Ecological site F090AY004WI
Loamy Floodplain

Last updated: 10/02/2023
Accessed: 04/27/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 090A–Wisconsin and Minnesota Thin Loess and Till

MLRA 90A is part of the recently glaciated till and outwash plains of central Minnesota and northern Wisconsin. The area was covered with loamy alluvium or loess after glaciation. It is in Wisconsin (56 percent), Minnesota (40 percent), and Michigan (4 percent). It makes up about 21,967 square miles (56,901 square kilometers).

This MLRA has distinct boundaries to the north where it borders tills of a dissimilar origin on the less morainic landscapes of MLRAs 88, 92, and 93A. The boundary to the west is where the MLRA transitions to the calcareous tills of the Des Moines Lobe, in MLRA 57. To the south, MLRA 90A borders MLRA 90B, which has older soils and better-defined drainage patterns, and MLRA 91, which has the distinct lower landscape relief of an outwash channel.

The part of this area in Minnesota is mostly in the Western Lake section of the Central Lowland province of the Interior Plains. Nearly all the parts in Wisconsin and Michigan are in the Superior Upland province of the Laurentian Upland. Four distinct lobes of the Laurentide Ice Sheet (Rainy, Superior, Chippewa, and Green Bay) played major roles in shaping the landscape in this area. The landscape is characterized by gently undulating to rolling, loess-mantled till plains, drumlin fields, and end moraines mixed with outwash plains associated with major glacial drainageways, swamps, bogs, and fens. In some areas lake plains and ice-walled lakes are significant. Steeper areas occur mostly as valley side slopes along flood plains and as escarpments along the margins of lakes.

Lakes, ponds, and marshes are common throughout the area, and streams generally have a dendritic pattern. The major rivers in this area are the Chippewa, St. Croix, Mississippi, and Wisconsin Rivers. Elevation ranges from 1,100 to 1,950 feet (335 to 595 meters). Local relief is mainly less than 10 feet to 20 feet (3 to 6 meters), but some major valleys and hills are 200 feet (60 meters) above the adjacent lowland.

Precambrian-age bedrock underlies most of the glacial deposits in this MLRA. The bedrock is a complex of folded and faulted igneous and metamorphic rocks. The bedrock terrain has been modified by glaciation and is covered in most areas by Pleistocene deposits and windblown silts. The glacial deposits form an almost continuous cover in most areas. The drift is several hundred feet thick in many areas. Loess covered the area shortly after the glacial ice melted.

Ground water is abundant in deep glacial deposits in most of this area. It also occurs in sedimentary and volcanic rock in the western part of the area. It is scarce where the layer of drift is thin. The water meets the domestic, agricultural, municipal, industrial, rural, and irrigation needs of the area. The content of dissolved solids in the ground water from all the various aquifers in this area is low, and the water generally is moderately hard or hard. The level of total dissolved solids in some of the water can be much higher because of a high content of limestone in some of the glacial deposits. Most of this area obtains ground water from unconsolidated glacial sand and gravel deposits on or very near the surface. Some wells tap the Cambrian sandstone in the southwestern part of the area, in Wisconsin.

In northwest Wisconsin (Ashland and Bayfield Counties) where there are no glacial deposits and in much of the part of this area in Minnesota, ground water from sedimentary and volcanic rock aquifers is used. This water is of very good quality; however, many soils have very porous layers that are poor filters of domestic waste and agricultural chemicals, so there is a risk of contamination from development and agriculture. Minor water concerns are hardness and, in some areas, high concentrations of iron. Yields of water from the glacial deposits vary.

The dominant soil orders are Alfisols, Entisols, Histosols, and Spodosols. The soils in the area have a frigid temperature regime, a udic or aquic moisture regime, and mixed mineralogy.

