

# Ecological site R110XY019IL

## Very Steep Gravel Prairie

Last updated: 4/22/2020  
Accessed: 08/29/2026

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### 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 Wisconsin glacialiation – 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: North-Central Interior Sand and Gravel Tallgrass Prairie (CES202.695) (NatureServe 2018) National Vegetation Classification – Plant Associations: Schizachyrium scoparium – Bouteloua curtipendula Gravel Grassland (CEGL002215) (Nature Serve 2018) Biophysical Settings: North-Central Interior Sand and Gravel Tallgrass Prairie (BpS 4214120) (LANDFIRE 2009) Illinois Natural Areas Inventory: Dry gravel prairie (White and Madany 1978)

### Ecological site concept

Very Steep Gravel Prairies are located within the green areas on the map. They occur on valley trains on slopes greater than 20 percent. The soils are Mollisols that are excessively drained and very deep, formed in glaciofluvial deposits. The historic pre-European settlement vegetation on this ecological site was dominated by drought-adapted herbaceous vegetation. Little bluestem (*Schizachyrium scoparium* (Michx.) Nash) and sideoats grama (*Bouteloua curtipendula* (Michx.) Torr.) are the dominant grasses on the site (White and Madany 1978). Other grasses present may include porcupinegrass (*Hesperostipa spartea* (Trin.) Barkworth) (Bowles and Jones 2004). Species indicative of an undisturbed plant community associated with this ecological site include eastern pasqueflower (*Pulsatilla patens* (L.) Mill ssp. *patens* (L.) Mill.), sidecluster milkweed (*Asclepias lanuginosa* Nutt.), grooved flax (*Linum sulcatum* Riddell), narrowleaf stoneseed (*Lithospermum incisum* Lehm.), Labrador buttercup (*Ranunculus rhomboideus* Goldie), and Bull's coraldrops (*Besseyia bullii* (Eaton) Rydb.) (Taft et al. 1997; White and Madany 1978). Fire is the primary disturbance factor that maintains this site, while periodic drought and large mammal grazing are secondary factors (LANDFIRE 2009).

### Associated sites

|                    |                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------|
| <b>R110XY017IL</b> | <b>Gravel Prairie</b><br><br>Glaciofluvial deposits on slopes less than 12 percent including Rodman soils   |
| <b>R110XY018IL</b> | <b>Steep Gravel Prairie</b><br><br>Glaciofluvial deposits on slopes 12 to 20 percent including Rodman soils |

#### Similar sites

|                    |                                                                                                                                                 |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>R110XY013IL</b> | <b>Dry Sand Prairie</b><br><br>Dry Sand Prairies have a similar midgrass vegetation type, but the parent material is eolian deposits or outwash |
| <b>R110XY017IL</b> | <b>Gravel Prairie</b><br><br>Gravel Prairies also occur on valley trains but slopes are less than 12 percent                                    |
| <b>R110XY018IL</b> | <b>Steep Gravel Prairie</b><br><br>Steep Gravel Prairies also occur on valley trains but slopes are 12 to 20 percent                            |

**Table 1. Dominant plant species**

|            |                                                                         |
|------------|-------------------------------------------------------------------------|
| Tree       | Not specified                                                           |
| Shrub      | Not specified                                                           |
| Herbaceous | (1) <i>Schizachyrium scoparium</i><br>(2) <i>Bouteloua curtipendula</i> |

#### Physiographic features

Very Steep Gravel Prairies occur on valley trains. They are situated on elevations ranging from approximately 470 to 1197 feet ASL. The site does not experience flooding but rather generates runoff to adjacent, downslope ecological sites.

