

Ecological site R110XY010IL

Moist Glacial Drift Upland Savanna

Last updated: 4/22/2020
Accessed: 08/28/2026

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): 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 Oak Savanna (CES202.698) (NatureServe 2018) National Vegetation Classification – Plant Associations: *Quercus macrocarpa* – (*Quercus alba*, *Quercus velutina*)/*Andropogon gerardii* Wooded Grassland (CEGL002020) (Nature Serve 2018) Biophysical Settings: North-Central Interior Oak Savanna (BpS 4213940) (LANDFIRE 2009) Illinois Natural Areas Inventory: Mesic savanna (White and Madany 1978) Wisconsin Natural Communities: Oak opening (WDNR 2015)

Ecological site concept

Moist Glacial Drift Upland Savannas are located within the green areas on the map. They occur on uplands. The soils are Mollisols, Alfisols, and Inceptisols that are somewhat poorly to moderately well drained and very deep, formed in loess, outwash, glacial till, or lacustrine deposits. The historic pre-European settlement vegetation on this ecological site was dominated by tallgrass prairie interspersed with trees. Bur oak (*Quercus macrocarpa* Michx.) is the dominant tree, and big bluestem (*Andropogon gerardii* Vitman) and Indiangrass (*Sorghastrum nutans* (L.) Nash) are the dominant species on the site. Other grasses present can include little bluestem (*Schizachyrium scoparium* (Michx.) Nash) (White and Madany 1978; NatureServe 2018). Forbs typically associated with an undisturbed plant community associated with this ecological site can include veiny pea (*Lathyrus venosus* Muhl. ex Willd.) (White and Madany 1978; Taft et al. 1997). Fire is the primary disturbance factor that maintains this site, while herbivory and drought are secondary factors (LANDFIRE 2009).

Associated sites

R110XY009IL	Dry Glacial Drift Upland Savanna Loess or other silty or loamy material, loamy outwash, glacial till, lacustrine deposits, or glaciofluvial deposits parent material with no seasonal water table including Bowes, Dresden, and Grays soils
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Table 1. Dominant plant species

Tree	(1) <i>Quercus macrocarpa</i>
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Sorghastrum nutans</i>

Physiographic features

Moist Glacial Drift Upland Savannas occur on uplands. They are situated on elevations ranging from approximately 470 to 1312 feet ASL. The site does not experience flooding but rather generates runoff to adjacent, downslope ecological sites.

Figure 1. Representative block diagram of Moist Glacial Drift Upland Savanna and associated ecological sites.

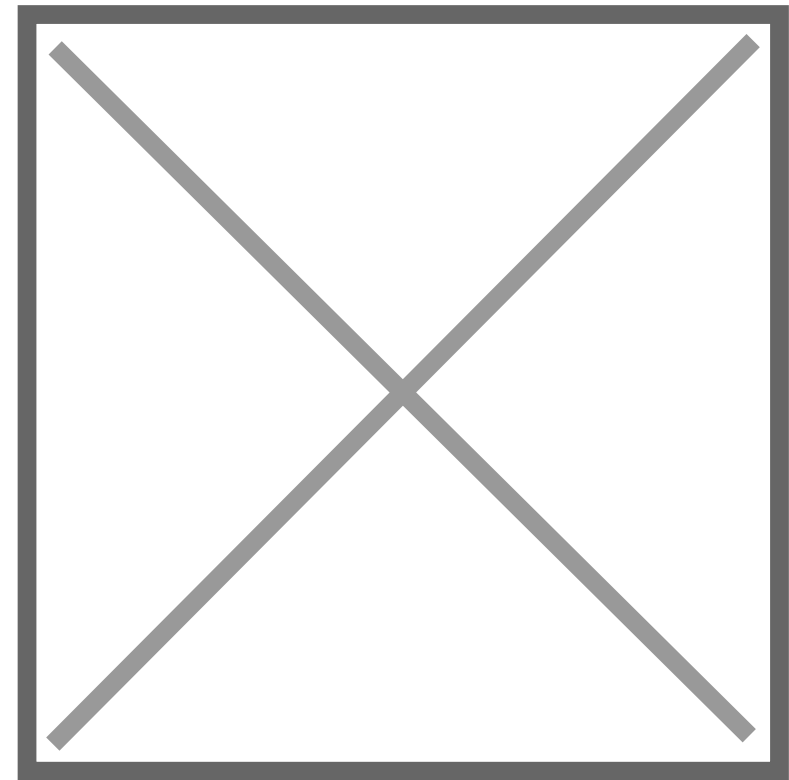


Figure 2.

