USDA Natural Resources Conservation Service

Ecological site F146XY082ME
Loamy Calcareous Till

Last updated: 9/27/2024
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.

MLRA notes

Major Land Resource Area (MLRA): 146X–Aroostook Area

This area is entirely in Maine and it makes up about 1,275 square miles (3,305 square kilometers). Presque Isle is the largest city in the area. Interstate 95 ends in the town of Houlton, at the border with New Brunswick, Canada. Aroostook State Park, Fort Kent Historic Site, and Loring Commerce Center are in this area. The Big Rock ski area is in the middle of this MLRA and is on the highest point, which is Mars Hill Mountain.

Ecological site concept

This site is found on deep, moderately well to well drained soils derived from loamy glacial till deposits. These soils often have gravels or channers that are fairly soft and break easily. As this soft parent material weathers, important nutrients for plant growth are made available, accounting for the richness of the site for plant growth. Although surface pH can be very acidic, most of the soil profile has circumneutral pH values between 5.5 and 6.5.

On gentle slopes, these soils are very productive farmland and are almost entirely under cultivation. Where native vegetation is present, basswood, American elm, hophornbeam, and Christmas fern are indicators of this site, however, sugar maple, yellow birch, and white ash typically dominate. American beech and red maple are also common overstory species, with wild sarsaparilla, Indian cucumber root, starflower, Canada mayflower, and intermediate woodfern as common understory species.

Associated sites

F146XY032ME	**Loamy Till Bottom** This site often grades into Loamy Till Bottom site at the base of hillslopes, where the slopes are less and groundwater seeps at or near the soil surface.
F146XY061ME	**Shallow Loamy Till** The Shallow Loamy Till site grades into this site as soils become shallower, to a depth of less than 20 inches of mineral soil material. Usually the Shallow Loamy Till site is upslope of the Loamy Calcareous Till site

Similar sites

F146XY081ME	**Loamy Acidic Till** The Loamy Acidic Till site is very similar to this site in landscape position and most soil/site properties, but it has soil pH mostly below 6.0. These lower pH soils do not support basswood other calcareous indicator species, but rather support other mixed hardwoods common to both sites.

Table 1. Dominant plant species

Tree	(1) *Picea rubens* (2) *Acer saccharum*
Shrub	(1) *Viburnum lantanoides* (2) *Cornus alternifolia*
Herbaceous	(1) *Dryopteris carthusiana* (2) *Deparia acrostichoides*

Physiographic features

This site occurs in glacial till deposits on hill slopes, till plains, drumlins and ridges. Slopes are typically 0-15 percent, but can be as high as 30 percent or higher. This site does not experience flooding or ponding, but may have a seasonally high water table in the wettest areas, which tend to be on lower slopes of hills or near drainageways.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Drumlin (3) Till plain
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	107–366 m
Slope	0–15%
Water table depth	20–84 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by cold, snowy winters, and cool summers. Precipitation is nearly equally distributed throughout the year, with slightly more moisture falling in June-October. During winter months, and sometimes fall and spring, cold winds from the north bring severe weather events. The effects of a relatively short growing season are somewhat mitigated by long summer days associated with the high latitudes of the region. Occasionally high winds, microbursts, or freezing rain events damage vegetation over small portions of the landscape.

Table 3. Representative climatic features

Frost-free period (characteristic range)	80-94 days
Freeze-free period (characteristic range)	126-134 days
Precipitation total (characteristic range)	940-1,067 mm
Frost-free period (actual range)	61-107 days
Freeze-free period (actual range)	103-141 days
Precipitation total (actual range)	914-1,067 mm
Frost-free period (average)	85 days
Freeze-free period (average)	127 days
Precipitation total (average)	991 mm

