USDA Natural Resources Conservation Service

Ecological site R110XY023IL Organic Interdunal Fen

Last updated: 4/22/2020
Accessed: 05/19/2024

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): 110X–Northern Illinois and Indiana Heavy Till Plain

The Northern Illinois and Indiana Heavy Till Plain (MLRA 110) encompasses the Northeastern Morainal, Grand Prairie, and Southern Lake Michigan Coastal landscapes (Schwegman et al. 1973, WDNR 2015). It spans three states – Illinois (79 percent), Indiana (10 percent), and Wisconsin (11 percent) – comprising about 7,535 square miles (Figure 1). The elevation is about 650 feet above sea level (ASL) and increases gradually from Lake Michigan south. Local relief varies from 10 to 25 feet. Silurian age fractured dolomite and limestone bedrock underlie the region. Glacial drift covers the surface area of the MLRA, and till, outwash, lacustrine deposits, loess or other silty material, and organic deposits are common (USDA-NRCS 2006).

The vegetation in the MLRA has undergone drastic changes over time. At the end of the last glacial episode – the Wisconsinan glaciation – the evolution of vegetation began with the development of tundra habitats, followed by a phase of spruce and fir forests, and eventually spruce-pine forests. Not until approximately 9,000 years ago did the climate undergo a warming trend which prompted the development of deciduous forests dominated by oak and hickory. As the climate continued to warm and dry, prairies began to develop approximately 8,300 years ago. Another shift in climate that resulted in an increase in moisture prompted the emergence of savanna-like habitats from 8,000 to 5,000 years before present (Taft et al. 2009). Forests maintained footholds on steep valley sides, morainal ridges, and wet floodplains. Fire, droughts, and grazing by native mammals helped to maintain the prairies and savannas until the arrival of European settlers, and the forests were maintained by droughts, wind, lightning, and occasional fire (Taft et al. 2009; NatureServe 2018).

Classification relationships

USFS Subregions: Southwestern Great Lakes Morainal (222K) and Central Till Plains and Grand Prairies (251D) Sections; Kenosha-Lake Michigan Plain and Moraines (222Kg), Valparaiso Moraine (Kj), and Eastern Grand Prairie (251Dd) Subsections (Cleland et al. 2007)

U.S. EPA Level IV Ecoregion: Kettle Moraines (53b), Illinois/Indiana Prairies (54a), and Valparaiso-Wheaton Morainal Complex (54f) (USEPA 2013)

National Vegetation Classification – Ecological Systems: Northern Great Lakes Interdunal Wetland (CES201.034) (NatureServe 2018)

National Vegetation Classification – Plant Associations: Dasiphora fruticosa/Cladium mariscoides – juncus arcticus ssp. littoralis – (*Rhynchospora capillacea*) Fen (CEGL005105) (Nature Serve 2018)

Illinois Natural Areas Inventory: Panne (White and Madany 1978)

Wisconsin Natural Communities: Interdunal wetland (WDNR 2015)

Ecological site concept

Organic Interdunal Fens are located within the green areas on the map. They occur on depressions in wind-deposited dune fields. The soils are Histosols that are very poorly drained and very deep, formed in organic material over outwash.

The historic pre-European settlement vegetation on this ecological site was dominated by hydrophytic vegetation. Shrubby cinquefoil (Dasiphora fruticosa (L.) Rydb.) is the dominant shrub and smooth sawgrass (Cladium mariscoides (Muhl.) Torr.), mountain rush (Juncus arcticus Willd. ssp. littoralis (Engelm.) Hultén), and bluejoint (Calamagrostis canadensis L.) are the are the dominant herbaceous species on the site. Species characteristic of an undisturbed plant community associated with this ecological site include little green sedge (Carex viridula Michx.), bright green spikerush (Eleocharis olivacea Torr.), stiff yellow flax (Linum medium (Planch.) Britton var. texanum (Planch.) Fernald), seaside arrowgrass (Triglochin maritima L.), marsh arrowgrass (Triglochin palustris L.), and horned bladderwort (Utricularia cornuta Michx.) (White and Madany 1978; Taft et al. 1997). Depth of groundwater or to the water table is the dominant disturbance factor that maintains this ecological site (Hiebert et al. 1986).

Associated sites

R110XY015IL	**Wet Sand Prairie** Outwash that is shallow to a high-water table including Fieldon, Gilford, Granby, Granby variant, Hooppole, and Mussey soils
R110XY014IL	**Moist Sand Prairie** Eolian deposits and outwash that have a high-water table within 15 to 18 inches including Bonfield, Hoopeston, Ridgeville, Watseka, and Wesley soils

Similar sites

R110XY022IL	**Organic Sand Seep** Organic Sand Seeps are in similar interdunal swales, but the water seepage is acidic and the site is restricted to the Kankankee Sand Area

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Dasiphora fruticosa*
Herbaceous	(1) *Cladium mariscoides* (2) *Juncus arcticus ssp. littoralis*

Physiographic features

Organic Interdunal Fens occur on depressions in dune fields. They are situated on elevations ranging from approximately 541 to 679 feet ASL. The site experiences frequent ponding that can last up to 30 days

Figure 1.

Table 2. Representative physiographic features

Slope shape across	(1) Concave
Slope shape up-down	(1) Concave
Landforms	(1) Dune field
Runoff class	Negligible
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Frequent
Elevation	165–207 m
Slope	0–2%
Ponding depth	0–30 cm
Water table depth	8 cm
Aspect	Aspect is not a significant factor

Climatic features

The Northern Illinois and Indiana Heavy Till Plain falls into the hot-summer humid continental climate (Dfa) and warm-summer humid continental climate (Dfb) Köppen-Geiger climate classifications (Peel et al. 2007). The two main factors that drive the climate of the MLRA are latitude and weather systems. Latitude, and the subsequent reflection of solar input, determines air temperatures and seasonal variations. Solar energy varies across the seasons, with summer receiving three to four times as much energy as opposed to winter. Weather systems (air masses and cyclonic storms) are responsible for daily fluctuations of weather conditions. High-pressure systems are responsible for settled weather patterns where sun and clear skies dominate. In fall, winter, and spring, the polar jet stream is responsible for the creation and movement of low-pressure systems. The clouds, winds, and precipitation associated with a low-pressure system regularly follow high-pressure systems every few days (Angel n.d.).

The soil temperature regime of MLRA 110 is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 150 days, while the frost-free period is about 129 days (Table 2). The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season. Average annual precipitation is 35 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 39.4 and 57.3°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	114-146 days

Freeze-free period (characteristic range)	123-178 days
Precipitation total (characteristic range)	864-914 mm
Frost-free period (actual range)	103-151 days
Freeze-free period (actual range)	105-187 days
Precipitation total (actual range)	864-940 mm
Frost-free period (average)	129 days
Freeze-free period (average)	150 days
Precipitation total (average)	889 mm

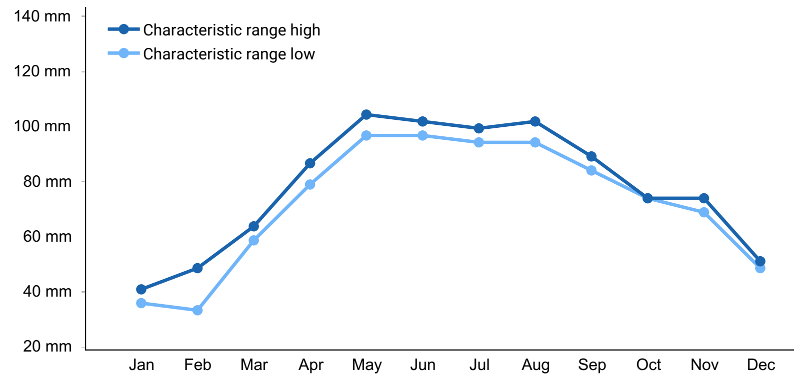


Figure 2. Monthly precipitation range

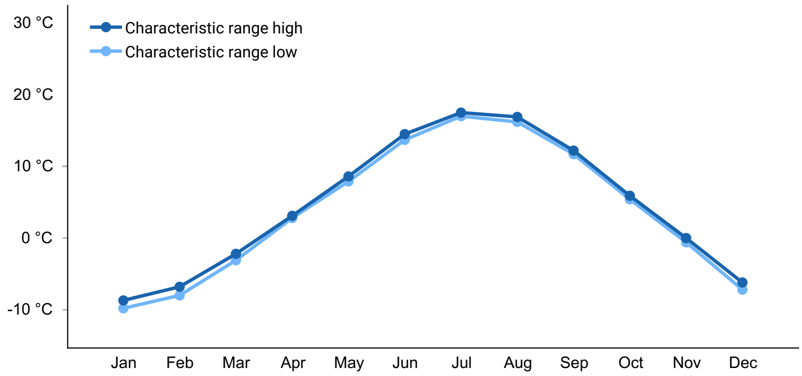


Figure 3. Monthly minimum temperature range

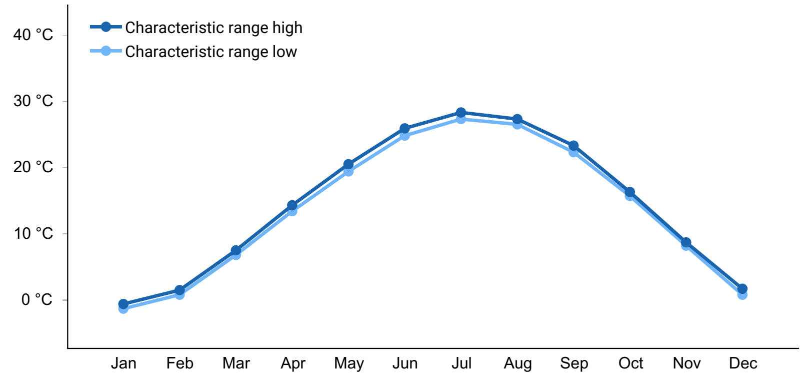


Figure 4. Monthly maximum temperature range

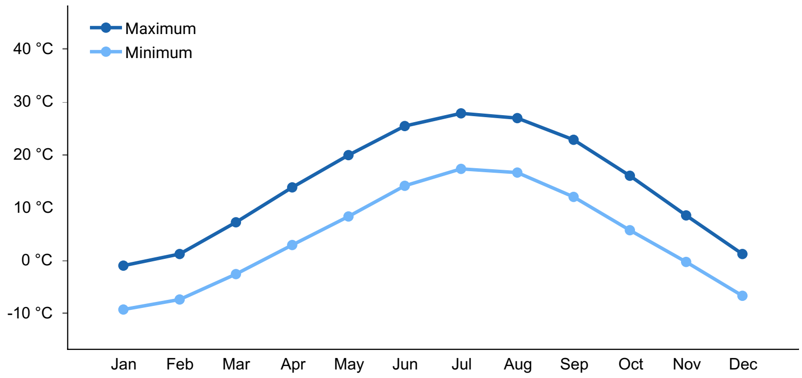


Figure 5. Monthly average minimum and maximum temperature

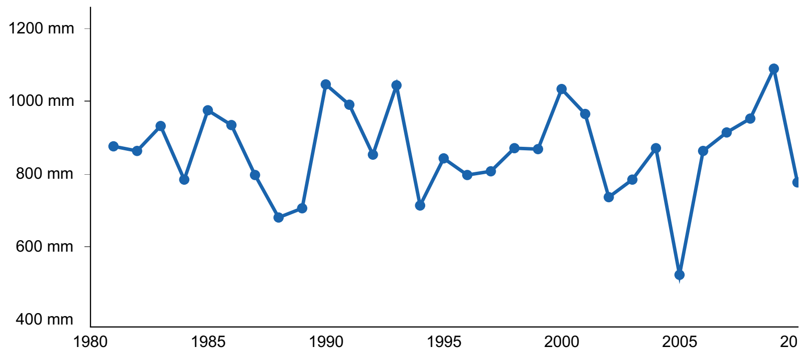


Figure 6. Annual precipitation pattern

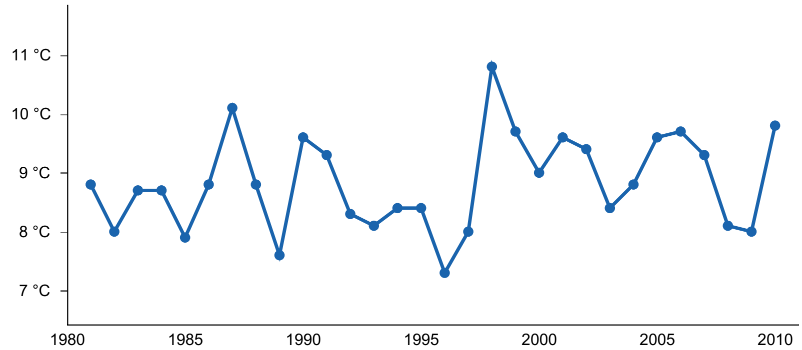


Figure 7. Annual average temperature pattern

Climate stations used

- (1) CHICAGO WAUKEGAN RGNL AP [USW00014880], Waukegan, IL
- (2) MUNDELEIN 4WSW [USC00115961], Lake Zurich, IL
- (3) CHICAGO PALWAUKEE AP [USW00004838], Wheeling, IL

Influencing water features

Organic Interdunal Fens are classified as a LACUSTRINE FRINGE: Interdune Swamp wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008) and as a Palustrine, Emergent, Semipermanently Flooded wetland under the National Wetlands Inventory (FGDC 2013). Groundwater emergence from the adjacent large freshwater lake is the main source of water for this ecological site (Smith et al. 1995). Infiltration is very slow (Hydrologic Group D) for undrained soils, and surface runoff is negligible.

Wetland description

Primary wetland hydrology indicators for an intact Organic Interdunal Fen may include: (A1) Surface water, (A2) High water table, and (A3) Saturation. Secondary wetland hydrology indicators may include: (C2) Dry-season water table, (D2) Geomorphic position, and (D5) FAC Neutral Test (USACE 2010).

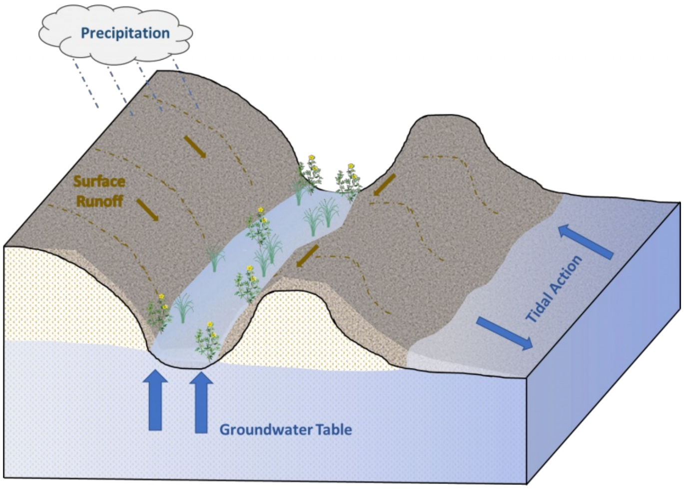


Figure 8. Hydrologic cycling in Organic Interdunal Fen ecological site.

Soil features

Soils of Organic Interdunal Fens are in the Histosols order, further classified as Terric Haplosaprists with very slow infiltration and negligible runoff potential. The soil series associated with this site includes Adrian. The parent material is herbaceous organic matter over outwash, and the soils are very poorly drained and very deep with seasonal high-water tables. Soil pH classes are moderately acid to moderately alkaline. No rooting restrictions are noted for the soils of this ecological site.

Some soil map units in this ecological site, if not drained, may meet the definition of hydric soils and are listed as meeting criteria 1 of the hydric soils list (77 FR 12234).

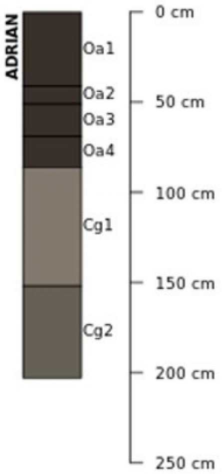


Figure 9. Profile sketches of soil series associated with Organic Interdunal Fen.

Table 4. Representative soil features

Parent material	(1) Organic material
Family particle size	(1) Sandy or sandy-skeletal
Drainage class	Very poorly drained
Permeability class	Slow
Depth to restrictive layer	203 cm
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (Depth not specified)	27.94 cm
Calcium carbonate equivalent (Depth not specified)	0–40%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	7%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

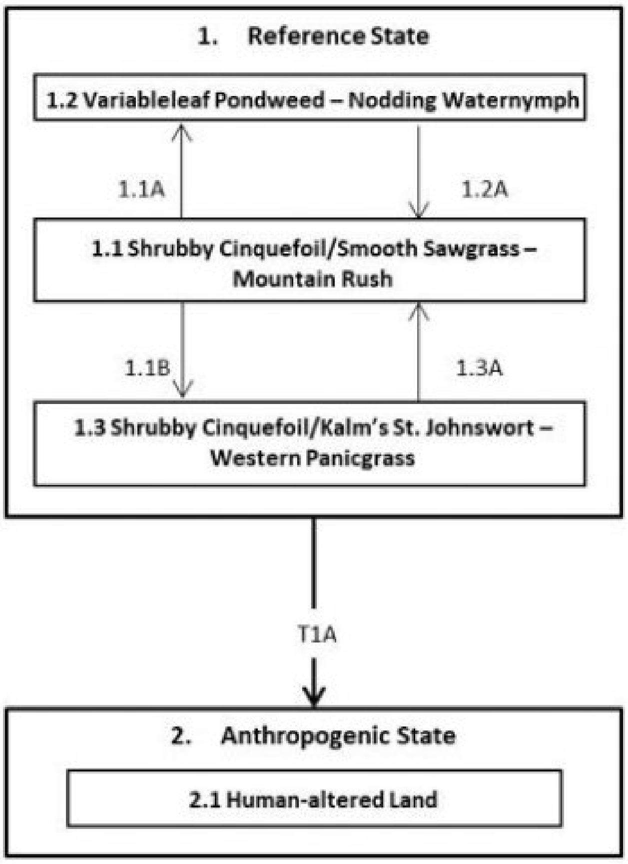
The MLRA lies within the tallgrass prairie ecosystem of the Midwest, but a variety of environmental and edaphic factors resulted in landscape that historically supported prairies, savannas, forests, and various wetlands. Organic Interdunal Fens form an aspect of this vegetative continuum. This ecological site occurs on depressions on wind-deposited dun fields on very poorly drained soils. Species characteristic of this ecological site consist of hydrophytic vegetation.

The depth of groundwater emergence and/or depth to the high-water table is the disturbance factor that maintains Organic Interdunal Fens. The depth affects species diversity, composition, and productivity. Periodic ponding results in a community dominated by species adapted to water-saturated soils and temporal inundation, while permanent ponding versus no ponding but persistent high-water table shifts the plant communities to species tolerant of the respective conditions (Hiebert et al. 1986).

Today, Organic Interdunal Fens have been greatly reduced as the land has been mostly converted to human-modified landscapes. These conversions are considered permanent for the foreseeable future. The state-and-transition model that follows provides a detailed description of each state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

R110XY023IL Organic Interdunal Fen



Code	Process
1.1A	Permanently inundated
1.2A, 1.3A	Periodically ponded
1.2B	Never ponded, permanently under the direct influence of a high-water table
T1A	Vegetation removal and human alterations/transportation of soils

State 1
Reference State

The reference plant community is categorized as a panne community, dominated by hydrophytic vegetation. The three community phases within the reference state are dependent on groundwater influences. The depth to ground water and the duration of ponding alter species composition, cover, and extent.

Community 1.1
Shrubby Cinquefoil/Smooth Sawgrass - Mountain Rush

Sites in this reference community phase are dominated by species tolerant of periodic ponding. The shrub and herbaceous strata each have up to 30 percent cover (NatureServe 2018). Shrubby cinquefoil is the dominant shrub present, and smooth sawgrass and mountain rush are the dominant herbaceous vascular plants. Other species present can include bluejoint, little green sedge, and needlebeak sedge (*Rhynchospora capillacea* Torr.) (White and Madany 1978; Heibert et al. 1986; NatureServe 2018). Periodic ponding will maintain this phase. Permanent ponding will shift the community to phase 1.2 while permanently saturated soils with no groundwater emergence will shift the community to phase 1.3 (Hiebert et al. 1986).

Dominant plant species

- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- smooth sawgrass (*Cladium mariscoides*), other herbaceous
- mountain rush (*Juncus arcticus ssp. littoralis*), other herbaceous

Community 1.2
Variableleaf Pondweed - Nodding Waternymph

This reference community phase occurs when groundwater emergence results in permanently ponded conditions. The plant community shifts towards more true aquatic species, such as variableleaf pondweed (*Potamogeton gramineus* L.) and nodding waternymph (*Najas flexilis* (Willd.) Rostk. & Schmidt). Continuous ponding will maintain this phase, while a reduction of the groundwater to periodic inundation will shift the community to phase 1.1 (Hiebert et al. 1986).

Dominant plant species

- variableleaf pondweed (*Potamogeton gramineus*), other herbaceous
- nodding waternymph (*Najas flexilis*), other herbaceous

Community 1.3
Shrubby Cinquefoil/Kalm's St. Johnswort - Western Panicgrass

This reference community phase occurs when groundwater remains below the surface, but the soil is permanently saturated. Herbaceous species composition shifts to plants tolerant of considerably fluctuations of groundwater, including Kalm’s St. Johnswort (*Hypericum kalmianum* L.) and western panicgrass (Dicanthelium acuminatum (Sw.) Gould & C.A. Clark var. fasciculatum (Torr.) Freckmann). An increase in groundwater resulting in periodic ponding will shift the community to phase 1.1 (Hiebert et al. 1986).

Dominant plant species

- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- western panicgrass (*Dichanthelium acuminatum var. fasciculatum*), grass
- Kalm's St. Johnswort (*Hypericum kalmianum*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

Groundwater emergence results in permanently ponded conditions.

Pathway 1.1B
Community 1.1 to 1.3

Groundwater remains below the surface, but the soil is permanently saturated.

Pathway 1.2A
Community 1.2 to 1.1

Groundwater emergence reduces, and site is periodically ponded.

Pathway 1.3A
Community 1.3 to 1.1

Groundwater emergence increases, and site is periodically ponded.

State 2
Anthropogenic State

The anthropogenic state occurs when the reference state is cleared and developed for human use and inhabitation, such as for commercial and housing developments, landfills, parks, golf courses, cemeteries, earthen spoils, etc.

The native vegetation has been removed and soils have either been altered in place (e.g. cemeteries) or transported from one location to another (e.g. housing developments). Most of the soils in this state have 50 to 100 cm of overburden on top of the natural soil. This natural material can be determined by observing a buried surface horizon or the unaltered subsoil, till, or lacustrine parent materials. This state is generally considered permanent.

Community 2.1
Human-altered land

Sites in this community phase have had the native plant community removed and soils heavily re-worked in support of human development projects.

Transition T1A
State 1 to 2

Vegetation removal and human alterations/transportation of soils transitions the site to the anthropogenic state (2).

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 this ecological site description.

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Approval

Chris Tecklenburg, 4/22/2020

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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	05/19/2024
Approved by	Chris Tecklenburg
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:**