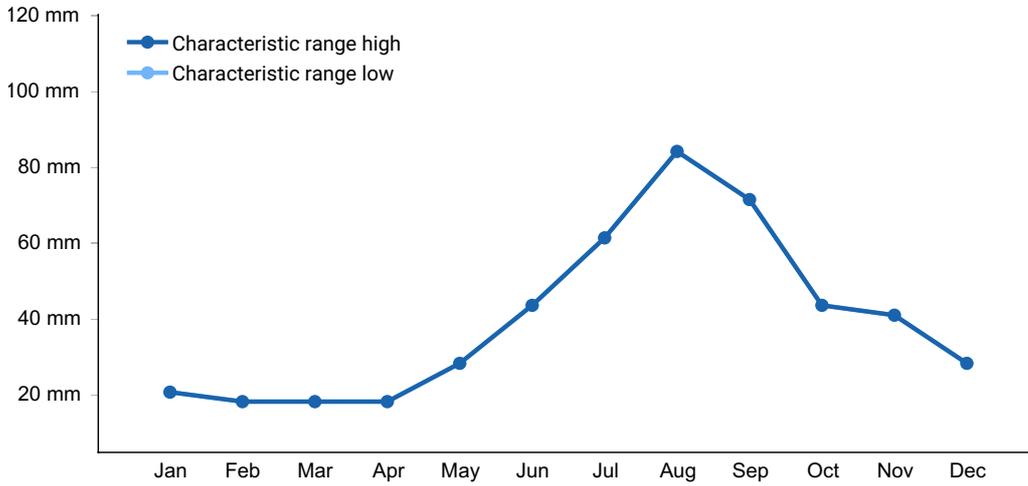


Figure 1. Monthly precipitation range

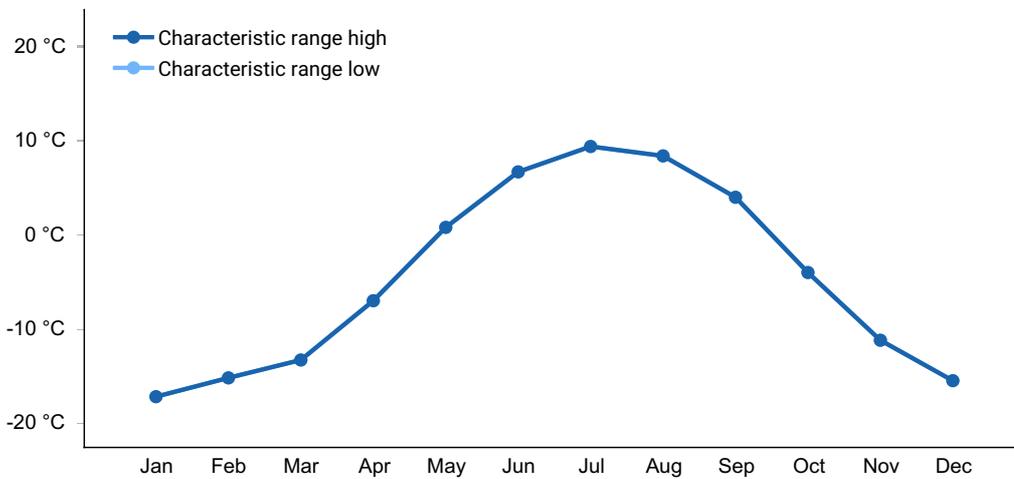


Figure 2. Monthly minimum temperature range

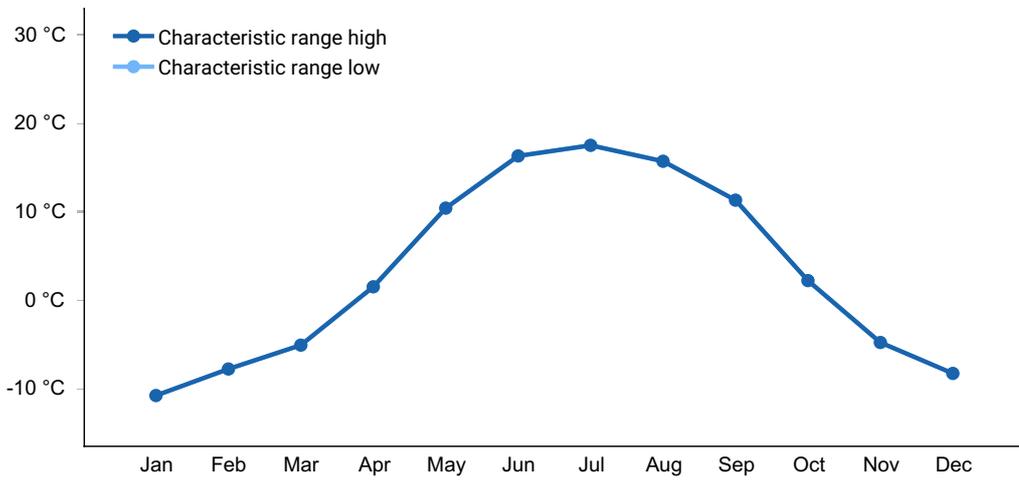


Figure 3. Monthly maximum temperature range

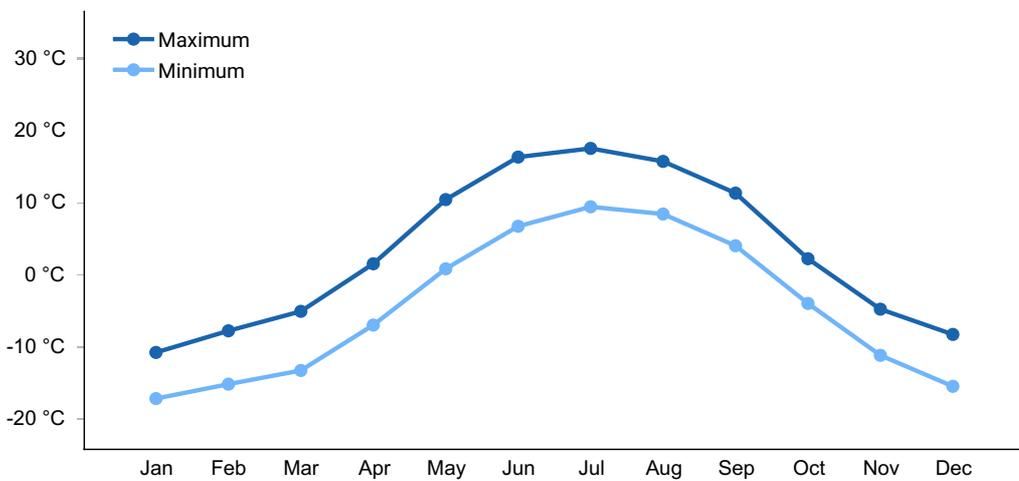


Figure 4. Monthly average minimum and maximum temperature

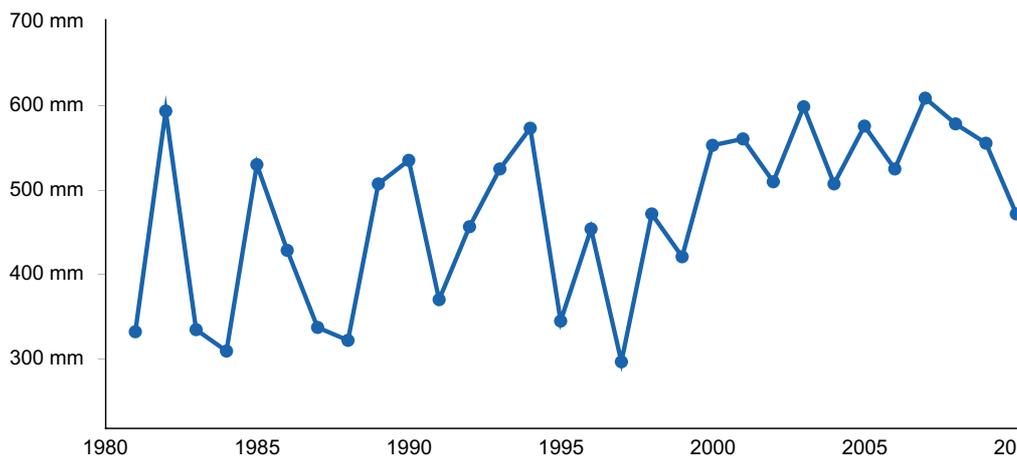


Figure 5. Annual precipitation pattern

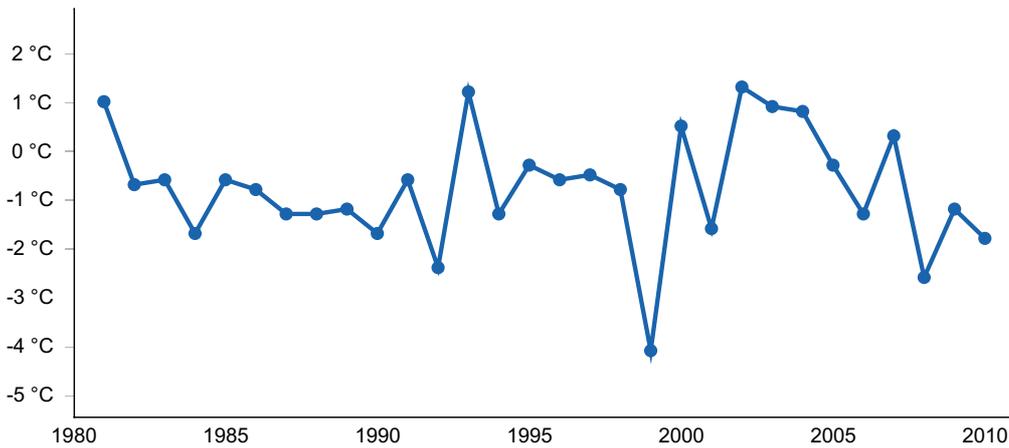


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BETHEL AP [USW00026615], Bethel, AK

Influencing water features

Depressional wetlands occur in topographic depressions. Dominant water sources are precipitation, ground water discharge, and both interflow and overland flow from adjacent uplands.

Wetland description

This ecological site is classified as a depressional wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008).

Soil features

- Soils formed in organic material over silty loess and/or alluvium.
- Rock fragments do not occur on the soil surface or in the soil profile.
- Mineral soils are capped with 22 to 60 inches or more organic material. The surface horizon texture is peat or mucky peat.
- Soils are considered very deep. Strongly contrasting textural stratification is an occasional restriction that occurs at moderate depths (20 to 39 inches).
- The pH of the soil profile ranges from extremely to slightly acidic.
- Soils are considered very poorly drained.

The Arctic Sedge Peat Depressions ecological site is correlated to 11 soil components. Soils are generally classified as Histosols in the great group Cryofibrists. On rare occasion, soils are Inceptisols classified as Histic Cryaquents.

Table 5. Representative soil features

Parent material	(1) Organic material (2) Loess (3) Alluvium
Surface texture	(1) Peat (2) Mucky peat
Drainage class	Very poorly drained
Permeability class	Moderately rapid
Depth to restrictive layer	Not specified
Soil depth	152 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	24.64–40.39 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Clay content (0-50.8cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-25.4cm)	4–6
Subsurface fragment volume ≤3" (0-152.4cm)	0%
Subsurface fragment volume >3" (0-152.4cm)	0%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	51–152 cm
Soil depth	Not specified
Surface fragment cover ≤3"	Not specified
Surface fragment cover >3"	Not specified

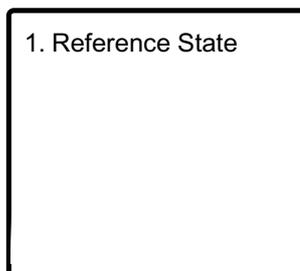
Available water capacity (0-101.6cm)	5.33–52.32 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Clay content (0-50.8cm)	0–5%
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0–3
Soil reaction (1:1 water) (0-25.4cm)	3.8–7.4
Subsurface fragment volume ≤3" (0-152.4cm)	0–10%
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Ecological dynamics

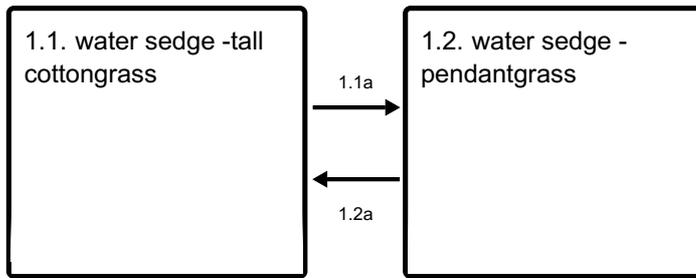
These organic depressions support two separate plant communities: wet sedge meadow tundra and fresh grass marsh (Viereck et al. 1992). The distribution of these plant communities in depressions are provisionally thought to be controlled by the frequency, duration, and depth of ponding. The fresh grass marsh community with pendantgrass and various sedge occurs near open water and/or in areas where the soils experience deep ponding depth (>6 inches). Soils are seldomly not ponded with water. The wet sedge meadow tundra with water sedge and tall cottongrass occurs in areas more distal to open water and/or in areas with comparatively shallower ponding depths (2 to 6 inches).

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1a - soils ponded more frequently and for longer durations of time

1.2a - soils ponded less frequently and for shorter durations of time

State 1 Reference State

This state covers all fresh water depressions in this MLRA. Soils are very wet, have thick organic horizons, and are commonly classified as Histosols. Two plant community were identified within the reference state related to ponding regime. All plant communities associated with this ecological site have limited data, so the state-and-transition model is provisional.

Dominant plant species

- water sedge (*Carex aquatilis*), grass
- tall cottongrass (*Eriophorum angustifolium*), grass

Community 1.1 water sedge -tall cottongrass

Community 1.1 is characterized as wet sedge meadow tundra (Vioreck et al. 1992) with the dominant plants being water sedge and tall cottongrass. The binomial name of these and other provisionally associated plants can be found in the below dominant plant species table and are based on Landfire BpS models. Medium graminoids (between 4 and 24 inches) and moss are the vegetative strata that characterize this plant community. The peaty soils are typically covered with several inches of ponded water.

Dominant plant species

- water sedge (*Carex aquatilis*), grass
- tall cottongrass (*Eriophorum angustifolium*), grass
- Northwest Territory sedge (*Carex utriculata*), grass
- purple marshlocks (*Comarum palustre*), other herbaceous
- common mare's-tail (*Hippuris vulgaris*), other herbaceous
- buckbean (*Menyanthes trifoliata*), other herbaceous
- tufted loosestrife (*Lysimachia thyrsiflora*), other herbaceous
- water horsetail (*Equisetum fluviatile*), other herbaceous

Community 1.2

water sedge - pendantgrass

This community is characterized as fresh grass marsh (Viereck et al. 1992) with the dominant plants being water sedge and pendantgrass. The soil surface is covered with deep ponded water. The binomial name of these and other provisionally associated plants can be found in the below dominant plant species table and are based on Landfire BpS models. Medium graminoids (between 4 and 24 inches) and moss are the vegetative strata that characterize this plant community. The peaty soils are typically covered with several inches of ponded water.

Dominant plant species

- water sedge (*Carex aquatilis*), grass
- pendantgrass (*Arctophila fulva*), grass
- Moss (*Moss*), other herbaceous
- common mare's-tail (*Hippuris vulgaris*), other herbaceous
- buckbean (*Menyanthes trifoliata*), other herbaceous
- tufted loosestrife (*Lysimachia thyrsiflora*), other herbaceous
- water horsetail (*Equisetum fluviatile*), other herbaceous

Pathway 1.1a

Community 1.1 to 1.2

The water table rises resulting in soils being ponded more frequently and for longer durations of time. This could result from flooding or short term changes to annual precipitation in the area.

Pathway 1.2a

Community 1.2 to 1.1

The water table lowers resulting in soils being ponded less frequently and for shorter durations of time. This could result from infilling of depressions or short term changes to annual precipitation in the area.

Additional community tables

Animal community

Not available.

Hydrological functions

Not available.

Recreational uses

Not available.

Wood products

Not available.

Other products

Not available.

Other information

Not available.

Inventory data references

The vegetation modeled for this site has limited data and is considered provisional. The associated model was largely developed from NRCS staff with working knowledge of the area and literature review.

Other references

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Contributors

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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)	
Contact for lead author	
Date	03/12/2026
Approved by	Blaine Spellman
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:**