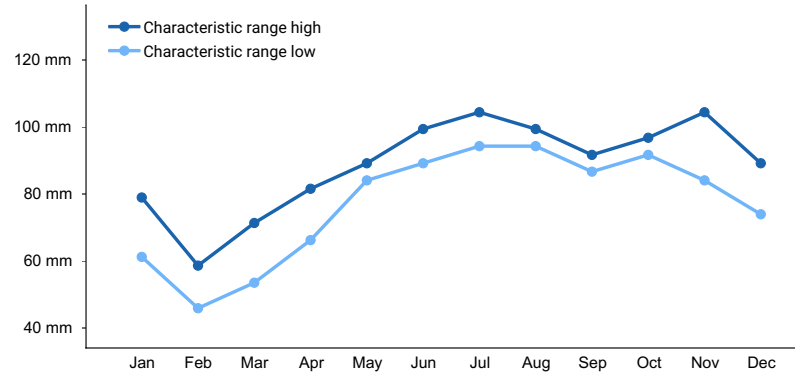


Figure 1. Monthly precipitation range

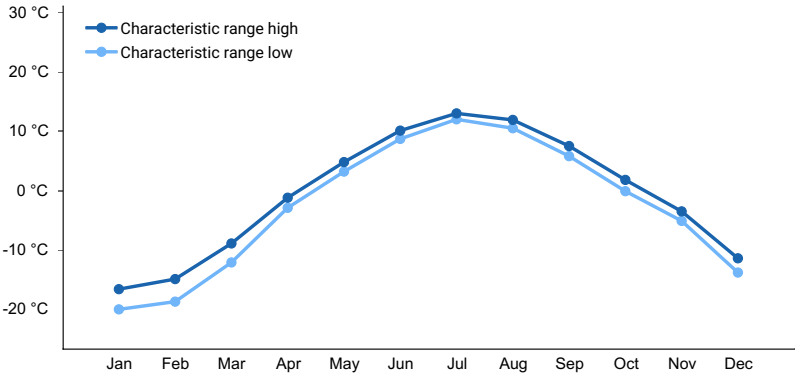


Figure 2. Monthly minimum temperature range

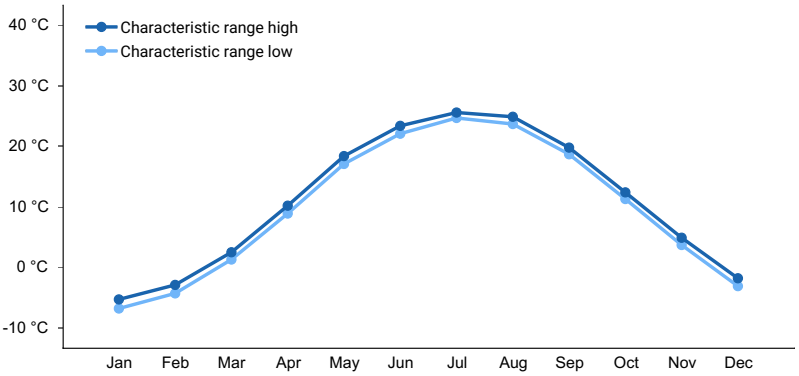


Figure 3. Monthly maximum temperature range

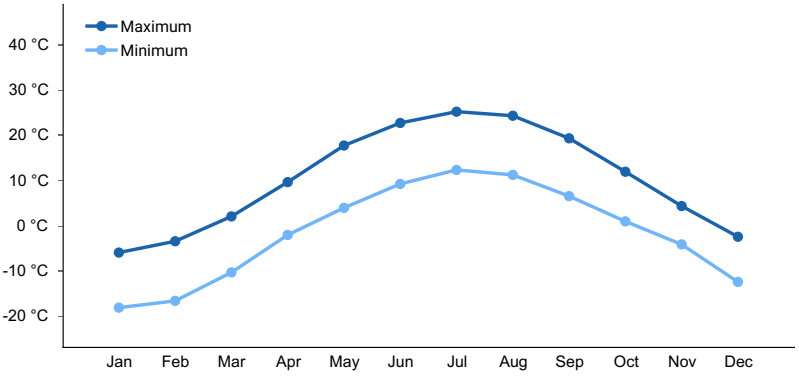


Figure 4. Monthly average minimum and maximum temperature

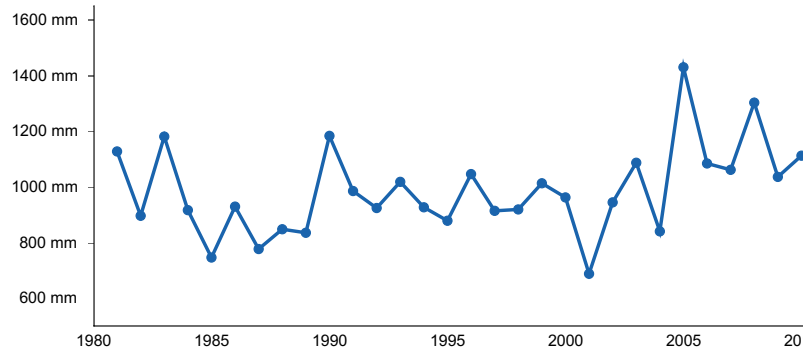


Figure 5. Annual precipitation pattern

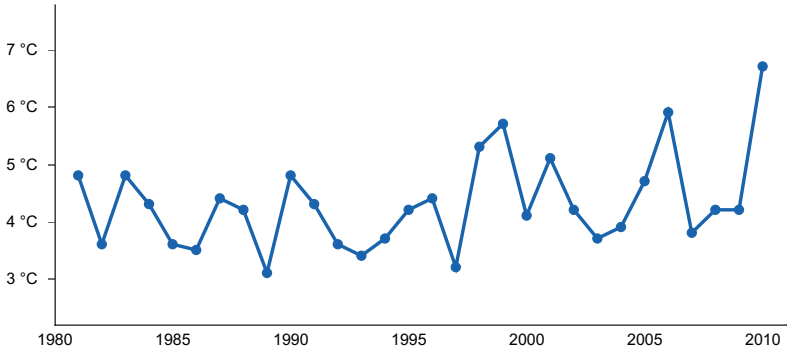


Figure 6. Annual average temperature pattern

Climate stations used

- (1) FT KENT [USC00172878], Fort Kent, ME
- (2) HOULTON 5N [USC00173944], Houlton, ME
- (3) PRESQUE ISLE [USC00176937], Presque Isle, ME
- (4) HOULTON INTL AP [USW00014609], Houlton, ME
- (5) ALLAGASH [USC00170200], Saint Francis, ME
- (6) CARIBOU MUNI AP [USW00014607], Caribou, ME
- (7) BRIDGEWATER [USC00170833], Bridgewater, ME

Influencing water features

Due to its landscape position, this site is not typically influenced by streams or wetlands. Small drainages are often included within this site, and they tend to influence local variations of the plant community.

Soil features

The soils of this site formed in deep or moderately deep loamy glacial till deposits. These soils often have gravels or channers that are fairly soft and break easily. As this soft parent material weathers, important nutrients for plant growth are made available, accounting for the richness of the site for plant growth. On gentle slopes, these soils are very productive farmland. Although surface pH can be very acidic, most of the soil profile has circumneutral pH values between 5.5 and 6.5. The soil moisture regime is udic and the soil temperature regime is frigid.

Table 4. Representative soil features

Parent material	(1) Supraglacial meltout till–shale and siltstone
Surface texture	(1) Silt loam (2) Gravelly loam (3) Channery silt loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained

Permeability class	Very slow to moderately slow
Soil depth	51 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	7.11–27.43 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	3.6–6.5
Subsurface fragment volume <=3" (Depth not specified)	10–27%
Subsurface fragment volume >3" (Depth not specified)	4–7%

Ecological dynamics

[Caveat: The vegetation information contained in this section and is only provisional, based on concepts, and future projects support validation through field work. *] The vegetation groupings described in this section are based on the terrestrial ecological system classification and vegetation associations developed by NatureServe (Comer 2003) and localized associations provided by the Maine Natural Areas Program (Gawler and Cutko, 2010).

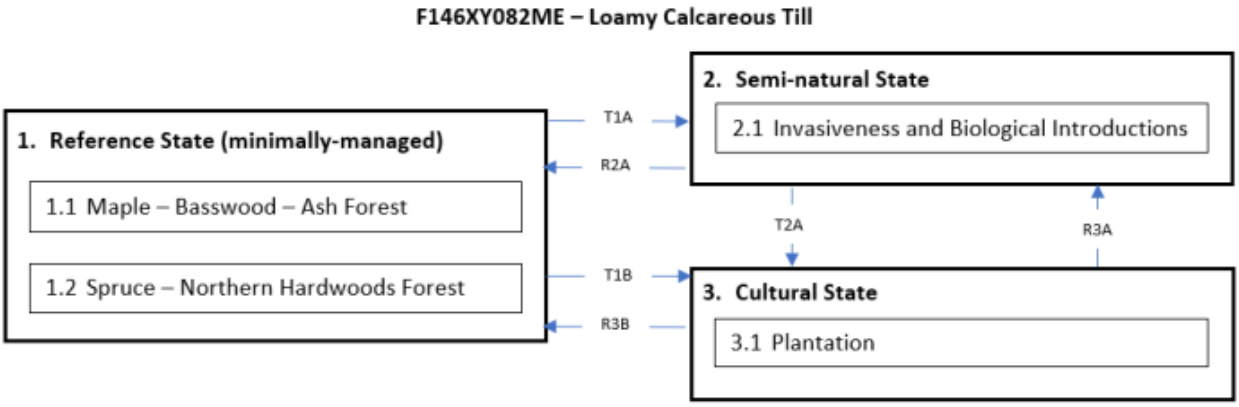
On gentle slopes, these soils are very productive farmland and are almost entirely under cultivation. Where native vegetation is present, basswood, American elm, hophornbeam, and Christmas fern are indicators of this site, however, sugar maple, yellow birch, and white ash typically dominate. American beech and red maple are also common overstory species, with wild sarsaparilla, Indian cucumber root, starflower, Canada mayflower, and intermediate woodfern as common understory species.

This site is subject to logging, wind, insects and disease, and other natural and human disturbances resulting in a variety of alternative states. Cultivated sites occur on flatter slopes, and are mostly cropland, pasture or hay land. Abandoned farmland may transition to pine, spruce-fir, or reference hardwood-dominated forests, often with an intermediate early seral forest phase.

When managed for timber production, several different ecological states are possible. The pine forest state, reference hardwood-dominated state, and spruce-fir state are managed to maintain dominance of their respective species, and to facilitate profitable harvests along predictable timelines. It is unclear whether hemlock forests are capable of dominating on this site.

With sufficient economic inputs, any of the states that occur on this site may transition from one to another, however, due to cost limitations, forests are typically managed for whatever timber species are currently present on the site.

State and transition model



Transition	*Drivers/practices*
T1A	Introduction of invasive species, pests, and/or pathogens that alter ecological site functions, dynamics, and properties
T2A, T1B	Timber management and harvesting, landscape clearing, mechanical landscape alteration, mechanical soil disturbance, planting, seeding, cultivation
R2A	Removal, remediation, or control of invasive species, pests, and/or pathogens through mechanical, biological, or chemical management; establishment of native plants through seeding and/or planting
R3A, R3B	Restoration of native plant communities, planting, seeding, removal of obstructions or barriers

State 1
Reference State (minimally-managed)

Community 1.1
Maple - Basswood -Ash Forest

These sites occur on sheltered (concave) hillsides, ravines, stream drainages, or slope bases where nutrients accumulate, often over calcium-bearing bedrock. Slopes often grade from moderate to flat as these forests straddle the base of a hillslope. Small drainage channels may occur in the lower portions, maintaining saturated soils over at least part of the site. These closed canopy forests are dominated by sugar maple, with beech and/or yellow birch subordinate. Basswood and white ash are typical indicators but are not necessarily abundant, and they are often absent in northwest Maine. The shrub layer is usually sparse and dominated by saplings of the canopy species. The lush herb layer may contain rare species that are strong indicators of this forest type with relatively nutrient rich soils. Bryoids are virtually absent. (Gawler and Cutko, 2010)

Resilience management. Maine Natural Areas Program State Rank: S3 Vulnerable – At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors. There are many known mature occurrences of Maple - Basswood - Ash Forests in the state, most with a history of harvesting. However, the market pressures for hardwoods have recently led to heavy cutting of several sites. Typical sites where this community occurs are naturally small and should be buffered from surrounding forest uses. Since this natural community type is most often an inclusion within larger northern hardwood forests, many of the species using northern hardwood forests will also use this type. (Gawler and Cutko, 2010)

Dominant plant species

- American basswood (*Tilia americana*), tree
- sugar maple (*Acer saccharum*), tree

- American beech (*Fagus grandifolia*), tree
- American hornbeam (*Carpinus caroliniana*), tree
- striped maple (*Acer pensylvanicum*), tree
- yellow birch (*Betula alleghaniensis*), tree
- alternateleaf dogwood (*Cornus alternifolia*), shrub
- silver false spleenwort (*Deparia acrostichoides*), other herbaceous
- Christmas fern (*Polystichum acrostichoides*), other herbaceous
- white baneberry (*Actaea pachypoda*), other herbaceous
- rattlesnake fern (*Botrychium virginianum*), other herbaceous
- maidenhair fern (*Adiantum*), other herbaceous
- roundleaf yellow violet (*Viola rotundifolia*), other herbaceous
- blue cohosh (*Caulophyllum thalictroides*), other herbaceous
- wild sarsaparilla (*Aralia nudicaulis*), other herbaceous

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates

Community 1.2
Spruce - Northern Hardwoods Forest

These forests occur on cooler microsites from near sea level to 2200'. They are usually on hillslopes, ranging from lower to upper slopes and from gentle to steep (up to 50%). The soils are typically well drained, sometimes somewhat excessively drained, sandy to loamy in texture, with pH 5.0-5.4. This mixed forest type is characterized by hardwoods with occasional scattered large supercanopy species. The sapling/shrub layer may be fairly well developed (20-40% cover), with saplings of canopy species; shrub species vary among sites. The herb layer ranges from sparse to dense but is usually >15% cover, divided between forbs, ferns, and regenerating trees, with dwarf shrubs virtually absent. The bryoid layer is patchy and locally well developed, with bryophytes far more abundant than lichens. (Gawler and Cutko, 2010)

Resilience management. Maine Natural Areas Program State Rank: S5 Secure – At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats. Nearly all forests of this type have been harvested in the past, and at many sites the spruce has been selectively removed. As a result, the canopies of such sites are more often indicative of Beech - Birch - Maple Forests, with spruce and fir more common in the understory than in the canopy. Sites with relatively little human disturbance are rare but are moderately well represented on conservation lands. (Gawler and Cutko, 2010)

Dominant plant species

- red spruce (*Picea rubens*), tree
- eastern white pine (*Pinus strobus*), tree
- yellow birch (*Betula alleghaniensis*), tree
- balsam fir (*Abies balsamea*), tree
- striped maple (*Acer pensylvanicum*), tree
- mountain maple (*Acer spicatum*), tree
- American beech (*Fagus grandifolia*), tree
- red maple (*Acer rubrum*), tree
- hobblebush (*Viburnum lantanoides*), shrub
- spinulose woodfern (*Dryopteris carthusiana*), other herbaceous
- mountain woodsorrel (*Oxalis montana*), other herbaceous
- starflower (*Trientalis borealis*), other herbaceous

Dominant resource concerns

- Plant structure and composition
- Plant pest pressure

- Terrestrial habitat for wildlife and invertebrates

State 2
Semi-natural State

Shifts in ecological site composition, functionality, and dynamics driven by natural disturbances, processes, and pressures (may have some anthropogenic influences). More research is needed to determine the extent of the Semi-natural state associated with this ecological site.

Community 2.1
Invasiveness and Biological Introductions

Introduction of invasive species, pathogens, and/or pests resulting in shifts in ecological site composition, functionality, and dynamics. More research is needed to determine the extent of these effects on the semi-natural state associated with this ecological site.

Dominant resource concerns

- Plant productivity and health
- Plant structure and composition
- Plant pest pressure

State 3
Cultural State

Shifts in ecological site composition, functionality, and dynamics that are primary driven by anthropogenic disturbances and pressures (may have some associated natural influences). More research is needed to determine the extent of the cultural state associated with this ecological site.

Community 3.1
Plantation

The cultivation, management, and harvesting of timber resulting in landscape clearing, mechanical landscape alteration, and mechanical soil disturbance.

Transition T1A
State 1 to 2

Introduction of invasive species, pests, and/or pathogens that alter ecological site functions, dynamics, and properties

Transition T1B
State 1 to 3

Timber management and harvesting, landscape clearing, mechanical landscape alteration, mechanical soil disturbance, planting, seeding, cultivation

Conservation practices

Clearing and Snagging
Cover Crop
Land Clearing
Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Tree/Shrub Site Preparation

Stripcropping
Stripcropping, Field
Agroforestry Planting
Land Grading
Agro Tillage
Silvopasture Establishment
Forest Land Management
Prescribed Forestry
Harvest hay in a manner that allows wildlife to flush and escape
Hardwood Crop Tree Release
Patch Harvesting
Intensive rotational grazing
Conversion of cropped land to grass-based agriculture

Restoration pathway R2A
State 2 to 1

Removal, remediation, or control of invasive species, pests, and/or pathogens through mechanical, biological, or chemical management; establishment of native plants through seeding and/or planting

Conservation practices

Restoration and Management of Rare and Declining Habitats
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Pathogen Management
Invasive Plant Species Control
Forest stand improvement for habitat and soil quality
Monitoring and Evaluation

Transition T2A
State 2 to 3

Timber management and harvesting, landscape clearing, mechanical landscape alteration, mechanical soil disturbance, planting, seeding, cultivation

Conservation practices

Clearing and Snagging
Cover Crop
Land Clearing
Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Grazing Land Mechanical Treatment
Range Planting

Agroforestry Planting
Land Grading
Strip - Intercropping
Agro Tillage
Planned Grazing System
Silvopasture Establishment
Silvopasture Management
Prescribed Forestry
Grazing Management Plan
Intensive Management of Rotational Grazing
Use of Cover Crop Mixes
Patch Harvesting
Intercropping to improve soil quality and increase biodiversity
Continuous No Till
Crop management system on crop land acres recently converted
Cover cropping in orchards, vineyards and other woody perennial horticultural crops

Restoration pathway R3B
State 3 to 1

Restoration of native plant communities, planting, seeding, removal of obstructions or barriers

Conservation practices

Conservation Cover
Obstruction Removal
Tree/Shrub Establishment
Vegetated Treatment Area
Restoration and Management of Rare and Declining Habitats
Early Successional Habitat Development/Management
Forest Stand Improvement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Restoration of Compacted Soils
Wildlife corridors
Restoration and Management of Rare or Declining Habitats
Multi-species Native Perennials for Biomass/Wildlife Habitat
Monitoring and Evaluation
Leave standing grain crops un-harvested to benefit wildlife
Creating forest openings to improve hardwood stands

Restoration pathway R3A
State 3 to 2

Restoration of native plant communities, planting, seeding, removal of obstructions or barriers

Conservation practices

Obstruction Removal
Restoration and Management of Rare and Declining Habitats
Early Successional Habitat Development/Management
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management

Additional community tables

Inventory data references

Future work is needed, as described in a future project plan, to validate the information presented in this provisional ecological site description. Future work includes field sampling, data collection and analysis by qualified vegetation ecologists and soil scientists. As warranted, annual reviews of the project plan can be conducted by the Ecological Site Technical Team. A final field review, peer review, quality control, and quality assurance reviews of the ESD are necessary to approve a final document.

Other references

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Contributors

Christopher Mann
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Approval

Nels Barrett, 9/27/2024

Acknowledgments

Nels Barrett, Nick Butler, and Carl Bickford provided considerable review of this ecological site concept.

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	Nels Barrett
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:**