Ecological site F108XD907IA
Flaggy Floodplain Forest

Last updated: 10/17/2024
Accessed: 05/13/2025

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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 108X–Illinois and Iowa Deep Loess and Drift

The Illinois and Iowa Deep Loess and Drift, Western Part MLRA covers parts of both Iowa and Missouri, and is known locally as part of the Southern Iowa Drift Plain. A silty loess deposit of varied thickness from 5 to 20 feet covers a series of glacial advances known collectively as pre-Illinoisan till. This till, deposited more than half a million years ago, was subjected to multiple instances of extreme erosion, as well as periods of subdued erosion and intense weathering. The loess thickness is deepest in the western part and generally thins eastward. In some areas, the loess has been removed entirely exposing the older weathered till called a “paleosol”. These highly weathered soils are high in clay and slow down the downward movement of water through the profile causing it to move laterally instead of vertically. Wet areas, or “side-hill seeps” commonly form where these paleosols become exposed along hillsides (Prior, 1991).

The dominant soil orders in this MLRA are Mollisols and Alfisols and to a lesser extent Entisols and Inceptisols. Most of the soils are Udolls or Udalfs. Aquolls are on the flatter interfluves. The soils in the area dominantly have a mesic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. They generally are very deep, well drained to poorly drained, and silty, loamy, or clayey. These soils on uplands include somewhat poorly drained, nearly level Argiudolls (Macksburg series); moderately well drained, gently sloping to strongly sloping Argiudolls (Sharpsburg series); poorly drained, nearly level Argiaquolls (Winterset series); and well drained strongly sloping to steep Hapludalfs (Gara, Lindley, Ladoga, Armstrong, series) (USDA-NRCS Handbook 296).
The western part of the Illinois and Iowa Deep Loess and Drift is a segment of three other MLRAs within the Central Feed Grains and Livestock Region. The other areas are: the

Classification relationships

Major Land Resource Area (MLRA): Illinois and Iowa Deep Loess and Drift, Western Part (108D)

USFS Subregions: Central Dissected Till Plains Section (251C); Loess Hills (251Cb) and Central Dissected Till and Loess Plain (251Cc) Subsections (Cleland et al, 2007)

Relationship to Other Established Classifications:
NatureServe Classification: Ecological System: North-Central Interior Floodplain (9338); Ecological Association: Ash - Elm / Wolfberry Forest (NatureServe, 2013)

Landfire Biophysical Setting: Central Tallgrass Prairie (4314210) (Landfire, 2009)

Ecological site concept

Flaggy Floodplains are within the red areas on the map (Figure 1). These sites formed alluvial parent material and can be found on floodplains in river valleys. Typically these sites are located down slope from limestone backslope glade ecological sites. Soils are typically either Mollisols or Entisols, characterized by thin variable surfaces containing a wide range of organic matter due to the repeated deposits as a result of flooding. Where these layers have been stable, a thick surface has developed with high organic matter. Plant communities consist of mostly trees, forbs, grasses and few sedges.

Associated sites

R108XD797IA	**Limestone Backslope Glade** Limestone Backslope Glade. Clayey soils including the Dunbarton series.

Similar sites

F108XD901IA	**Loamy Floodplain Forest** Loamy Floodplain Forest. Fine-silty and coarse-loamy soils including Nodaway, Landes, Kennebec and Huntsville series.

Table 1. Dominant plant species

Tree	(1) *Fraxinus pennsylvanica* (2) *Ulmus americana*
Shrub	(1) *Symphoricarpos occidentalis*
Herbaceous	Not specified

Physiographic features

Flaggy Floodplains are of small extent, and can be found on floodplains in river valleys along streams and rivers in MLRA 108D. These sites are within a dissected till plain landscape. Slopes are generally less than 2 percent. These sites typically occur in areas surrounded upslope by limestone outcrops.

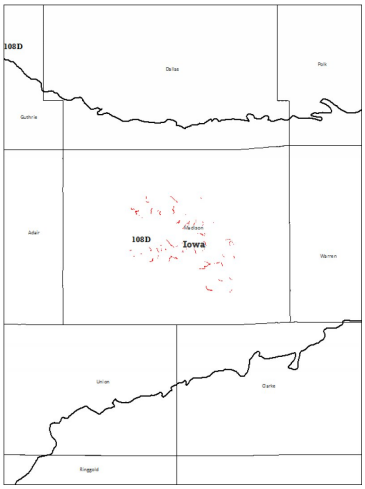


Figure 2. Location of this ecological site within the MLRA.