Table 2. Representative physiographic features

Slope shape across	(1) Convex
Slope shape up-down	(1) Convex

Landforms	(1) Upland
Runoff class	Negligible to very high
Elevation	140 – 400 m
Slope	0 – 20 %
Water table depth	30 – 80 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 167 days, while the frost-free period is about 144 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 38 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 39.3 and 59.4°F, respectively.

Table 3 Representative climatic features

Frost-free period (characteristic range)	140-150 days
Freeze-free period (characteristic range)	160-180 days
Precipitation total (characteristic range)	910-1,040 mm
Frost-free period (actual range)	130-150 days
Freeze-free period (actual range)	150-180 days
Precipitation total (actual range)	890-1,040 mm
Frost-free period (average)	140 days

Freeze-free period (average)	170 days
Precipitation total (average)	970 mm

- (1) PIPER CITY [USC00116819], Piper City, IL
- (2) MARSEILLES LOCK [USC00115372], Marseilles, IL
- (3) PARK FOREST [USC00116616], Chicago Heights, IL
- (4) WEST CHICAGO DUPAGE AP [USW00094892], Saint Charles, IL
- (5) UNION GROVE [USC00478723], Union Grove, WI

Influencing water features

Moist Glacial Drift Upland Savannas are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is slow (Hydrologic Group C), and surface runoff is negligible to very high. Surface runoff contributes some water to downslope ecological sites.

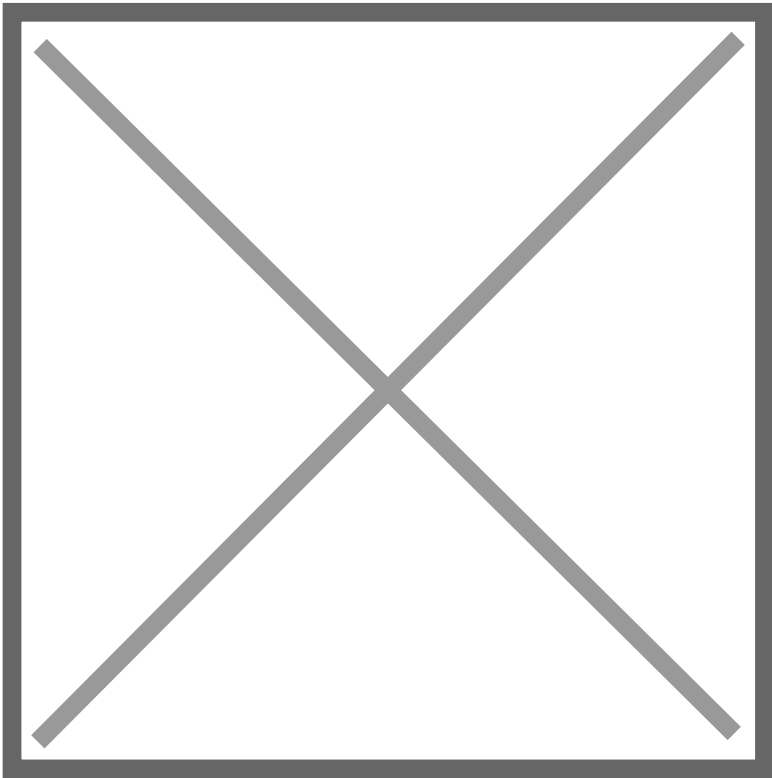


Figure 9. Hydrologic cycling in Moist Glacial Drift Upland Savanna ecological site.

Soil features

Soils of Moist Glacial Drift Upland Savannas are in the Mollisols, Alfisols, and Inceptisols orders, further classified as Oxyaquic Argiudolls, Udollic Endoaqualfs, Udollic Epiaqualfs, Mollic Oxyaquic Hapludalfs, and Oxyaquic Eutrudepts with slow infiltration and negligible to very high runoff potential. The soil series associated with this site includes Beardstown, Beecher, Chatsworth, Frankfort, Graymont, Grays, Markham, Millbrook, and Wauconda. The parent material is loess or other silty or loamy material, loamy outwash, glacial till, or lacustrine deposits and the soils are somewhat poorly to moderately well drained with a seasonal water table. Soil pH classes are very strongly acid to moderately alkaline. No rooting restrictions are noted for the soils of this ecological site.

Figure 10. Profile sketches of soil series associated with Moist Glacial Drift Upland Savanna.

Table 4. Representative soil features

Parent material	(1) Loess (2) Outwash (3) Till (4) Lacustrine deposits
Family particle size	(1) Fine (2) Fine-silty
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately slow
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 (Depth not specified)	10.16 – 20.32 cm
Calcium carbonate equivalent (Depth not specified)	0 – 40 %
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (Depth not specified)	4.5 – 8.4

Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (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. Moist Glacial Drift Upland Savannas form an aspect of this vegetative continuum. This ecological site occurs on uplands on somewhat poorly to moderately well drained soils. Species characteristic of this ecological site consist of herbaceous vegetation with scattered trees.

Fire is a critical disturbance factor that maintains Moist Glacial Drift Upland Savannas. Fire intensity typically consisted of periodic 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; White 1994).

Drought and herbivory by native ungulates have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the somewhat poorly to moderately well 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. Bison (*Bos bison*) grazing, while present, served a more limited role in community composition and structure than lands further west. Prairie elk (*Cervus elaphus*) and white-tailed deer (*Odocoileus virginianus*) likely contributed to woody species reduction but are also considered to be of a lesser impact compared to the west (LANDFIRE 2009). When coupled with fire, periods of drought and herbivory can further delay the establishment of woody vegetation (Pyne et al. 1996).

Today, Moist Glacial Drift Upland Savannas are virtually extinct, having been type-converted to agricultural production land or other human-modified landscapes. Remnants that do exist show evidence of indirect anthropogenic influences from fire suppression and non-native species invasion. A return to the historic plant community may not be possible following extensive land modification, but long-term conservation agriculture or prairie reconstruction efforts can help to restore some biotic diversity and ecological function. 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 (%)
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Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 4.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 5.2 plant community composition

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

Angel, J. No date. Climate of Illinois Narrative. Illinois State Water Survey, Prairie Research Institute, University of Illinois at Urbana-Champaign. Available at <https://www.isws.illinois.edu/statecli/General/Illinois-climate-narrative.htm>. Accessed 8 November 2018.

Asbjornsen, H., L.A. Brudvig, C.M. Mabry, C.W. Evans, and H.M. Karnitz. 2005. Defining reference information for restoring ecologically rare tallgrass oak savannas in the midwestern United States. *Journal of Forestry* 103: 345-350.

Barrett, S.W. 1980. Indians and fire. *Western Wildlands* Spring: 17-20.

Brudvig, L.A., C.M. Mabry, J.R. Miller, and T.A. Walker. 2007. Evaluation of central North American prairie management based on species diversity, life form, and individual species metrics. *Conservation Biology* 21: 864-874.

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Coterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 92 pps.

Colandonato, M. 1992. *Carya cordiformis*. In: Fire Effects Information System [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at <https://www.crs-feis.org/feis/>. (Accessed 23 March 2018).

Fierer, N., J. Ladau, J.C. Clemente, J.W. Leff, S.M. Owens, K.S. Pollard, R. Knight, J.A. Gilbert, and R.L. McCulley. 2013. Reconstructing the microbial diversity and function of pre-agricultural tallgrass prairie soils in the United States. *Science* 342: 621-624.

Gucker, C.L. 2011. *Quercus macrocarpa*. In: Fire Effects Information System [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at <https://www.crs-feis.org/feis/>. (Accessed 23 March 2018).

Karol, P. and D.A. Wardle. 2010. How understanding aboveground-belowground linkages can assist restoration ecology. *Trends in Ecology and Evolution* 25: 670-679.

LANDFIRE. 2009. Biophysical Setting 4213940 North-Central Interior Oak Savanna. In: LANDFIRE National Vegetation Dynamics Models. USDA Forest Service and US Department of Interior. Washington, DC.

Leake, J., D. Johnson, D. Donnelly, G. Muckle, L. Boddy, and D. Read. 2004. Networks of power and influence: the role of mycorrhizal mycelium in controlling plant communities and agroecosystem functioning. *Canadian Journal of Botany* 82: 1016-1045.

Martin, L.M. and B.J. Wilsey. 2006. Assessing grassland restoration success: relative roles of seed additions and native ungulate

activities. *Journal of Applied Ecology* 43: 1098-1110.

Martin, L.M. and B.J. Wilsey. 2012. Assembly history alters alpha and beta diversity, exotic-native proportions and functioning of restored prairie plant communities. *Journal of Applied Ecology* 49: 1436-1445.

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1 NatureServe, Arlington, VA. Available at <http://explorer.natureserve.org>. (Accessed 13 January 2020).

Nowacki, G.J. and M.D. Abrams. 2008. The demise of fire and “mesophication” of forests in the eastern United States. *BioScience* 58: 123-138.

Peel, M.C., B.L. Finlayson, and T.A. McMahon. 2007. Updated world map of the Köppen-Geiger climate classification. *Hydrology and Earth System Sciences* 11: 1633-1644.

