

Ecological site F110XY011IL

Dry Glacial Drift Upland Forest

Last updated: 4/22/2020
Accessed: 09/01/2026

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 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: North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046) (NatureServe 2018) National Vegetation Classification – Plant Associations: *Quercus alba* – *Quercus rubra* – *Carya ovata* Glaciated Forest (CEGL002068) (Nature Serve 2018) Biophysical Settings: North-Central Interior Dry-Mesic Oak Forest and Woodland (BpS 4213100) (LANDFIRE 2009) Illinois Natural Areas Inventory: Dry-mesic forest (White and Madany 1978) Wisconsin Natural Communities: Southern dry-mesic forest (WDNR 2015)

Ecological site concept

Dry Glacial Drift Upland Forests are located within the green areas on the map (Figure 1). They occur on uplands. The soils are Alfisols that are moderately well to well drained and very deep, formed in loess or other silty or loamy material, loamy outwash, glacial till, or lacustrine deposits. The historic pre-European settlement vegetation on this ecological site was dominated by a closed canopy of oaks. White oak (*Quercus alba* L.) and northern red oak (*Quercus rubra* L.) are the dominant species in the tree canopy, but black oak (*Quercus velutina* Lam.), and shagbark hickory (*Carya ovata* (Mill.) K. Koch) can also be present (White and Madany 1978; LANDFIRE 2009; NatureServe 2018). Hophornbeam (*Ostrya virginiana* (Mill.) K. Koch) and blackhaw (*Viburnum prunifolium* L.) are the dominant subcanopy and shrub species, respectively. Spotted geranium (*Geranium maculatum* L.) and wood anemone (*Anemone quinquefolia* L.) are characteristic herbaceous species of this closed canopy forest (White and Madany 1978; WDNR 2015). Herbaceous species characteristic of an undisturbed plant community associated with this ecological site include forked aster (*Eurybia furcata* (Burgess) G.L. Nesom), heartleaf skullcap (*Scutellaria ovata* Hill), and threebirds (*Triphora trianthophora* (Sw.) Rydb.) (Taft et al. 1997; Bernthal 2003; WDNR 2015). Fire is the primary disturbance factor that maintains this ecological site, while storm damage and drought are secondary factors (LANDFIRE 2009).

Associated sites

F110XY012IL	Moist Glacial Drift Upland Forest Loess or other silty or loamy material, loamy outwash, glacial till, or lacustrine deposits with a water table within 18-72 inches including Aptakisic, Blount, Del Rey, Nappanee, Ozaukee, Sabina, Starks, St. Clair, Tuscola, and Whitaker soils
-------------	---

Similar sites

F110XY012IL	Moist Glacial Drift Upland Forest Moist Glacial Drift Upland Forests are on adjacent, down-gradient landscapes and have a water table within 18-72 inches
-------------	--

Table 1. Dominant plant species

Tree	(1) <i>Quercus alba</i> (2) <i>Quercus rubra</i>
Shrub	(1) <i>Ostrya virginiana</i> (2) <i>Viburnum prunifolium</i>
Herbaceous	(1) <i>Geranium maculatum</i> (2) <i>Anemone quinquefolia</i>

Physiographic features

Dry Glacial Drift Upland Forests occur on uplands. They are situated on elevations ranging from approximately 400 to 1312 feet ASL. The site does not experience flooding but rather generates runoff to adjacent, downslope ecological sites.

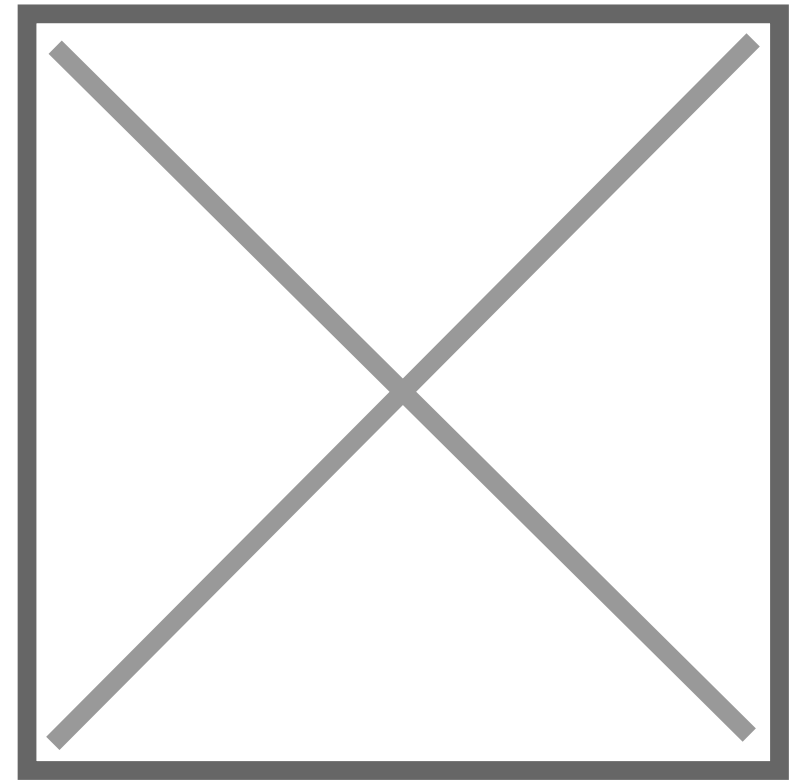


Figure 1.

Table 2. Representative physiographic features

Slope shape across	(1) Convex
Slope shape up-down	(1) Convex
Landforms	(1) Upland
Runoff class	Low to very high
Elevation	120 – 400 m
Slope	0 – 20 %
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 165 days, while the frost-free period is about 136 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 38.6 and 58.4°F, respectively.

Table 3 Representative climatic features

Frost-free period (characteristic range)	130-150 days
Freeze-free period (characteristic range)	160-180 days
Precipitation total (characteristic range)	890-940 mm
Frost-free period (actual range)	120-150 days
Freeze-free period (actual range)	130-190 days

Precipitation total (actual range)	890-970 mm
Frost-free period (average)	140 days
Freeze-free period (average)	170 days
Precipitation total (average)	910 mm

- (1) WATSEKA 2 NW [USC00119021], Watseka, IL
- (2) JOLIET BRANDON RD DAM [USC00114530], Joliet, IL
- (3) MCHENRY-WG STRATTON LD [USC00115493], McHenry, IL
- (4) LAKE GENEVA [USC00474457], Lake Geneva, WI
- (5) GERMANTOWN [USC00473058], Germantown, WI

Influencing water features

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

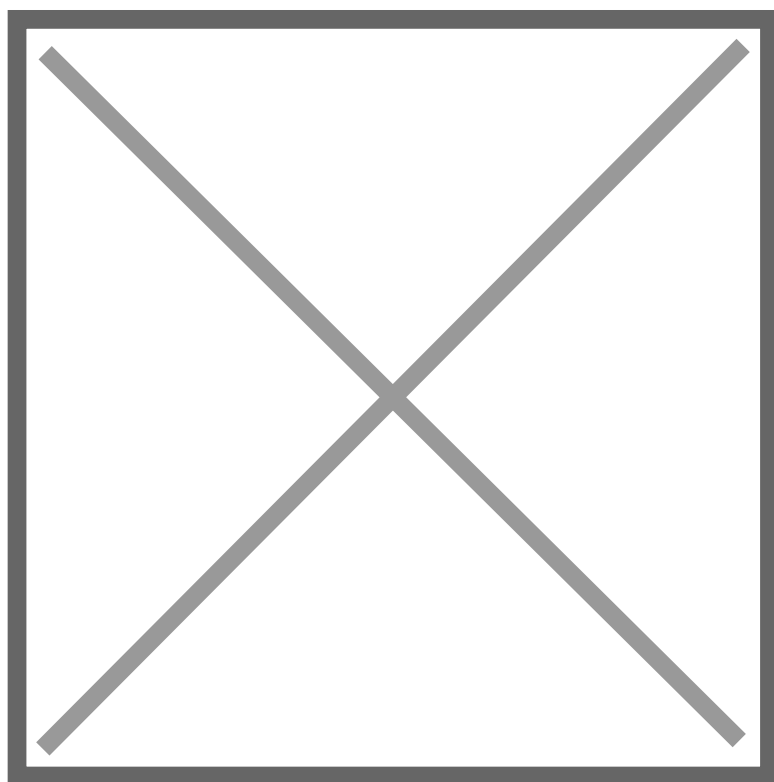


Figure 8. Hydrologic cycling in Dry Glacial Drift Upland Forest ecological site.

Soil features

Soils of Dry Glacial Drift Upland Forests are in the Alfisols order, further classified as Typic Hapludalfs and Oxyaquic Hapludalfs with moderate infiltration and low to very high runoff potential. The soil series associated with this site includes Fox, Hebron, Martinsville, Ockley, Ozaukee, Rush, Saylesville, Senachwine, Sisson, Somonauk, Strawn, St. Clair, and Zurich. The parent material is loess or other silty or loamy material, loamy outwash, glacial till, or lacustrine deposits, and the soils are moderately well to well drained and very deep. Soil pH classes are very strongly acid to strongly alkaline. No rooting restrictions are noted for the soils of this ecological site.

Figure 9. Profile sketches of soil series associated with Dry Glacial Drift Upland Forest.

Table 4. Representative soil features

Parent material	(1) Loess (2) Outwash (3) Till (4) Lacustrine deposits
Family particle size	(1) Fine (2) Fine-silty (3) Fine-loamy (4) Fine-loamy over sandy or sandy-skeletal
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to 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)	5.08 – 20.32 cm
Calcium carbonate equivalent (Depth not specified)	0 – 60 %
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 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 30 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

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. Glacial Drift Upland Forests form an aspect of this vegetative continuum. This ecological site occurs on uplands on well-drained soils. Species characteristic of this ecological site consist of a closed canopy of oaks with shade-tolerant herbaceous vegetation.

Fire is a critical factor that maintains Dry Glacial Drift Upland Forests. Fire typically consisted of low-severity surface fires every 25 to 50 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, drive large game, improve grazing and browsing habitat, agricultural clearing, and enhance vital ethnobotanical plants (Barrett 1980; LANDFIRE 2009).

Drought and storm damage have also played a role in shaping this ecological site. The periodic episodes of reduced soil moisture in conjunction with the 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. Damage to trees from wind and ice storms can vary from minor, patchy effects of individual trees to stand effects that temporarily affect community structure and species richness and diversity (Irland 2000; Peterson 2000). When coupled with fire, periods of drought and catastrophic storm damage can greatly delay the establishment and maturation of woody vegetation (Pyne et al. 1996).

Today, Dry Glacial Drift Upland Forests have been reduced as they have been type-converted to agricultural or other human-modified landscape. Remnants that do exist have experienced long-term fire suppression and overbrowsing resulting in significant changes to the forest structure. A return to the historic plant community may not be possible following extensive land modification, but long-term conservation agriculture or forest 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 (%)
-------	-------------	--------	-----------------	----------------------	------------------

Table 6. Community 2.1 plant community composition

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

Table 7. Community 2.2 plant community composition

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

Table 8. Community 3.1 plant community composition

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

Table 9. Community 4.1 plant community composition

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

Table 10. Community 4.2 plant community composition

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

Table 11. Community 4.3 plant community composition

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

Table 12. Community 5.1 plant community composition

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

Table 13. Community 5.2 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

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.

Barrett, S.W. 1984. Indians and fire. *Western Wildlands*. Spring: 17-20.

Bernthal, T.W. 2003. Development of a Floristic Quality Assessment Methodology for Wisconsin: Final Report to the U.S. Environmental Protection Agency Region V. Wisconsin Department of Natural Resources, Bureau of Fisheries Management and habitat Protection, Madison, WI. 96 pps.

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.

Gubanyi, J., J. Savidge, S.E. Hygnstrom, K. VerCauteren, G.W. Garabrandt, and S. Korte. 2008. Deer impact on vegetation in natural areas in southeastern Nebraska. USDA National Wildlife Research Center – Staff Publications. 913. Available at http://digitalcommons.unl.edu/icwdm_usdanwrc/913. (Accessed 6 April 2017).

Illinois Forestry Development Council (IFDC). 2018. Illinois Forest Action Plan: A Statewide Forest Resource Assessment and Strategy, Version 4.1. Illinois Forestry Development Council and Illinois Department of Natural Resources. 80 pps.

Irland, L.C. 2000. Ice storms and forest impacts. *The Science of the Total Environment* 262:231-242.

LANDFIRE. 2009. Biophysical Setting 4213100 North-Central Interior Dry-Mesic Oak Forest and Woodland. 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.

Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being: Current States and Trends*. World Resources Institute. Island Press, Washington, D.C. 948 pages.

NatureServe. 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1 NatureServe, Arlington, VA. Available at <http://explorer.natureserve.org>. (Accessed 16 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.
- Peterson, C.J. 2000. Catastrophic wind damage to North American forests and the potential impact of climate change. *The Science of the Total Environment* 262: 287-311.
- 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.
- Rawbinski, T.J. 2008. Impacts of White-tailed Deer Overabundance in Forest Ecosystems: An Overview. U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry. Newton Square, PA, USA. Available at https://www.na.fs.fed.us/fhp/special_interests/White-tailed_deer.pdf (Accessed 17 April 2017).
- 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.
- 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.
- 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.
- 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).
- VerCauteren, K. and S.E. Hygnstrom. 2011. Managing white-tailed deer: Midwest North America. *Papers in Natural Resources*. Paper 380. Available at <http://digitalcommons.unl.edu/natrespapers/380>. (Accessed 17 April 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.
- 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.

Contributors

Lisa Kluesner
Kristine Ryan
Sarah Smith
Tiffany Justus

Approval

Chris Tecklenburg, 4/22/2020

Acknowledgments

This project could not have been completed without the dedication and commitment from a variety of staff members. Team members supported the project by serving on the technical team, assisting with the development of state and community phases of the state-and-transition model, providing peer review and technical editing, and conducting quality control and quality assurance reviews. Table 6. List of primary contributors and reviewers. Organization Name Title Location Natural Resources Conservation Service Ron Collman State Soil Scientist Champaign, IL Tonie Endres Senior Regional Soil Scientist Indianapolis, IN Tiffany Justus Soil Scientist Aurora, IL Lisa Kluesner Ecological Site Specialist Waverly, IA Rick Neilson State Soil Scientist Indianapolis, IN Jason Nemecek State Soil Scientist Madison, WI Kevin Norwood Soil Survey Regional Director Indianapolis, IN Kristine Ryan MLRA Soil Survey Leader Aurora, IL Stanley Sipp Resource Inventory Specialist Champaign, IL Sarah Smith Soil Scientist Aurora, IL Chris Tecklenberg Acting Regional Ecological Site Specialist Hutchinson, KS

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	09/01/2026
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:
