USDA Natural Resources Conservation Service

Ecological site F146XY084ME
Silty

Last updated: 9/27/2024
Accessed: 05/14/2025

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

The soils of this site are deep, silty loams with very few rock fragments. These soils formed in lakebed sediments in areas where glacial meltwater once collected. As glacial lakes dried out, some areas were bisected by streams and rivers which persist today. In these cases, this site occurs on stream terraces. This site is no longer flooded or ponded, and the former lakebeds are now dry and moderately well to well drained.

Plant communities are conifer-dominated mixedwood forests. Common conifer species on the site are white pine, red spruce, balsam fir, hemlock, and northern white cedar. Hardwood species are red maple, yellow birch, white birch, bigtooth aspen, and black cherry.

Associated sites

F146XY081ME	**Loamy Acidic Till**

Similar sites

F146XY071ME	**Sandy** Similar vegetative and overstory composition
F146XY072ME	**Loamy Over Sandy** Similar vegetative and overstory composition

Table 1. Dominant plant species

Tree	(1) *Pinus strobus* (2) *Picea rubens*
Shrub	(1) *Vaccinium angustifolium* (2) *Viburnum nudum var. cassinoides*
Herbaceous	(1) *Maianthemum canadense* (2) *Pteridium aquilinum*

Physiographic features

This site occurs on old lakebed sediments from ponded glacial meltwater. As glacial lakes dried out, some were bisected by streams and rivers which persist today. In these cases, this site occurs on stream terraces. This site is no longer flooded or ponded, and can be found at elevations up to 2000 feet.

Table 2. Representative physiographic features

Landforms	(1) Lakebed (2) Stream terrace
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	6–610 m
Slope	0–15%
Water table depth	46 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

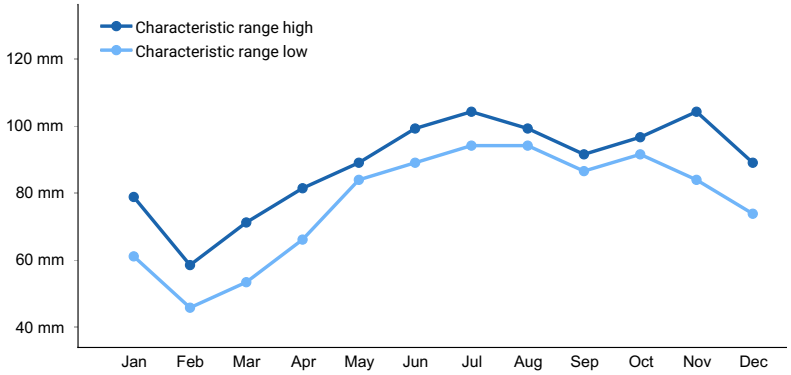


Figure 1. Monthly precipitation range

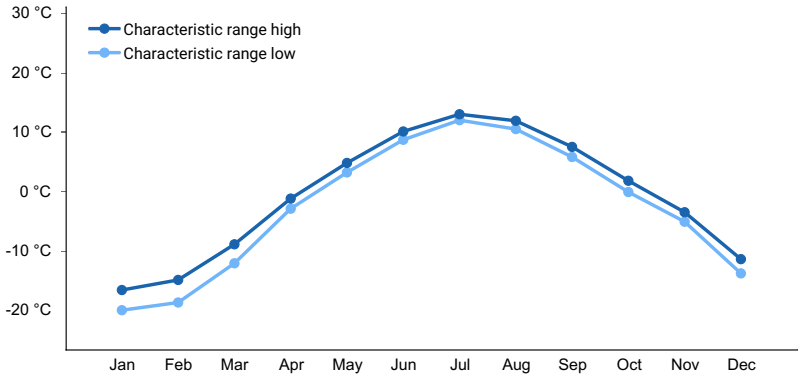


Figure 2. Monthly minimum temperature range

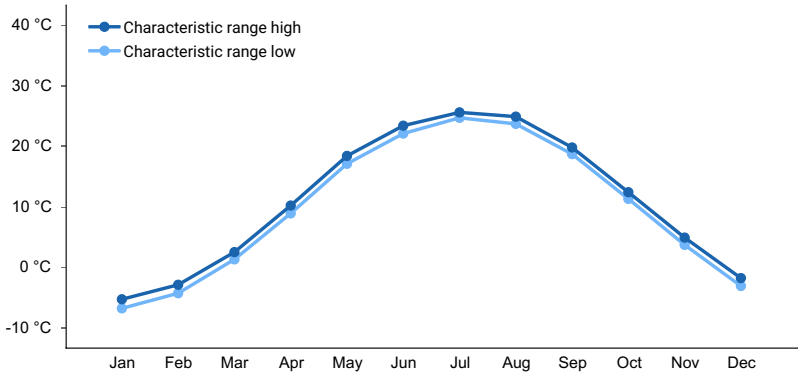


Figure 3. Monthly maximum temperature range

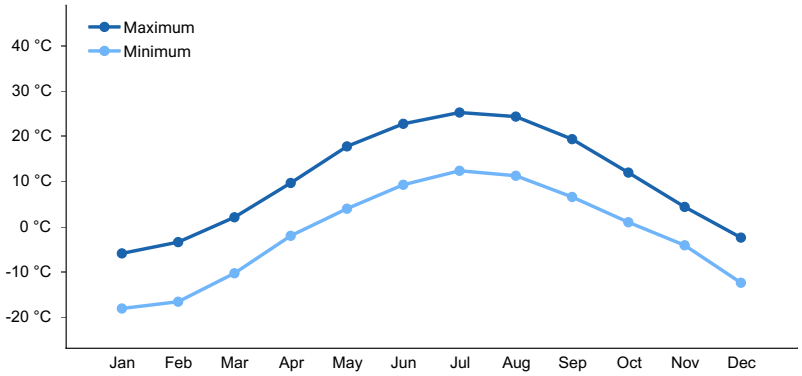


Figure 4. Monthly average minimum and maximum temperature

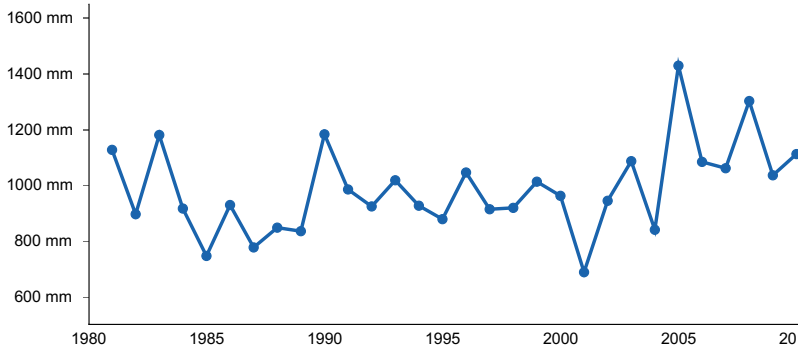


Figure 5. Annual precipitation pattern

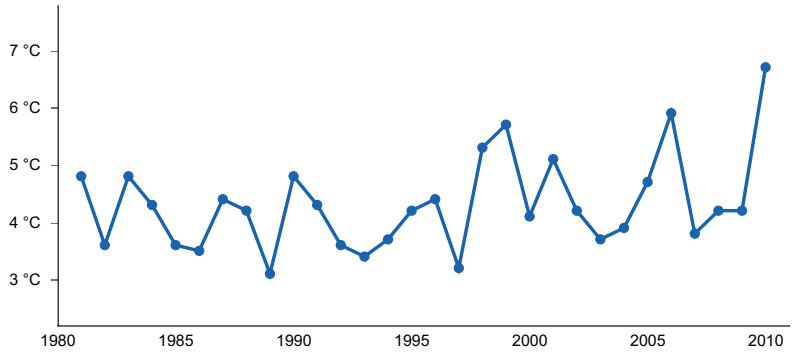


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

This site is not typically influenced by streams or wetlands.

Soil features

The soils of this site are deep, silty loams with very few rock fragments. These soils formed in lakebed sediments in areas where glacial meltwater once collected. The former lakebeds are now dry and moderately well to well drained. Soil pH ranges broadly from 3.6 to 6.5, and water-holding capacity ranges from 4 to 8.9 inches of water in the upper 40 inches of soil. The soil moisture regime is udic and the soil temperature regime is frigid.

Table 4. Representative soil features

Parent material	(1) Glaciolacustrine deposits–calcareous siltstone
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow
Soil depth	165 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16–22.61 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)	0–12%
Subsurface fragment volume >3" (Depth not specified)	0%

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).

Plant communities are conifer-dominated mixedwood forests. Common conifer species on the site are white pine, red spruce, balsam fir, hemlock, and northern white cedar. Hardwood species are red maple, yellow birch, white birch, bigtooth aspen, and black cherry.

Abandoned cropland may transition to pine, spruce-fir, or reference conifer-dominated mixedwood forests.

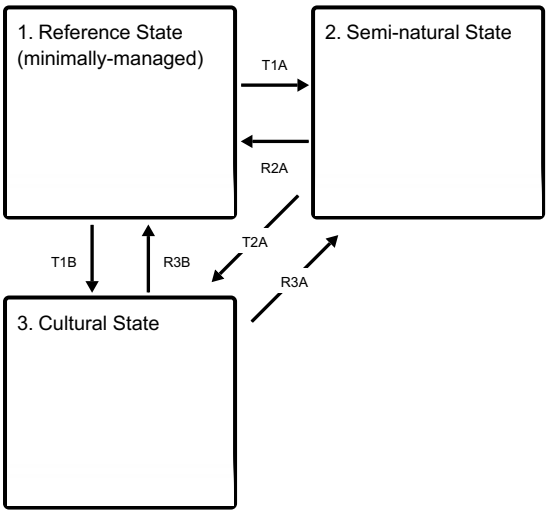
This site is subject to logging, wind, insects and disease, and other natural and human disturbances resulting in a variety of alternative states.

When managed for timber production, several different ecological states are possible. The pine forest state, reference conifer-dominated mixedwood state, and spruce-fir state are managed to maintain dominance of their respective timber species, and to facilitate profitable harvests along predictable timelines. Hemlock forests may also result from logging practices, though these are typically less-desirable and may result from selective harvest of more valuable species, leaving the hemlock behind. As hemlock increases on the site, it inhibits the establishment of other species by shading, reducing soil moisture availability to other plants, and especially by acidifying the soil.

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.

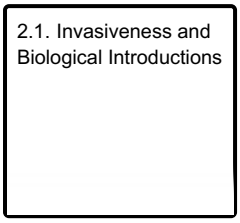
State and transition model

Ecosystem states

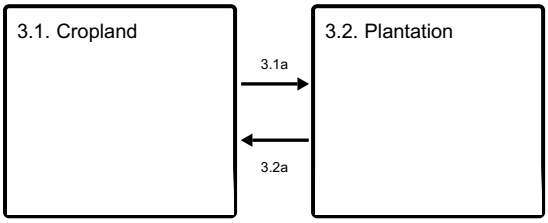


State 1 submodel, plant communities

State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State (minimally-managed)

The soils of this site are deep, silty loams with very few rock fragments. These soils formed in lakebed sediments in areas where glacial meltwater once collected. As glacial lakes dried out, some areas were bisected by streams and rivers which persist today. In these cases, this site occurs on stream terraces. This site is no longer flooded or ponded, and the former lakebeds are now dry and moderately well to well drained. Plant communities are conifer-dominated mixedwood forests. Common conifer species on the site are white pine, red spruce, balsam fir, hemlock, and northern white cedar. Hardwood species are red maple, yellow birch, white birch, bigtooth aspen, and black cherry.

Resilience management. Abandoned cropland may transition to pine, spruce-fir, or reference conifer-dominated mixedwood forests. This site is subject to logging, wind, insects and disease, and other natural and human disturbances resulting in a variety of alternative states. When managed for timber production, several different ecological states are possible. The pine forest state, reference conifer-dominated mixedwood state, and spruce-fir state are managed to maintain dominance of their respective timber species, and to facilitate profitable harvests along predictable timelines. Hemlock forests may also result from logging practices, though these are typically less-desirable and may result from selective harvest of more valuable species, leaving the hemlock behind. As hemlock increases on the site, it inhibits the establishment of other species by shading, reducing soil moisture availability to other plants, and especially by acidifying the soil. 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.

Community 1.1
White Pine – Mixed Conifer Forest

This type occurs on sandy to loamy mesic soils (usually well drained, occasionally imperfectly drained or very well drained), often with a slowly decomposing duff layer of conifer needles. Soils are generally shallow (<40 cm) and moderately acidic (pH 5.0-6.0). These forests are usually at low elevations (<900') on slopes or coarse-textured flats. This is a closed canopy forest type in which white pine is dominant and occasionally red spruce, red pine, and hemlock nearly co-dominant. The pine trees tend to be larger and the other trees smaller, the smaller trees may be more numerous. In many of these forests, the dense and strongly coniferous canopy limits understory growth. Shrub cover is rarely >20% and the herb layer rarely exceeds 30%. The herb layer can include a spotty mixture of s

such as lowbush blueberry, forbs, or ferns, but graminoids are very uncommon. The ground layer is mostly conifer litter, with bryoid cover <25%; large hair-cap moss and red- stemmed moss are common species. (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. Demand for white pine has considerably reduced mature, undisturbed examples of this type. Most sites known to be of high ecological quality lack formal protection. Maintaining the surrounding lands as forest is important in conserving particular stands of this type, particularly given that many known examples are small (<50 acres). (Gawler and Cutko, 2010)

Dominant plant species

- eastern white pine (*Pinus strobus*), tree
- eastern hemlock (*Tsuga canadensis*), tree
- red maple (*Acer rubrum*), tree
- arborvitae (*Thuja occidentalis*), tree
- red spruce (*Picea rubens*), tree
- balsam fir (*Abies balsamea*), tree
- beaked hazelnut (*Corylus cornuta*), shrub
- withe-rod (*Viburnum nudum var. cassinoides*), shrub
- lowbush blueberry (*Vaccinium angustifolium*), shrub
- bristly dewberry (*Rubus hispidus*), shrub
- Canada mayflower (*Maianthemum canadense*), other herbaceous
- starflower (*Trientalis borealis*), 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
Red Spruce – Mixed Conifer Woodland

Sites occur on mid to upper slopes (usually 10-20% slope) and low summits at elevations up to 2000'. Soils are thin (<25 cm), consisting of coarse mineral soil or poorly decomposed duff, and form patches over the bedrock substrate. The very well drained soils are acidic (pH 4.6-5.2) and nutrient poor. Some sites show evidence of past fire. This type is a mixed canopy woodland (25-70% closure) in which red spruce and/or white pine is always present and associated species vary, at others the canopy is mixed, with no one tree species strongly dominant. The shrub layer is typically very sparse (and variable in composition), and the herb layer has mostly 15-50% cover. Heath shrubs are the dominant feature of the herb layer; herb species rarely exceed 8% cover. The bryoid layer is sparse at some sites (<25%) and well developed at others (35-70%). Fruticose lichens typically make up half or more of the bryoid cover. (Gawler and Cutko, 2010)

Resilience management. Maine Natural Areas Program State Rank: S4 Apparently Secure – At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors. Most sites have little pressure from development or timbering; the primary impacts are from recreational use. Communications towers or wind turbines could have an impact on some of these woodlands on mid-elevation summits. Several sites are in public or private conservation ownership. (Gawler and Cutko, 2010)

Dominant plant species

- red spruce (*Picea rubens*), tree
- white spruce (*Picea glauca*), tree
- eastern white pine (*Pinus strobus*), tree
- paper birch (*Betula papyrifera*), tree
- arborvitae (*Thuja occidentalis*), tree

- black spruce (*Picea mariana*), tree
- balsam fir (*Abies balsamea*), tree
- northern bayberry (*Morella pensylvanica*), shrub
- withe-rod (*Viburnum nudum var. cassinoides*), shrub
- Canadian serviceberry (*Amelanchier canadensis*), shrub
- lowbush blueberry (*Vaccinium angustifolium*), shrub
- black huckleberry (*Gaylussacia baccata*), shrub
- sheep laurel (*Kalmia angustifolia*), shrub
- western brackenfern (*Pteridium aquilinum*), other herbaceous

Dominant resource concerns

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

Pathway 1.1a
Community 1.1 to 1.2

Reduction or loss of White Pine allowing Red Spruce to become the dominant canopy species, creating shifts in composition and canopy structure.

Pathway 1.2a
Community 1.2 to 1.1

Reduction or loss of Red Spruce allowing White Pine to become the dominant canopy species, creating shifts in composition and canopy structure.

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
- Terrestrial habitat for wildlife and invertebrates

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.

Dominant resource concerns

- Compaction
- Organic matter depletion
- Aggregate instability
- Ponding and flooding
- Pesticides transported to surface water
- Pesticides transported to ground water
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates

Community 3.1
Cropland

The cultivation and production of crops resulting in seeding, planting, landscape clearing, mechanical landscape alteration, and mechanical soil disturbance, etc...

Dominant resource concerns

- Compaction
- Aggregate instability
- Ponding and flooding
- Inefficient irrigation water use
- Pesticides transported to surface water
- Pesticides transported to ground water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates

Community 3.2
Plantation

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

Dominant resource concerns

- Compaction
- Organic matter depletion
- Aggregate instability
- Ponding and flooding
- Inefficient irrigation water use
- Pesticides transported to surface water
- Pesticides transported to ground water
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates

Pathway 3.1a
Community 3.1 to 3.2

Landscape altered and transitioned between crop cultivation to hardwood management for timber production

Conservation practices

Agroforestry Planting

Pathway 3.2a
Community 3.2 to 3.1

Landscape altered and transitioned between hardwood management for timber production to crop cultivation

Conservation practices

Land Clearing

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

Cultivation, management, and production of timber or crops through landscape clearing, mechanical landscape alteration, mechanical harvesting, mechanical soil disturbance, planting, seeding, etc.…

Conservation practices

Land Clearing
Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Grazing Land Mechanical Treatment
Stripcropping
Stripcropping, Field
Tree/Shrub Establishment
Agroforestry Planting
Land Grading
Agro Tillage
Silvopasture Establishment
Silvopasture Establishment
Hardwood Crop Tree Release
Intensive Management of Rotational Grazing
Continuous no till with high residue
Continuous No Till Organic System
Continuous cover crops
Use of Cover Crop Mixes
Use deep rooted crops to breakup soil compaction
Conversion of cropped land to grass-based agriculture
Intercropping to improve soil quality and increase biodiversity
Creating forest openings to improve hardwood stands
Continuous No Till
Conversion of cropped land to grass-based agriculture

Intensive no-till (Organic or Non-organic systems)
Crop management system on crop land acres recently converted
Cover cropping in orchards, vineyards and other woody perennial horticultural crops
Intensive cover cropping in annual crops

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

Critical Area Planting
Obstruction Removal
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
Forest Land Management
Invasive Plant Species Control
Pathogen Management
Prescribed Forestry
Invasive Species Pest Management
Forest stand improvement for habitat and soil quality
Restoration and Management of Rare or Declining Habitats
Multi-species Native Perennials for Biomass/Wildlife Habitat
Establish pollinator habitat
Hardwood Crop Tree Release
Biological suppression and other non-chemical techniques to manage herbaceous weeds invasive species
Monitoring and Evaluation
Forest Stand Improvement for Soil Quality
Establish pollinator and/or beneficial insect habitat
Creating forest openings to improve hardwood stands

Transition T2A
State 2 to 3

Cultivation, management, and production of timber or crops through landscape clearing, mechanical landscape alteration, mechanical harvesting, mechanical soil disturbance, planting, seeding, etc.…

Conservation practices

Cover Crop
Land Clearing

Precision Land Forming
Irrigation Land Leveling
Land Smoothing
Restoration of Compacted Soils
Silvopasture Establishment
Invasive Plant Species Control
Multi-Story Cropping
Prescribed Forestry
Invasive Species Pest Management
Extending existing field borders for water quality protection and wildlife habitat
Improve the plant diversity and structure of non-cropped areas for wildlife food and habitat
Silvopasture for wildlife habitat
Multi-story cropping, sustainable management of nontimber forest plants
Continuous no till with high residue
Continuous No Till Organic System
Continuous cover crops
Use of Cover Crop Mixes
Intensive rotational grazing
Creating forest openings to improve hardwood stands
Continuous No Till
Conversion of cropped land to grass-based agriculture

Restoration pathway R3B
State 3 to 1

Restoration of native plant communities and landscape properties through planting, seeding, removal of obstructions or barriers

Conservation practices

Critical Area Planting
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
Restoration of Compacted Soils
Forest stand improvement for habitat and soil quality
Restoration and Management of Rare or Declining Habitats
Multi-species Native Perennials for Biomass/Wildlife Habitat
Monitoring and Evaluation
Establish pollinator and/or beneficial insect habitat
Creating forest openings to improve hardwood stands

Restoration pathway R3A

State 3 to 2

Restoration of native plant communities and landscape properties through planting, seeding, removal of obstructions or barriers

Conservation practices

Critical Area Planting
Obstruction Removal
Tree/Shrub Establishment
Early Successional Habitat Development/Management
Agroforestry Planting
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Restoration of Compacted Soils
Monitoring and Evaluation

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	05/14/2025
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):**

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

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

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

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

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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:

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

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

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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:**