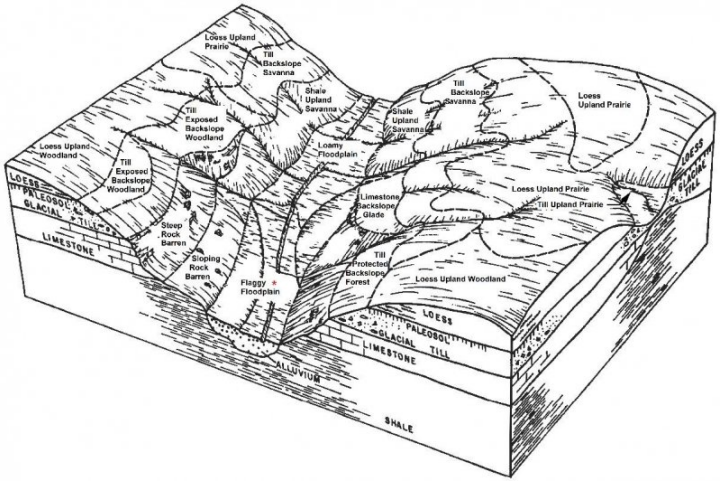


Figure 3. Block diagrams representing typical soil-landform sequences in the Loess over Limestone physiographic area. Red asterisks identify soil components correlated to Flaggy Floodplain Forest.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	152–305 m
Slope	0–2%
Water table depth	30–152 cm
Aspect	Aspect is not a significant factor

Climatic features

The soil temperature regime of MLRA 108D is classified as “mesic” where the mean annual soil temperature is between 46 and 59°F (Soil Survey Staff, 2014). The average freeze-free period of this ecological site is about 166 days, while the frost-free period is about 144 days.

Average annual precipitation is 31 inches, which includes rainfall plus the water equivalent from snowfall. The average annual low and high temperatures are 38 and 60°F, respectively.

Table 3. Representative climatic features

Frost-free period (characteristic range)	135-144 days
Freeze-free period (characteristic range)	157-174 days
Precipitation total (characteristic range)	889-940 mm
Frost-free period (actual range)	129-149 days
Freeze-free period (actual range)	149-176 days
Precipitation total (actual range)	889-965 mm
Frost-free period (average)	140 days
Freeze-free period (average)	165 days
Precipitation total (average)	914 mm

Climate stations used

- (1) GUTHRIE CTR [USC00133509], Guthrie Center, IA
- (2) KNOXVILLE [USC00134502], Knoxville, IA
- (3) GREENFIELD [USC00133438], Greenfield, IA
- (4) CLARINDA [USC00131533], Clarinda, IA
- (5) WINTERSET 1N [USC00139132], Winterset, IA
- (6) MARYVILLE 2E [USC00235340], Maryville, MO

Influencing water features

Soils are moderately well-drained, and permeability is moderate to rapid. The site contains hydrologic groups A and B/D (Hydrologic Soil Group, 2016). Land capability class is 4s or 5w (Land Capability Classification, 2016). Depth to endosaturation ranges from 1 to 5 feet or more.

This ecological site is typically in natural levee positions directly adjacent to a perennial stream. Stream levels typically respond quickly to storm events, especially in watersheds where surface runoff is dominant. Short- to medium- duration flooding is common in many areas, particularly during spring and early summer storm events. Constructed levees, often accompanied by stream channelization, have altered the hydrology and flooding dynamics in many places. Streambeds are typically incised into the surrounding floodplain by as much as 10 feet. Some soils in this ecological site have seasonal water tables below about two feet in the winter and spring, generally receding with the falling river levels in the early summer. The water table has a minimal effect on the vegetative community.