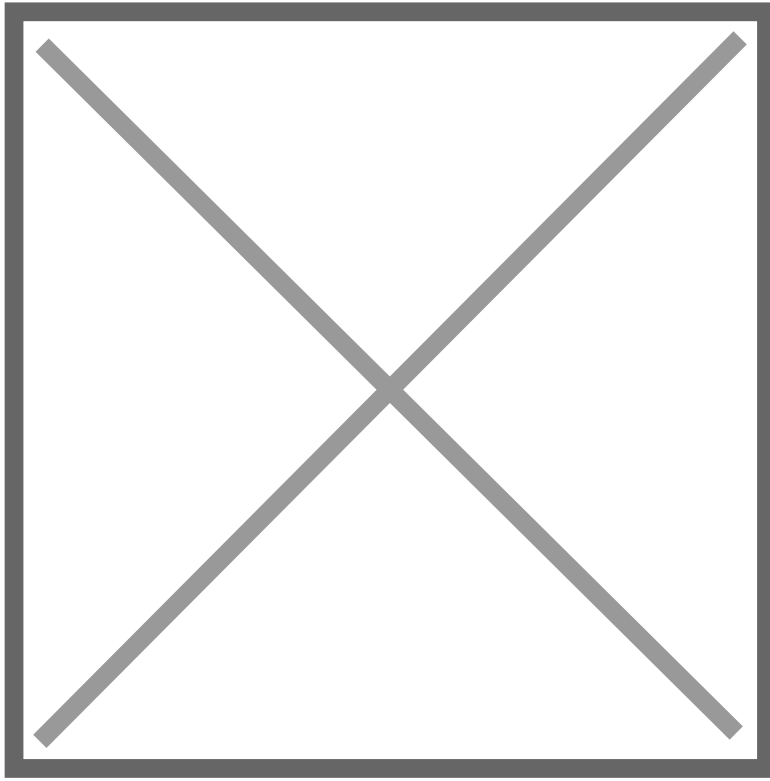


Figure 1.

Table 2. Representative physiographic features

|                     |                                    |
|---------------------|------------------------------------|
| Slope shape across  | (1) Convex                         |
| Slope shape up-down | (1) Convex                         |
| Landforms           | (1) Valley                         |
| Runoff class        | Low to medium                      |
| Elevation           | 140 – 370 m                        |
| Slope               | 20 – 60 %                          |
| Water table depth   | 200 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 169 days, while the frost-free period is about 138 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 36 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 38.3 and 57.8°F, respectively.

**Table 3 Representative climatic features**

|                                            |              |
|--------------------------------------------|--------------|
| Frost-free period (characteristic range)   | 130-150 days |
| Freeze-free period (characteristic range)  | 150-190 days |
| Precipitation total (characteristic range) | 890-940 mm   |
| Frost-free period (actual range)           | 130-150 days |
| Freeze-free period (actual range)          | 150-190 days |
| Precipitation total (actual range)         | 860-990 mm   |
| Frost-free period (average)                | 140 days     |
| Freeze-free period (average)               | 170 days     |
| Precipitation total (average)              | 910 mm       |

- (1) ATTICA 2E [USC00120331], Attica, IN
- (2) JOLIET BRANDON RD DAM [USC00114530], Joliet, IL
- (3) MCHENRY-WG STRATTON LD [USC00115493], McHenry, IL
- (4) BURLINGTON [USC00471205], Burlington, WI
- (5) PLYMOUTH [USC00476678], Plymouth, WI

### Influencing water features

Very Steep Gravel Prairies are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is high (Hydrologic Group A), and surface runoff is low to medium. Surface runoff contributes some water to downslope ecological sites.