Pyne, S.J., P.L. Andrews, and R.D. Laven. 1996. *Introduction to Wildland Fire*, Second Edition. John Wiley and Sons, Inc. New York, New York. 808 pps.

Schwegman, J.E., G.B. Fell, M. Hutchinson, G. Paulson, W.M. Shepherd, and J. White. 1973. Comprehensive Plan for the Illinois Nature Preserves System, Part 2 The Natural Divisions of Illinois. Illinois Nature Preserves Commission, Rockford, IL. 32 pps.

Skinner, R.H. 2008. High biomass removal limits carbon sequestration potential of mature temperate pastures. *Journal for Environmental Quality* 37: 1319-1326.

Smith, D.D., D. Williams, G. Houseal, and K. Henderson. 2010. *The Tallgrass Prairie Center Guide to Prairie Restoration in the Upper Midwest*. University of Iowa Press, Iowa City, IA. 338 pps.

Society for Ecological Restoration [SER] Science & Policy Working Group. 2002. *The SER Primer on Ecological Restoration*. Available at: <http://www.ser.org/>. (Accessed 28 February 2017).

Taft, J.B., G.S. Wilhelm, D.M. Ladd, and L.A. Masters. 1997. Floristic Quality Assessment for vegetation in Illinois, a method for assessing vegetation integrity. *Erigenia* 15: 3-95.

Taft, J.B., R.C. Anderson, L.R. Iverson, and W.C. Handel. 2009. Chapter 4: Vegetation ecology and change in terrestrial ecosystems. In: C.A. Taylor, J.B. Taft, and C.E. Warwick (eds.). *Canaries in the Catbird Seat: The Past, Present, and Future of Biological Resources in a Changing Environment*. Illinois Natural Heritage Survey Special Publication 30, Prairie Research Institute, University of Illinois at Urbana-Champaign. 306 pps.

Teague, W.R., S.L. Dowhower, S.A. Baker, N. Haile, P.B. DeLaune, and D.M. Conover. 2011. Grazing management impacts on vegetation, soil biota and soil chemical, physical and hydrological properties in tall grass prairie. *Agriculture, Ecosystems and Environment* 141: 310-322.

Tirmenstein, D.A. 1991. *Quercus alba*. In: *Fire Effects Information System* [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Available at <https://www.crs-feis.org/feis/>. (Accessed 23 March 2018).

Tomer, M.D., D.W. Meek, and L.A. Kramer. 2005. Agricultural practices influence flow regimes of headwater streams in western Iowa. *Journal of Environmental Quality* 34:1547-1558.

Undersander, D., B. Albert, D. Cosgrove, D. Johnson, and P. Peterson. 2002. *Pastures for Profit: A Guide to Rotational Grazing (A3529)*. University of Wisconsin-Extension and University of Minnesota Extension Service. 43 pps.

United States Department of Agriculture – Natural Resource Conservation Service (USDA-NRCS). 2006. *Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin*. U.S. Department of Agriculture Handbook 296. 682 pps.

U.S. Environmental Protection Agency [EPA]. 2013. Level III and Level IV Ecoregions of the Continental United States. Corvallis, OR, U.S. EPA, National Health and Environmental Effects Research Laboratory, map scale 1:3,000,000. Available at <http://www.epa.gov/eco-research/level-iii-andiv-ecoregions-continental-united-states>. (Accessed 1 March 2017).

White, J. and M.H. Madany. 1978. Classification of natural communities in Illinois. In: J. White. *Illinois Natural Areas Inventory Technical Report*. Illinois Natural Areas Inventory, Department of Landscape Architecture, University of Illinois at Urbana/Champaign. 426 pps.

White, J. 1994. How the terms savanna, barrens, and oak openings were used in early Illinois. In: J. Fralisch, ed. *Proceedings of the North American Conference on Barrens and Savannas*. Illinois State University, Normal, IL.

Williams, D.A., L.L. Jackson, and D.D. Smith. 2007. Effects of frequent mowing on survival and persistence of forbs seeded into a

species-poor grassland. Restoration Ecology 15: 24-33.

Wilsey, B.J. 2008. Productivity and subordinate species response to dominant grass species and seed source during restoration. Restoration Ecology 18: 628-637.

Wisconsin Department of Natural Resources [WDNR]. 2015. The Ecological Landscapes of Wisconsin: An Assessment of Ecological Resources and a Guide to Planning Sustainable Management. Wisconsin Department of Natural Resources, PUB-SS-1131 2015, Madison, WI. 293 pps.

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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	08/28/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

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

5. Number of gullies and erosion associated with gullies:

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

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

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

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

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

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

12. Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant:

Sub-dominant:

Other:

Additional:

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

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

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

16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:

17. Perennial plant reproductive capability:
