Ecological site R110XY022IL
Organic Sand Seep

Last updated: 4/22/2020
Accessed: 05/04/2024

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)

Illinois Natural Areas Inventory: Sand Seep (White and Madany 1978)

Ecological site concept

Organic Sand Seeps are located within the green areas on the map. They occur on depressions on outwash plains. The soils are Histosols that are very poorly drained and very deep, formed in organic material over sandy outwash or glaciolacustrine deposits.

The historic pre-European settlement vegetation on this ecological site was dominated by hydrophytic woody and herbaceous vegetation. Fowl mannagrass (Glyceria striata (Lam.) Hitchc.) and common ladyfern (Athyrium filix-femina (L.) Roth) are characteristic herbaceous species of the site, and common ninebark (Physocarpus opulifolius (L.) Maxim., orth.cons.) is a characteristic shrub. Species indicative of an undisturbed plant community associated with this ecological site include cinnamon fern (Osmunda cinnamomea L.), royal fern (Osmunda regalis L.), and spinulosa woodfern (Dryopteris carthusiana (Vill.) H.P. Fuchs) (White and Madany 1978; Taft et al. 1997). Acidic groundwater seepage flowing through sand is the primary disturbance factor that maintains this site, while drought and fire are secondary disturbances.

Associated sites

R110XY015IL	**Wet Sand Prairie** Outwash parent material that is shallow to a high-water table including Fieldon, Gilford, Granby, Granby variant, Hooppole, and Mussey soils

Similar sites

R110XY023IL	**Organic Interdunal Fen** Organic Intertidal Fens are a similar vegetation type, but the site is a LACUSTRINE FRINGE wetland

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Physocarpus opulifolius*
Herbaceous	(1) *Glyceria striata* (2) *Athyrium filix-femina*

Physiographic features

Organic Sand Seeps occur on depressions on outwash plains. They are situated on elevations ranging from approximately 541 to 935 feet ASL. The site does not experience flooding, but rather is continuous saturated to ponded with acidic groundwater seepage

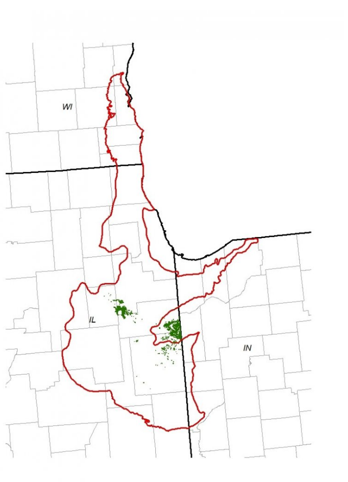


Figure 1.

Table 2. Representative physiographic features

Slope shape across	(1) Concave
Slope shape up-down	(1) Concave
Landforms	(1) Outwash plain
Runoff class	Negligible
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	Frequent

Elevation	165–285 m
Slope	0–2%
Ponding depth	0–30 cm
Water table depth	8–15 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 174 days, while the frost-free period is about 137 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 39 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 40.7 and 60.4°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	134-139 days
Freeze-free period (characteristic range)	173-175 days
Precipitation total (characteristic range)	965-991 mm
Frost-free period (actual range)	134-141 days
Freeze-free period (actual range)	173-176 days
Precipitation total (actual range)	965-991 mm
Frost-free period (average)	137 days
Freeze-free period (average)	174 days
Precipitation total (average)	991 mm

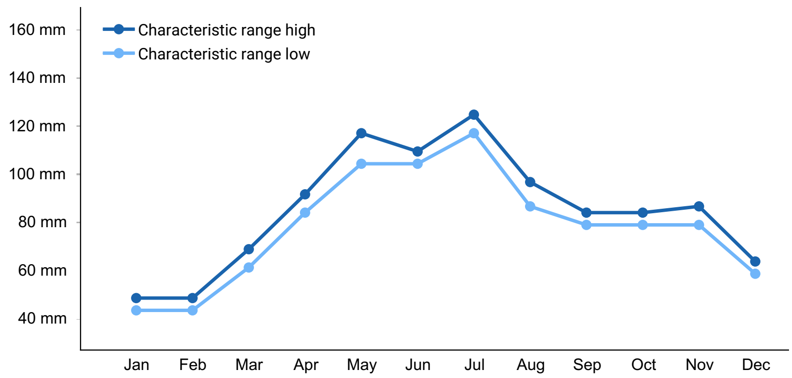


Figure 2. Monthly precipitation range

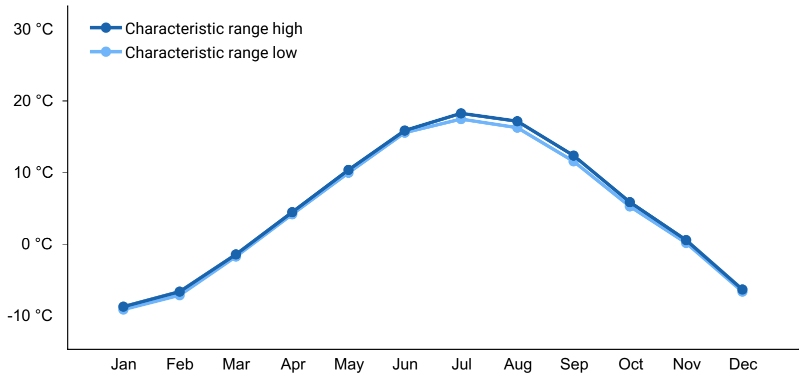


Figure 3. Monthly minimum temperature range

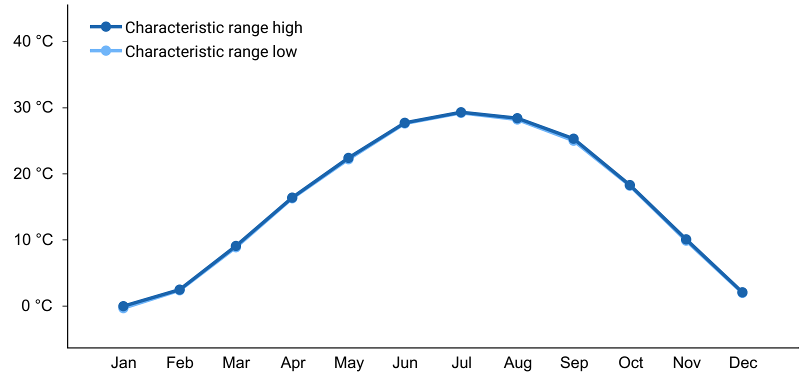


Figure 4. Monthly maximum temperature range

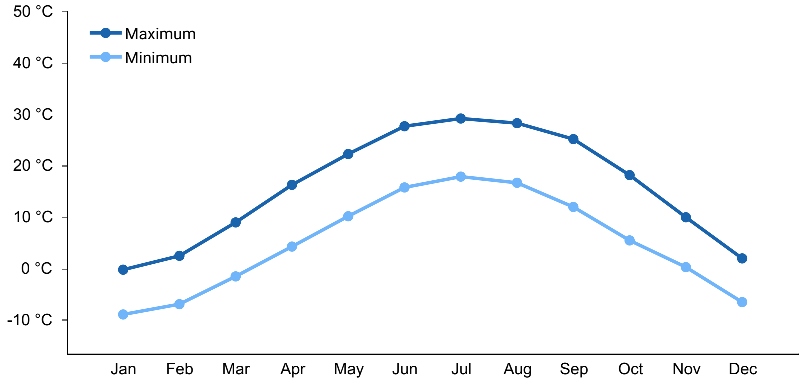


Figure 5. Monthly average minimum and maximum temperature

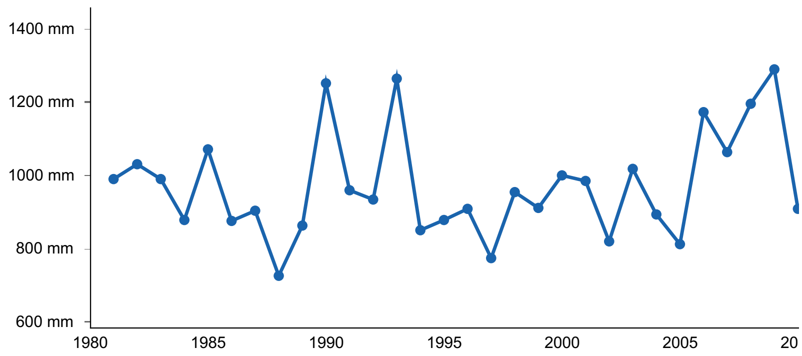


Figure 6. Annual precipitation pattern

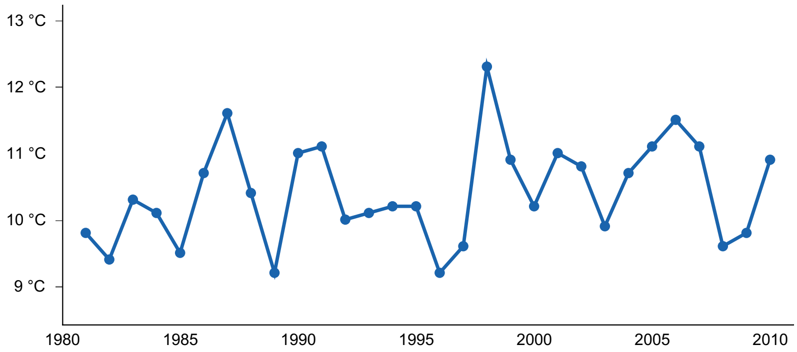


Figure 7. Annual average temperature pattern

Climate stations used

- (1) WATSEKA 2 NW [USC00119021], Watseka, IL
- (2) KANKAKEE WASTEWATER [USC00114603], Kankakee, IL
- (3) MORRIS 1 NW [USC00115825], Morris, IL

Influencing water features

Organic Sand Seeps are classified as a SLOPE: discharge, ponded, herbaceous wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008) and as a Palustrine, Persistent, Emergent, Continuously Saturated wetland under the National Wetlands Inventory (FGDC 2013). Groundwater discharge 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 Sand Seep may include: A2 High water table and A3 Saturation. Secondary wetland hydrology indicators may include: C2 Dry-season water table and D5 FAC-neutral test (USACE 2010).

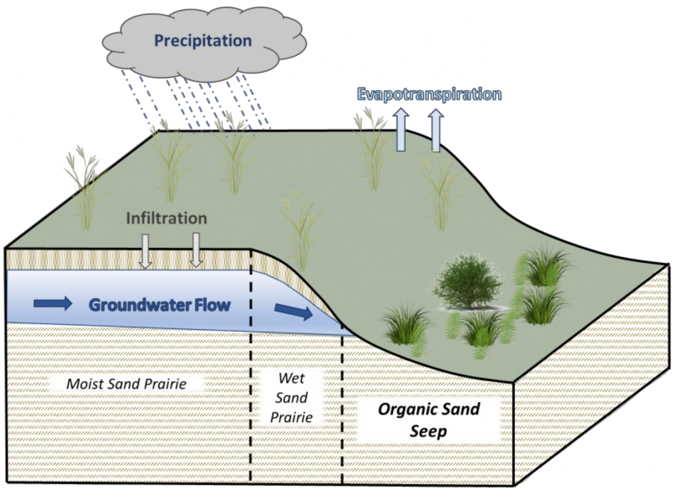


Figure 8. Hydrologic cycling in Organic Sand Seep ecological site.

Soil features

Soils of Organic Sand Seeps are in the Histosols and Inceptisols orders, further classified as Terric Haplosaprists and Histic Humaquepts with very slow infiltration and negligible runoff potential. The soil series associated with this site includes Adrian and Aurelius. The parent material is organic matter over sandy outwash or glaciolacustrine deposits, and the soils are very poorly drained and very deep with seasonal high-water tables. Soil pH classes are strongly 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 2 or 4 of the hydric soils list (77 FR 12234).

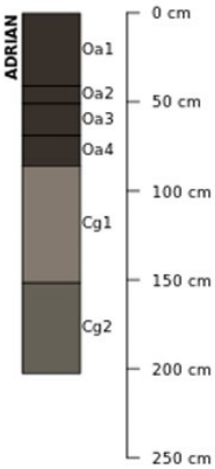


Figure 9. Profile sketches of soil series associated with Organic Sand Seep.

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	Very slow to 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)	17.78–40.64 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)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	2–7%
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

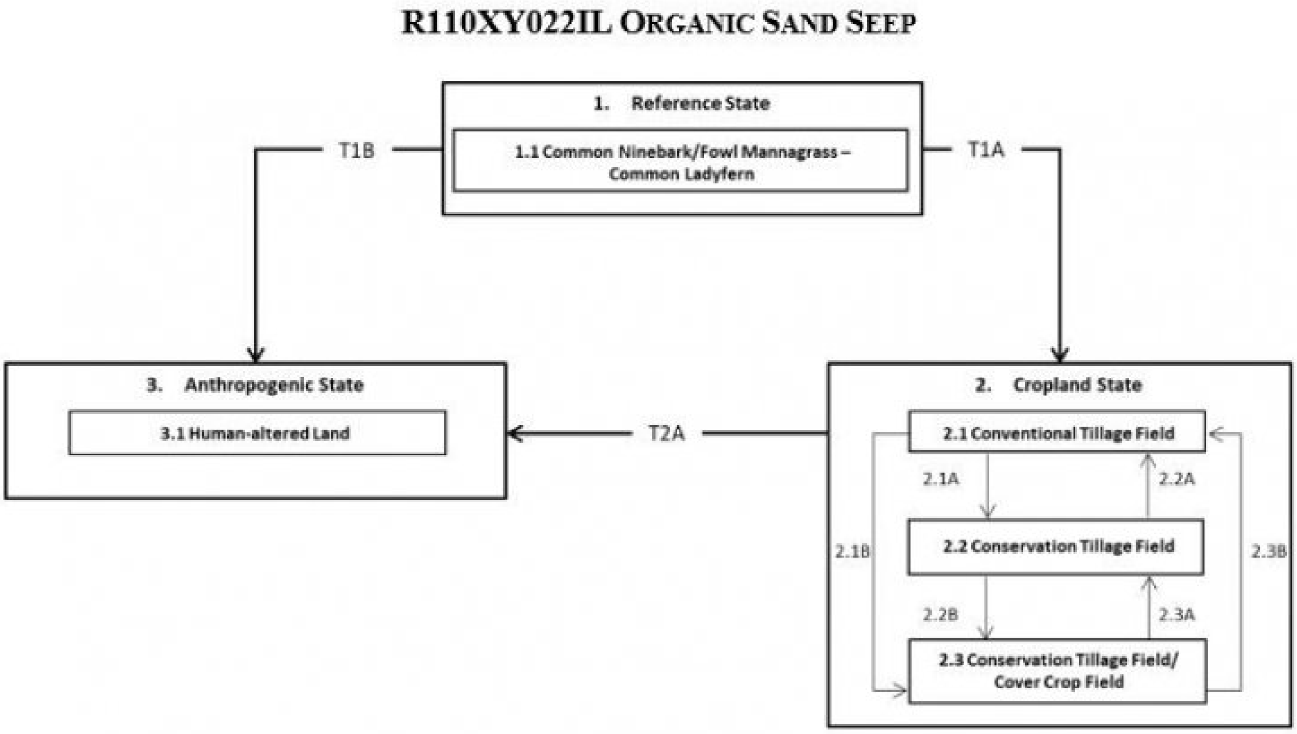
Sand Seeps form an aspect of this vegetative continuum. This ecological site occurs on depressions on outwash plains on very poorly drained soils. Species characteristic of this ecological site consist of hydrophytic woody and herbaceous vegetation.

Organic Sand Seeps are dependent on consistent groundwater discharge. The water is generally acidic, as it flows through nutrient poor sand.

Drought and fire have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the very poorly drained soils have favored the proliferation of plant species tolerant of such conditions. Drought can also slow the growth of plants and result in dieback of certain species. Occasional fires reduced plant litter and aided in preventing declines in species richness and dominance of shrubby species.

Today, Organic Sand Seeps have been greatly reduced as sites have been type-converted to agricultural or other human-modified landscape. Restoration of these sites back to the historic conditions may be improbable as landscape level hydrologic alterations are likely permanent. 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



Code	Process
T1A	Agricultural conversion via tillage, seeding, and non-selective herbicide
2.1A	Less tillage, residue management
2.1B	Less tillage, residue management, and implementation of cover cropping
2.2B	Implementation of cover cropping
2.2A, 2.3B	Intensive tillage, remove residue, and reinitiate monoculture row cropping
2.3A	Remove cover cropping
T1B, T2A	Vegetation removal and human alterations/transportation of soils

State 1
Reference State

The reference plant community is categorized as a seep community, dominated by hydrophytic woody and herbaceous vegetation. The one community phase within the reference state is dependent on constant groundwater seepage. The flow alters species composition, cover, and extent. Drought and occasional fires have more localized impacts in the reference phases, but do contribute to overall species composition, diversity, cover, and productivity.

Community 1.1
Common Ninebark/Fowl Mannagrass - Common Ladyfern

Sites in this reference community phase are composed of hydrophytic woody and herbaceous species. Common ninebark is a characteristic shrub of sandy seeps, and fowl mannagrass and common ladyfern are characteristic herbaceous species. Other species that can occur include cinnamon fern, royal fern, and spinulose fern.

Dominant plant species

- common ninebark (*Physocarpus opulifolius*), shrub
- fowl mannagrass (*Glyceria striata*), grass
- common ladyfern (*Athyrium filix-femina*), other herbaceous

State 2
Cropland State

The continuous use of tillage, row-crop planting, chemicals (i.e., herbicides, fertilizers, etc.), and subsurface tile drainage has effectively eliminated the reference community and many of its natural ecological functions in favor of crop production. Corn and soybeans are the dominant crops for the site, and common wheat (*Triticum aestivum* L.) and alfalfa (*Medicago sativa* L.) may be rotated periodically. These areas are likely to remain in crop production for the foreseeable future.

Community 2.1
Conventional Tillage Field

Sites in this community phase typically consist of monoculture row-cropping maintained by conventional tillage practices. They are cropped in either continuous corn or corn-soybean rotations. The frequent use of deep tillage, low crop diversity, and bare soil conditions during the non-growing season negatively impacts soil health. Under these practices, soil aggregation is reduced or destroyed, soil organic matter is reduced, erosion and runoff are increased, and infiltration is decreased, which can ultimately lead to undesirable changes in the hydrology of the watershed (Tomer et al. 2005).

Community 2.2
Conservation Tillage Field

This community phase is characterized by rotational crop production that utilizes various conservation tillage methods to promote soil health and reduce erosion. Conservation tillage methods include strip-till, ridge-till, vertical-till, or no-till planting systems. Strip-till keeps seedbed preparation to narrow bands less than one-third the width of the row where crop residue and soil consolidation are left undisturbed in-between seedbed areas. Strip-till planting may be completed in the fall and nutrient application either occurs simultaneously or at the time of planting. Ridge-till uses specialized equipment to create ridges in the seedbed and vegetative residue is left on the surface in between the ridges. Weeds are controlled with herbicides and/or cultivation, seedbed ridges are rebuilt during cultivation, and soils are left undisturbed from harvest to planting. Vertical-till systems employ machinery that lightly tills the soil and cuts up crop residue, mixing some of the residue into the top few inches of the soil while leaving a large portion on the surface. No-till management is the most conservative, disturbing soils only at the time of planting and fertilizer application. Compared to conventional tillage systems, conservation tillage methods can improve soil ecosystem function by reducing soil erosion, increasing organic matter and water availability, improving water quality, and reducing soil compaction.

Community 2.3
Conservation Tillage Field/Alternative Crop Field

This community phase applies conservation tillage methods as described above as well as adds cover crop practices. Cover crops typically include nitrogen-fixing species (e.g., legumes), small grains (e.g., rye, wheat, oats), or forage covers (e.g., turnips, radishes, rapeseed). The addition of cover crops not only adds plant diversity but also promotes soil health by reducing soil erosion, limiting nitrogen leaching, suppressing weeds, increasing soil organic matter, and improving the overall soil ecosystem. In the case of small grain cover crops, surface cover and water infiltration are increased, while forage covers can be used to graze livestock or support local wildlife. Of the three community phases for this state, this phase promotes the greatest soil sustainability and improves ecological functioning within a cropland system.

Pathway 2.1A
Community 2.1 to 2.2

Tillage operations are greatly reduced, crop rotation occurs on a regular interval, and crop residue remains on the soil surface.

Pathway 2.1B
Community 2.1 to 2.3

Tillage operations are greatly reduced or eliminated, crop rotation occurs on a regular interval, crop residue remains on the soil surface, and cover crops are planted following crop harvest.

Pathway 2.2A
Community 2.2 to 2.1

Intensive tillage is utilized, and monoculture row-cropping is established.

Pathway 2.2B
Community 2.2 to 2.3

Cover crops are implemented to minimize soil erosion.

Pathway 2.3B
Community 2.3 to 2.1

Intensive tillage is utilized, cover crop practices are abandoned, monoculture row-cropping is established, and crop rotation is reduced or eliminated.

Pathway 2.3A
Community 2.3 to 2.2

Cover crop practices are abandoned.

State 3
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 3.1
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

Agricultural conversion via draining, tillage, seeding, and non-selective herbicide transitions the site to the cropland state (2).

Transition T1B
State 1 to 3

Vegetation removal and human alterations/transportation of soils transitions the site to the anthropogenic state (3).

Transition T2A
State 2 to 3

Vegetation removal and human alterations/transportation of soils transitions the site to the anthropogenic state (3).

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	05/04/2024
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):

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