This area has a significant acreage of public and private forestland used to support the paper and lumber industry Sap collection from sugar maple and syrup production are important forestry enterprises. Agricultural enterprises include row crops, dairy farms, and beef operations. Crops include corn, soybeans, oats, wheat, and alfalfa. Tourism, recreation, and wildlife management are important. Hunting, fishing, snowmobiling, hiking, and skiing are popular activities because of the area's abundance of water, the many acres of national and county forests, and public hunting grounds. (United States Department of Agriculture, Natural Resources Conservation Service, 2022)

Classification relationships

Major Land Resource Area (MLRA 90A): Wisconsin and Minnesota Thin Loess and Till

USFS Subregions: Central-Northwest Wisconsin Loess Plains (212Xd), Glidden Loamy Drift Plain (212Xa), Lincoln Formation Till Plain - Mixed Hardwoods (212Qb), Lincoln Formation Till Plain - Hemlock Hardwoods (212Qc), Brule and Paint Rivers Drumlinized Ground Moraine (212Xc), Perkinstown End Moraine (212Xe), Rib Mountain Rolling Ridges (212Qd), Rosemont Baldwin Plains and Moraines (222Md)
Small sections occur in Hayward Stagnation Moraines (212Xf), St. Croix Moraine (212Qa), Mille Lacs Uplands (212Kb), Green Bay Lobe Stagnation Moraine (212Ta)

Wisconsin DNR Ecological Landscapes: Western Prairie, Forest Transition, and North Central Forest

Ecological site concept

The Loamy Floodplain ecological site is found scattered throughout MLRA 90A in floodplains along streams and rivers that dissect expansive till plains and outwash plains. These sites are characterized by very deep, very poorly to moderately well drained soils that formed in loamy alluvium and lacustrine deposits. Sites are subject to frequent flooding in the spring and fall, and some sites are subject to frequent ponding. Some sites remain saturated for long durations and meet hydric soil requirements. Stream inflow, precipitation, runoff from adjacent uplands, and groundwater discharge are the primary sources of water. Soils range from very strongly acid to moderately alkaline.

The characteristic traits of Loamy Floodplain are their loamy textures and their location on a floodplain. The loamy textures, presence of carbonates, and higher pH and available water capacity differentiate these sites from their Sandy Floodplain counterparts.

Similar sites

F090AY003WI	**Sandy Floodplain** Sandy Floodplain site are found exclusively on floodplains in sandy and sometimes silty alluvium. These sites are somewhat poorly to poorly drained and are subject to flooding. Some sites may be saturated for long enough for hydric conditions to occur. They are found in similar landscape positions as Sandy Floodplains but have coarser textures.
F090AY006WI	**Wet Loamy Lowland** Wet Loamy Lowland consist primarily of deep loamy deposits derived from a mixture of outwash, alluvium, loess, and lacustrine sources. Some sites may have bedrock contact within two meters of the surface. These sites are seasonally ponded depressions that remain saturated for sustained periods, allowing hydric conditions to occur.

F090AY008WI	**Moist Sandy Bedrock Upland** Moist Sandy Bedrock Upland sites consist of sandy to clayey alluvium, till, or eolian deposits over residuum weathered from bedrock. Bedrock contact occurs within two meters of the surface. Sites have seasonally high water table within a meter of the surface. Perching of the water table may occur as a result of bedrock contact. Vegetative communities supported by Loamy Floodplains are also supported by Somewhat Poorly Drained Over Bedrock sites.
F090AY009WI	**Moist Sandy Upland** Moist Sandy Lowland consist of deep sandy and loamy deposits derived from a mixture of alluvium, residuum, till, or lacustrine sources. The finer textures allow the soil to stay moist - but not saturated - for sustained periods during the growing season. Some vegetative communities supported by Loamy Floodplains are also supported by Somewhat Poorly Drained Loams.

Table 1. Dominant plant species

Tree	(1) *Quercus alba* (2) *Quercus bicolor*
Shrub	Not specified
Herbaceous	(1) *Onoclea* (2) *Maianthemum canadense*

Physiographic features

These sites occur in floodplains. All sites are subject to very rare to frequent flooding. Surface runoff is negligible to low.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Runoff class	Negligible to low
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Very rare to frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	490–905 ft
Slope	0–3%
Ponding depth	0–6 in
Water table depth	0–36 in
Aspect	Aspect is not a significant factor

Climatic features

The climate of the expansive Wisconsin and Minnesota Thin Loess and Till Plain is highly variable. The eco-climatic zone (the “Tension Zone”) that runs southeast-northwest across the state splits the MLRA. In general, the MLRA has cold winters and warm summers with an adequate amount of precipitation. Near Lake Superior, precipitation and temperature tend to increase. The far western section of the MLRA, known as the western prairie ecological landscape by the Wisconsin DNR, has warmer temperatures compared to the rest of the MLRA because it falls below the eco-climatic zone. The soil moisture regime of MLRA is udic (humid climate). The soil temperature regime is frigid or cryic.

Table 3. Representative climatic features

Frost-free period (characteristic range)	83-107 days
Freeze-free period (characteristic range)	116-135 days

Precipitation total (characteristic range)	30-33 in
Frost-free period (actual range)	69-116 days
Freeze-free period (actual range)	105-145 days
Precipitation total (actual range)	29-33 in
Frost-free period (average)	93 days
Freeze-free period (average)	125 days
Precipitation total (average)	31 in

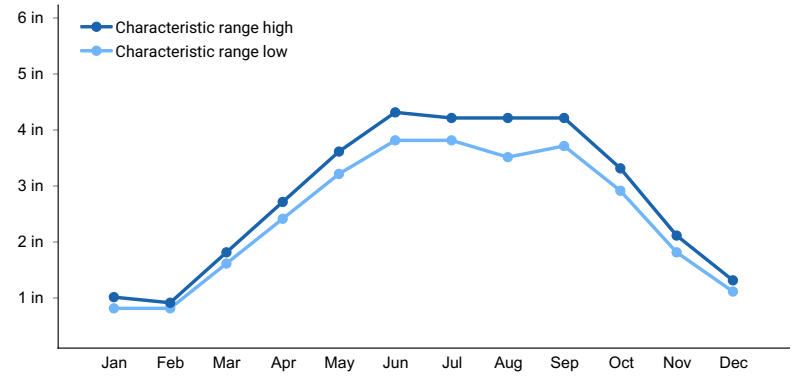


Figure 1. Monthly precipitation range

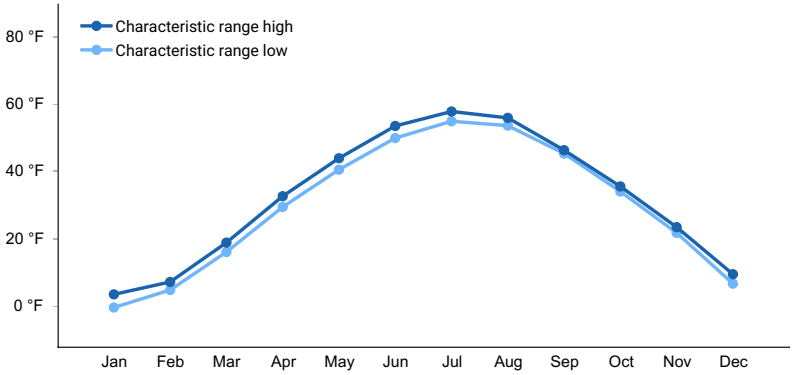


Figure 2. Monthly minimum temperature range

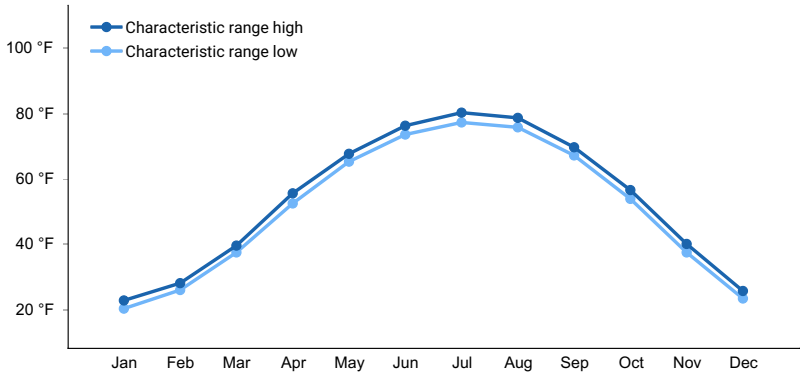


Figure 3. Monthly maximum temperature range

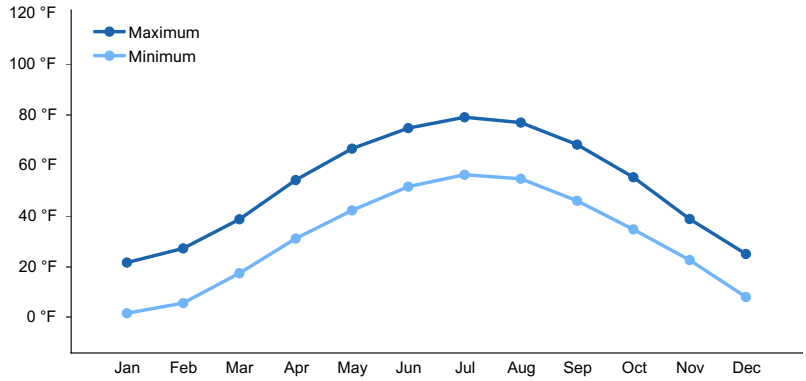


Figure 4. Monthly average minimum and maximum temperature

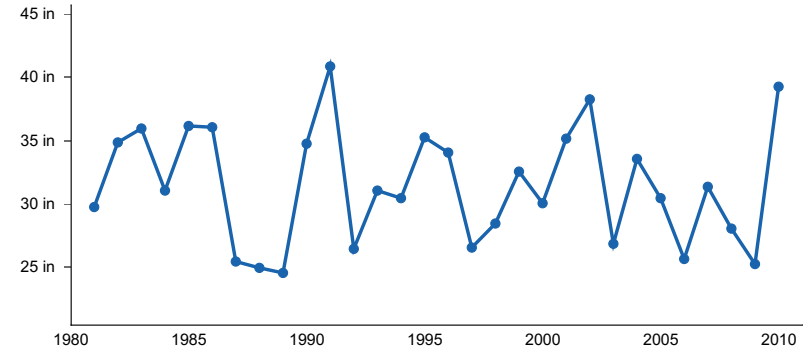


Figure 5. Annual precipitation pattern

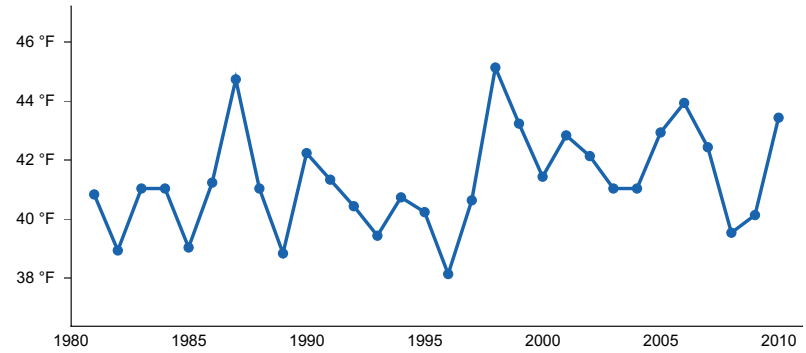


Figure 6. Annual average temperature pattern

Climate stations used

- (1) STAMBAUGH 2SSE [USC00207812], Iron River, MI
- (2) GOODMAN SANITARY DIST [USC00473174], Goodman, WI
- (3) LAONA 6 SW [USC00474582], Laona, WI
- (4) ROSHOLT 9 NNE [USC00477349], Wittenberg, WI
- (5) JUMP RIVER 3E [USC00474080], Sheldon, WI
- (6) HOLCOMBE [USC00473698], Holcombe, WI
- (7) WEYERHAEUSER 1N [USC00479144], Weyerhaeuser, WI
- (8) BIG FALLS HYDRO [USC00470773], Glen Flora, WI
- (9) PARK FALLS DNR HQ [USC00476398], Park Falls, WI
- (10) WINTER [USC00479304], Ojibwa, WI
- (11) LUCK [USC00474894], Luck, WI
- (12) AMERY [USC00470175], Amery, WI
- (13) ISLE 12N [USC00214103], Isle, MN
- (14) MORA [USC00215615], Mora, MN
- (15) BRUNO 7ENE [USC00211074], Bruno, MN
- (16) WRIGHT 3 E [USC00219173], Wright, MN

Influencing water features

Water is received through stream inflow, precipitation, runoff from adjacent uplands, and groundwater discharge. Water levels are greatly influenced by precipitation rates and runoff from upland sites. Water is lost from the site primarily through stream outflow, subsurface outflow, evapotranspiration, and groundwater recharge. These sites are wetlands.

Frequent flooding from stream inflow is a significant factor in the ecological development of Loamy Floodplain sites. The vegetation must be tolerant of frequent flooding that may persist for a month.

Wetland description

the Cowardin System of Wetland Classification, or National Wetlands Inventory (NWI), the wetlands can be classified as:
1) Palustrine, forested, broad-leaved deciduous, saturated, or
2) Palustrine, scrub-shrub, broad-leaved deciduous, saturated, or
3) Palustrine, emergent, persistent, saturated

Under the Hydrogeomorphic Classification System (HGM), the wetlands can be classified as:
1) Depressional, scrub-shrub/organic

Permeability of the soils is impermeable to moderately slow.
Hydrologic Group: B, C, B/D
Hydrogeomorphic Wetland Classification: Depressional, scrub-shrub/organic
Cowardin Wetland Classification: PFO1B, PSS2B, PEM1B

Soil features

These sites are represented by the Coland, Fordum, Moppet, and Orion soil series. Coland is classified as a Cumulic Endoaquoll, Fordum is a Mollic Fluvaquent, Moppet is an Oxyaquic Dystrudept, and Orion is a Fluvaquentic Hapludoll. Some sites are also represented by Fluvaquents, Haplaquolls, and Udifluvents that are not classified to a series.

These sites formed in sandy to silty alluvium, possibly underlain by loamy to clayey lacustrine deposits. Soils are very deep, and most sites are very poorly or moderately well drained. The very poorly and poorly drained sites are saturated for long periods of time and meet hydric soil requirements.

Surface textures of these sites are loam, sandy loam, and silt loam. Subsurface textures include silt loam, sandy loam, and sand. Some horizons have a gravelly modifier. Soil pH ranges from very strongly acid to moderately alkaline with values of 4.8 to 7.9. Carbonates are absent in some sites, but others can have 20 percent found throughout the profile.

Figure 7. Fordum soil series photograph courtesy of UWSP taken on 8/19/2019 in Marathon County, WI.

Table 4. Representative soil features

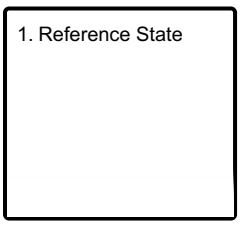
Parent material	(1) Alluvium (2) Lacustrine deposits
Surface texture	(1) Loam (2) Sandy loam (3) Silt loam
Drainage class	Very poorly drained to moderately well drained
Permeability class	Very slow to moderately slow
Soil depth	79–98 in
Surface fragment cover <=3"	0–7%
Surface fragment cover >3"	0–2%
Available water capacity (0-59.8in)	2.52–4.84 in
Calcium carbonate equivalent (0-39.4in)	0–20%
Soil reaction (1:1 water) (0-39.4in)	4.8–7.9
Subsurface fragment volume <=3" (Depth not specified)	0–56%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

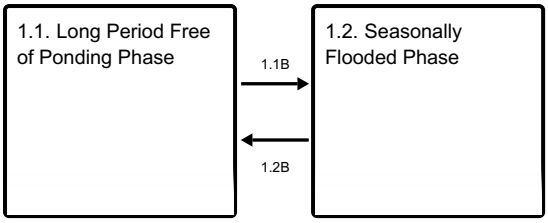
Because this Ecological Site is subject to seasonal, yearly and long-term variation in hydrological conditions, it is not possible to speak of any directional, community-driven plant succession, as is typical of more environmentally-stable upland plant communities. Instead, individual hydrologic events create conditions temporarily favorable to a given species, or groups of species, and unfavorable to other species or groups. Species differ greatly in their ability to tolerate frequency of flooding and duration of ponding. Silver maple (*Acer saccharinum*) is best adapted species to colonize freshly deposited sediment. It is a prolific seed producer and germinates immediately upon maturing, without the need of undergoing a cold period. Once established, seedlings, as well as mature trees, tolerate repeated flooding and prolonged ponding. Black ash (*Fraxinus nigra*) is well adapted to growing in saturated conditions, allowing it to grow commonly in seasonally flooded habitats. Other species that may become established in periods without major flooding or ponding include red maple (*Acer rubrum*), white oak (*Quercus alba*), swamp white oak (*Q. bicolor*), and white ash (*Fraxinus americana*).

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1B - Major flooding event depositing new sediment.

1.2B - Long period without major flooding.

State 1
Reference State

Because of the dynamic nature of hydrological events affecting this Ecological Site, many different plant communities can be found at any given time. We chose two distinct community phases to represent the Reference state: 1, a long period free of extended ponding community phase and 2, frequently flooded and ponded community phase.

Community 1.1
Long Period Free of Ponding Phase

Figure 8. Photo courtesy of UWSP taken on 8/09/2019 in Marathon County, WI.

Periods of several decades, or longer, without prolonged ponding allow for the development of forest communities closely resembling the upland mesic or wet-mesic communities. Such forests are characterized by strong presence, or dominance of any of the following species: white and swamp white oak, white ash, and other mesic hardwoods like red and sugar maple (*Acer saccharum*), and basswood (TIlia americana). Some of these mesic hardwoods are sensitive to saturated soils and are quickly elimanted by major flooding or extended ponding events. Characteristic

understory plants Sensitive fern (*Onoclea sensibilis*), Canada mayflower (Mainathemum canadense), bedstraws (Gallium, spp.), and meadow rue (*Thalictrum dioicum*).

Dominant plant species

- white oak (*Quercus alba*), tree
- swamp white oak (*Quercus bicolor*), tree
- sensitive fern (*Onoclea*), other herbaceous
- Canada mayflower (*Maianthemum canadense*), other herbaceous

Community 1.2
Seasonally Flooded Phase

Figure 9. Photo courtesy of UWSP taken on 8/9/2019 in Marathon County, WI.

Silver maple is a well-adapted species to frequently flooded conditions. On such sites it typically occurs in pure stands, or with only sporadic association of other species that become established on micro-sites with less frequent, or shorter duration ponding. Such associates are black ash, red maple, swamp white oak, elms (Ulmus spp.) and occasionally yellow birch. Understory vegetation is sparse, consisting mostly of goldenrod (Solidago, spp.), sedges (Carex, spp.) and false-nettle (*Laportea canadensis*).

Dominant plant species

- silver maple (*Acer saccharinum*), tree
- black ash (*Fraxinus nigra*), tree
- sedge (*Carex*), grass
- goldenrod (*Oligoneuron*), other herbaceous

Pathway 1.1B
Community 1.1 to 1.2

Long Period Free of Ponding Phase

Seasonally Flooded Phase

Major flooding event deposits new sediment that causes mortality of some of the canopy trees and provides germination and seedling establishment conditions for some species, most frequently silver maple.

Pathway 1.2B
Community 1.2 to 1.1

Seasonally Flooded Phase

Long Period Free of Ponding Phase

Long period without major flooding.

Additional community tables

Inventory data references

Plot and other supporting inventory data for site identification and community phases is located on a NRCS North Central Region shared and one drive folder. University Wisconsin-Stevens Point described soils, took photographs, and inventoried vegetation data at community phases within the reference state.

The data sources include WI ESD Plot Data Collection Form - Tier 2, Releve Method, NASIS pedon description, NRCS SOI 036, photographs, and Kotar Habitat Types.

Habitat Types of N. Wisconsin (Kotar, 2002): The sites of this ES keyed out to three habitat types: Acer-Tsuga/Athyrium-Onoclea (ATAtOn); *Acer rubrum*-Abies balsamea/Cornus (ArAbCo); Acer/Hydrophyllum-Impatiens (AHI)

Biophysical Settings (Landfire, 2014): This ES is largely mapped as Laurentian-Acadian Floodplain Forest, Central Interior and Appalachian Floodplain Shrubland, North-Central Interior Maple-Basswood Forest, Laurentian-Acadian Northern Oak Forest, and Laurentian-Acadian Alkaline Conifer-Hardwood Swamp Forest

WDNR Natural Communities (WDNR, 2015): Floodplain Forest

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Approval

Suzanne Mayne-Kinney, 10/02/2023

Acknowledgments

NRCS contracted UWSP to write ecological sites in MLRA 90A, completed in 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	04/27/2024
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):

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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:**