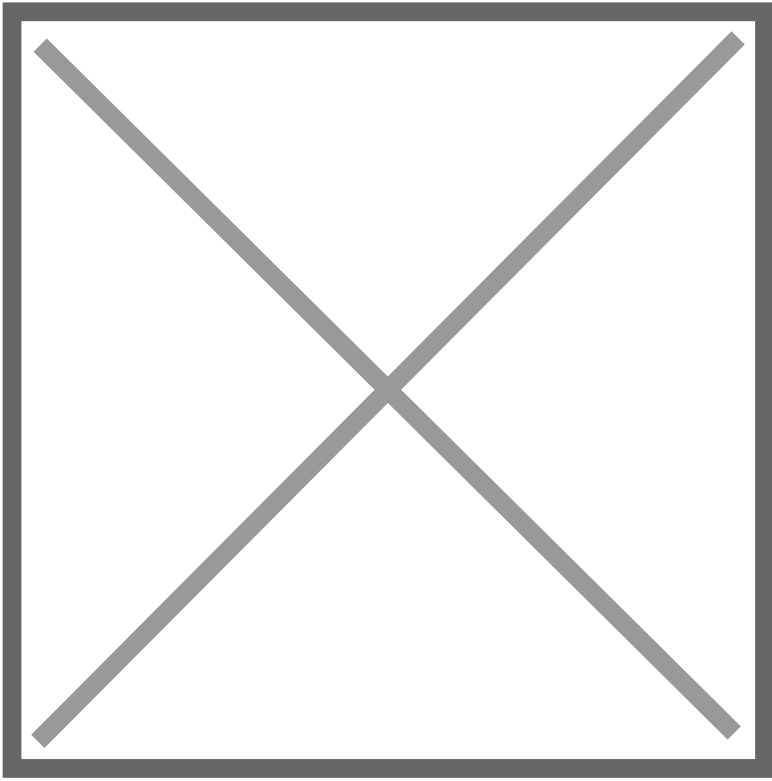


Figure 8. Hydrologic cycling in Very Steep Gravel Prairie ecological site.

Soil features

Soils of Very Steep Gravel Prairies are in the Mollisols order, further classified as Typic Hapludolls with high infiltration and low to medium runoff potential. The soil series associated with this site includes Rodman. The parent material is glaciofluvial deposits, and the soils are excessively drained and very deep. Soil pH classes are Neutral to moderately alkaline. No rooting restrictions are noted for the soils of this ecological site.

Figure 9. Profile sketches of soil series associated with Very Steep Gravel Prairie.

Table 4. Representative soil features

|                             |                            |
|-----------------------------|----------------------------|
| Parent material             | (1) Glaciofluvial deposits |
| Family particle size        | (1) Sandy-skeletal         |
| Drainage class              | Excessively drained        |
| Permeability class          | Moderate                   |
| Depth to restrictive layer  | 200 cm                     |
| Soil depth                  | 200 cm                     |
| Surface fragment cover <=3" | Not specified              |

|                                                          |               |
|----------------------------------------------------------|---------------|
| Surface fragment cover >3"                               | Not specified |
| Available water capacity<br>(Depth not specified)        | 5.08 cm       |
| Calcium carbonate equivalent<br>(Depth not specified)    | 0 – 60 %      |
| Electrical conductivity<br>(Depth not specified)         | Not specified |
| Sodium adsorption ratio<br>(Depth not specified)         | Not specified |
| Soil reaction (1:1 water)<br>(Depth not specified)       | 6.6 – 8.4     |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 30 – 60 %     |
| Subsurface fragment volume >3"<br>(Depth not specified)  | Not specified |

## 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. Very Steep Gravel Prairies form an aspect of this vegetative continuum. This ecological site occurs on valley trains with slopes greater than 20 percent on excessively drained soils. Species characteristic of this ecological site consist of herbaceous, midgrass vegetation.

Fire is a critical disturbance factor that maintains Very Steep Gravel Prairies. Fire intensity typically consisted of periodic, low-intensity surface fires occurring every 1 to 5 years (LANDFIRE 2009). Ignition sources included summertime lightning strikes from convective storms and bimodal, human ignitions during the spring and fall seasons. Native Americans regularly set fires to improve sight lines for hunting, driving large game, improving grazing and browsing habitat, agricultural clearing, and enhancing vital ethnobotanical plants (Barrett 1980).

Drought and grazing by native ungulates have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the excessively 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. Large mammals, specifically prairie elk (*Cervus elaphus*), bison (*Bos bison*), and white-tailed deer (*Odocoileus virginianus*), likely occurred in low densities resulting in limited impacts to

plant composition and dominance (LANDFIRE 2009). When coupled with fire, periods of drought and herbivory can greatly delay the establishment of woody vegetation (Pyne et al. 1996).

Today, Very Steep Gravel Prairies are limited in their extent, having been type-converted to other human-modified landscapes. These conversions appear to be 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

## Additional community tables

Table 5. Community 1.1 plant community composition

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

Table 6. Community 1.2 plant community composition

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

Table 7. Community 2.1 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 this ecological site description.

## Other references

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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                                        | 08/29/2026        |
| Approved by                                 |                   |
| Approval date                               |                   |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. Number and extent of rills:

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2. Presence of water flow patterns:

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3. Number and height of erosional pedestals or terracettes:

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4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

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5. Number of gullies and erosion associated with gullies:

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6. Extent of wind scoured, blowouts and/or depositional areas:

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7. Amount of litter movement (describe size and distance expected to travel):

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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:**

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