Soil features

These soils have no major rooting restriction. The soils were formed under forest vegetation, and have either thin, varied organic horizons or dark, organic-rich surface horizons. Parent material is alluvium. These soils contain flagstones within the profile. The soils have loam and loamy sand surface horizons. Subsoils are sand or sandy loam. Soil series associated with this site include Spillville. Also associated are flaggy alluvial lands.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loamy sand (2) Loam
Drainage class	Moderately well drained
Permeability class	Very slow to moderate
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	4.32–21.84 cm
Subsurface fragment volume <=3" (Depth not specified)	0–14%
Subsurface fragment volume >3" (Depth not specified)	0–45%

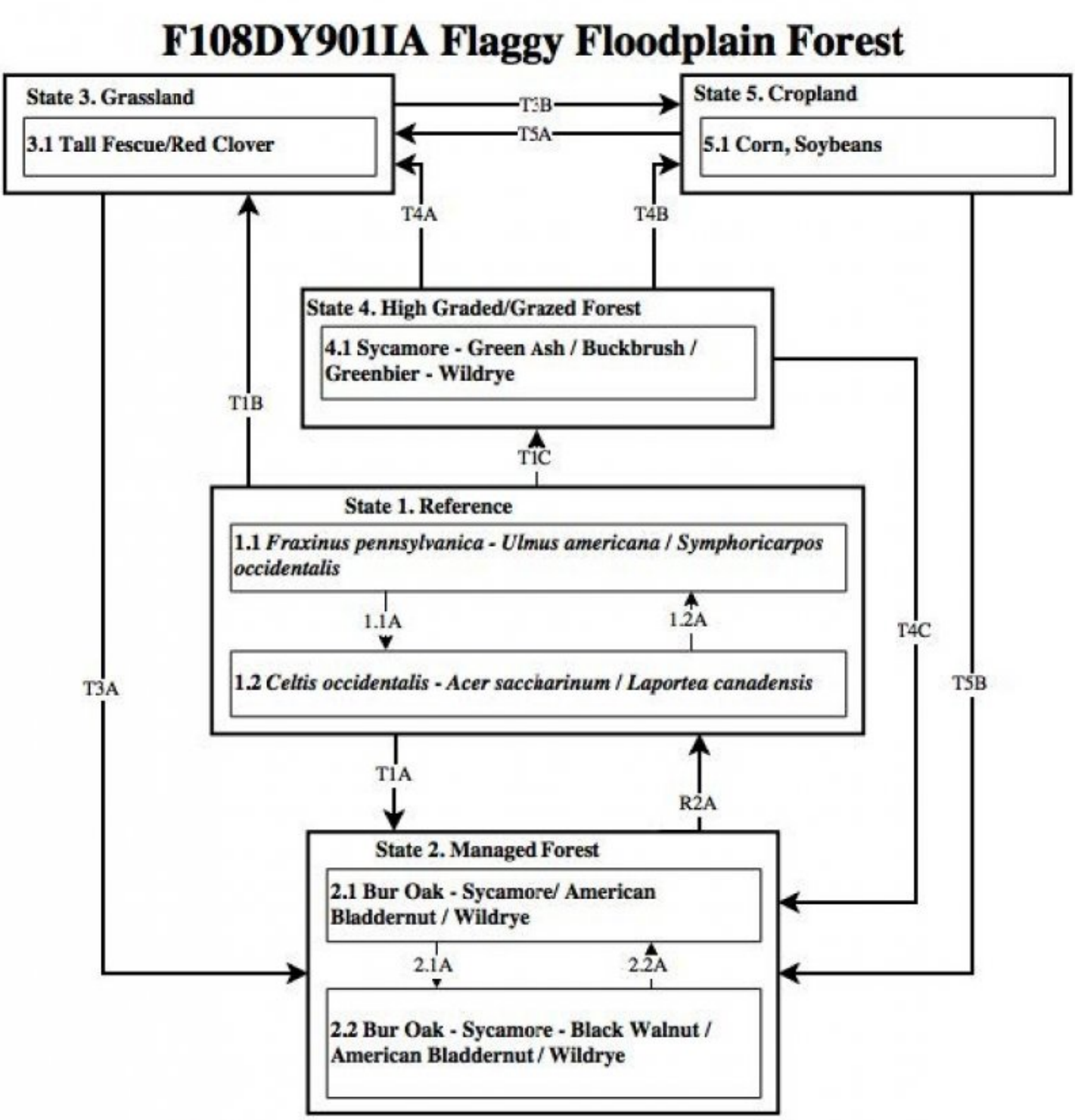
Ecological dynamics

Reference plant community is categorized as a lowland mixed deciduous forest and includes trees grasses, forbs, sedges and shrubs. Species composition typically includes *Fraxinus pennsylvanica*, *Ulmus americana*, *Symphoricarpos occidentalis*, *Ulmus rubra*, *Quercus macrocarpa*, *Juglans nigra*, Carya cordiformes, *Aesculus glabra*, *Celtis occidentalis*, Sanicula gregaria, Laportea Canadensis, and *Asarum canadense* (Rosburg, 2015).

Flooding, scouring, and deposition are the major disturbances influencing the dynamics at this site. Changes in channel course causing stream bank erosion, scouring from floodwaters and also deposition as sediment loads are

released where floodwaters are moving more slowly, contributes to an extremely variable natural community (Mutel, 2008).

State and transition model



Code	Process
T1A	Uneven-age timber management; harvesting
T1B, T4A	Clearing; pasture planting; prescribed grazing
T5A	Pasture planting; prescribed grazing
T1C	Poorly planned harvest (high-grading); uncontrolled grazing
T3B	Tillage; conservation cropping system
T4B	Clearing; tillage; conservation cropping system
T3A, T5B	Tree planting; long-term succession (+30-50 years); forest stand improvement; access control
T4C	Forest stand improvement; access control
R2A	Forest stand improvement; long-term succession (+10-20 years)
1.1A	Long term succession (+10-30 years); sediment accumulation
1.2A	Catastrophic flood; blow-down
2.1A	Crop Tree Release; little to no harvesting (10-20 years)
2.2A	Uneven-age timber management; harvesting

Figure 10. STM

State 1
Reference State

As a cottonwood/maple floodplain, this state has a reference plant community which is categorized as floodplain forest and includes trees, forbs grasses and sedges. Long term succession and sediment accumulation can cause this state to shift into state 1.2. Catastrophic floods and blow-down can cause a shift back towards the 1.1 reference community. In addition, frequent fires followed by periods of no fire can cause this state to shift to the managed forest state to form.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- American elm (*Ulmus americana*), tree
- common hackberry (*Celtis occidentalis*), tree
- silver maple (*Acer saccharinum*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub
- Canadian woodnettle (*Laportea canadensis*), other herbaceous

Community 1.1
Green ash - American elm / western snowberry

Hardwood forest dominated by ash and elm.

Dominant plant species

- green ash (*Fraxinus pennsylvanica*), tree
- American elm (*Ulmus americana*), tree
- western snowberry (*Symphoricarpos occidentalis*), shrub

Community 1.2
Common hackberry - silver maple/ Canadian clearweed

Hardwood floodplain forest with sediment accumulation.

Dominant plant species

- common hackberry (*Celtis occidentalis*), tree
- silver maple (*Acer saccharinum*), tree
- Canadian clearweed (*Pilea pumila*), other herbaceous

Pathway P1.1A
Community 1.1 to 1.2

Long term succession and sediment accumulation (10-30 years) can cause this state to shift into state 1.2.

Pathway P1.2A
Community 1.2 to 1.1

Catastrophic floods and blow-down can cause a shift back towards the 1.1 reference community.

State 2
MANAGED FOREST STATE

Where this state remains, it has often been subjected to very selective timber harvests. While these forested areas may resemble the reference state, the diversity of tree species has been selectively (removal of oak and walnut) altered. Reducing harvests and extending rotations will cause a transition to community phase 2.2. Eliminating harvests, implementing selective thinning, and allowing long tern succession may allow a return to the reference

state where hydrologic regimes are least altered.

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- American sycamore (*Platanus occidentalis*), tree
- American bladdernut (*Staphylea trifolia*), shrub
- wildrye (*Elymus*), grass

Community 2.1
bur oak - sycamore / American bladdernut / wildrye

Forest with management inputs.

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- American sycamore (*Platanus occidentalis*), tree
- American bladdernut (*Staphylea trifolia*), shrub
- wildrye (*Elymus*), grass

Community 2.2
Bur oak - sycamore - black walnut / American bladdernut / wildrye

Managed forestland

Dominant plant species

- bur oak (*Quercus macrocarpa*), tree
- American sycamore (*Platanus occidentalis*), tree
- black walnut (*Juglans nigra*), tree
- American bladdernut (*Staphylea trifolia*), shrub
- wildrye (*Elymus*), grass

Pathway P2.1A
Community 2.1 to 2.2

Crop tree release; little to no harvesting (1-20 years).

Pathway P2.2A
Community 2.2 to 2.1

Uneven age timber management; harvesting.

State 3
GRASSLAND STATE

Many acres of this ecological site have been converted to non-native grasslands of tall fescue and red clover. This state frequently transitions to a cropland state especially when commodity prices are high. A return to a near-reference state from this state is not recommended. Transitioning to a Managed Forest state is possible through long-term commitments of time and money.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- red clover (*Trifolium pratense*), other herbaceous

Community 3.1
Tall fescue / Red clover

managed pasture.

Dominant plant species

- tall fescue (*Schedonorus arundinaceus*), grass
- red clover (*Trifolium pratense*), other herbaceous

State 4
HIGH GRADED / GRAZED FOREST STATE

This state is subjected to uncontrolled grazing and high-graded timber harvests. The grazing will open up the understory and remove much of the diverse ground flora. This can lead to erosion of the topsoil during floods. Grazed units also often undergo timber harvest removing a wide variety of outstanding hardwood trees, further diminishing the structural and compositional diversity

Dominant plant species

- American sycamore (*Platanus occidentalis*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- buckbrush (*Ceanothus cuneatus*), shrub
- wildrye (*Elymus*), grass

Community 4.1
Sycamore - Green ash / buckbrush / greenbrier - wildrye

a high graded or grazed forest community

Dominant plant species

- American sycamore (*Platanus occidentalis*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- buckbrush (*Ceanothus cuneatus*), shrub
- wildrye (*Elymus*), grass

State 5
CROPLAND STATE

Some areas of this ecological site have been converted to row crop agriculture. They often transition to a grassland state. A return to the near-reference state is not practical from this state. Transitioning to a Managed Forest state may be possible through long-term commitments of time and money. Although corn and soybeans are common, many different crops may be grown.

Community 5.1
Corn, soybeans

Row crop agriculture. Many species may be planted depending on landowner objectives.

Transition T1A
State 1 to 2

Uneven- age timber management; harvesting.

Transition T1B
State 1 to 3

Clearing; pasture planting; prescribed grazing.

Transition T1C

State 1 to 4

Poorly planned harvest; uncontrolled grazing.

Restoration pathway R2A
State 2 to 1

Forest stand improvement; long term succession (10-20 plus years)

Transition T3A
State 3 to 2

Tree planting; long term succession; forest stand improvement; access control.

Transition T3B
State 3 to 5

Tillage; conservation cropping system

Transition T4C
State 4 to 2

Forest stand improvement; access control.

Restoration pathway T4A
State 4 to 3

Clearing; pasture planting; prescribed grazing

Transition T4B
State 4 to 5

Clearing; tillage; conservation cropping system.

Transition T5B
State 5 to 2

Tree planting long term succession; forest stand improvement; access control

Restoration pathway T5A
State 5 to 3

Pasture planting; prescribed grazing

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 ecological site description.

Other references

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 Conterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC.

Landfire. 2009. Biophysical Setting 4314210 Central Tallgrass Prairie. In: Landfire National Vegetation Dynamics Models. USDA For. Serv. and U.S. Department of Interior. Washington, DC.

Mutel, Cornelia F. 2008. The Emerald Horizon: The History of Nature in Iowa. University of Iowa Press.

NatureServe. 2013. Associations and alliances of Iowa. St. Paul, Minnesota.
Prior, Jean Cutler. 1991. Landforms of Iowa. University of Iowa Press, Iowa City, Iowa.

Rosburg, T. 2015 July 29. Middle River Park. Unpublished raw data. Ecological Site Contract.

Soil Survey Staff. 2014. Keys to soil taxonomy, 12th ed. USDA Natural Resources Conservation Service.

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. USDA Handbook 296.

United States Department of Agriculture, Natural Resources Conservation Service. Hydrologic Soil Group. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054223#39 accessed August 29, 2016.

United States Department of Agriculture, Natural Resources Conservation Service. Land Capability Classification. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_054226#02 accessed August 29, 2016.

Woodland Health: Stewardship Options for Iowa Woodland Owners. 2004. Iowa Natural Heritage Foundation. Des Moines, Iowa.

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Approval

Suzanne Mayne-Kinney, 10/17/2024

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This ESD was originally approved prior to April 2021.

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	05/13/2025
Approved by	Suzanne Mayne-Kinney
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:**