USDA Natural Resources
Conservation Service

Ecological site F146XY034ME
Wet Sandy Bog

Last updated: 5/20/2025
Accessed: 05/21/2025

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 occurs on gently-sloping, very-poorly drained glacial outwash deposits that are frequently ponded for much or all of the year. Soils are deep loams formed, often with a mucky peat surface layer. These saturated bog soils are acidic to very acidic with few rock fragments. The soil moisture regime is aquic and soil temperature regime is frigid.

This site receives significant inputs of run-in water from surrounding uplands. This results in year-round saturation, extended surface ponding, and ultimately acidification. These water features influence plant community structure and dynamics on this site.

Associated sites

F146XY021ME	**Marsh** This site may grade into the Marsh site as soils become wetter.
F146XY033ME	**Wet Loamy Flat** This site may grade into the Wet Loamy Flat site as soils become drier.

Similar sites

F146XY033ME	**Wet Loamy Flat** This site is similar to the Wet Loamy Flat, except it is wetter, more acidic, and supports primarily black spruce instead of red spruce and balsam fir

Table 1. Dominant plant species

Tree	(1) *Picea mariana* (2) *Abies balsamea*
Shrub	(1) *Ilex mucronata* (2) *Kalmia angustifolia*
Herbaceous	(1) *Osmunda cinnamomea* (2) *Eriophorum angustifolium*

Physiographic features

This site occurs on very-poorly drained glacial outwash deposits that are frequently ponded for much or all of the year. It occurs at elevations below 1500 feet, on very gentle slopes, less than three percent.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain (2) Outwash terrace
Runoff class	Negligible to low
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	15–457 m
Slope	0–3%
Ponding depth	0–15 cm
Water table depth	0 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, microburst, 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

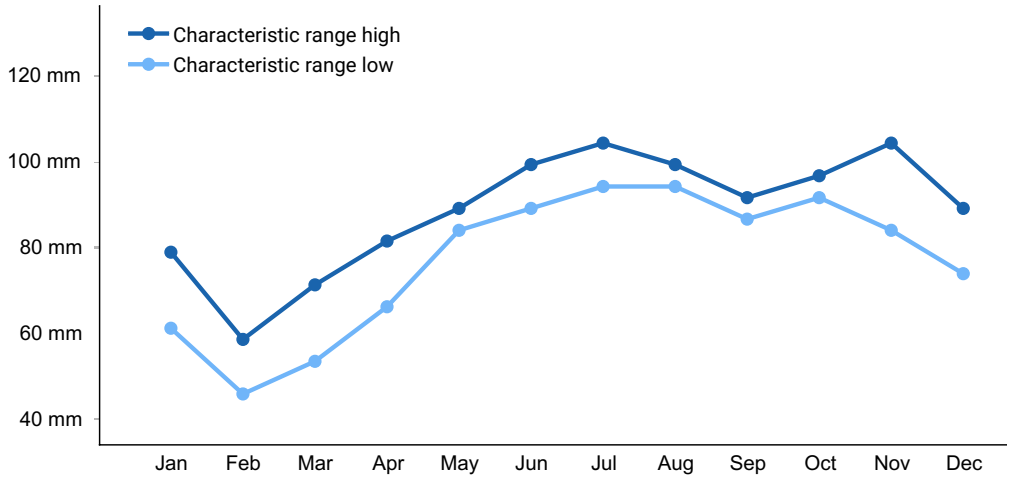


Figure 1. Monthly precipitation range

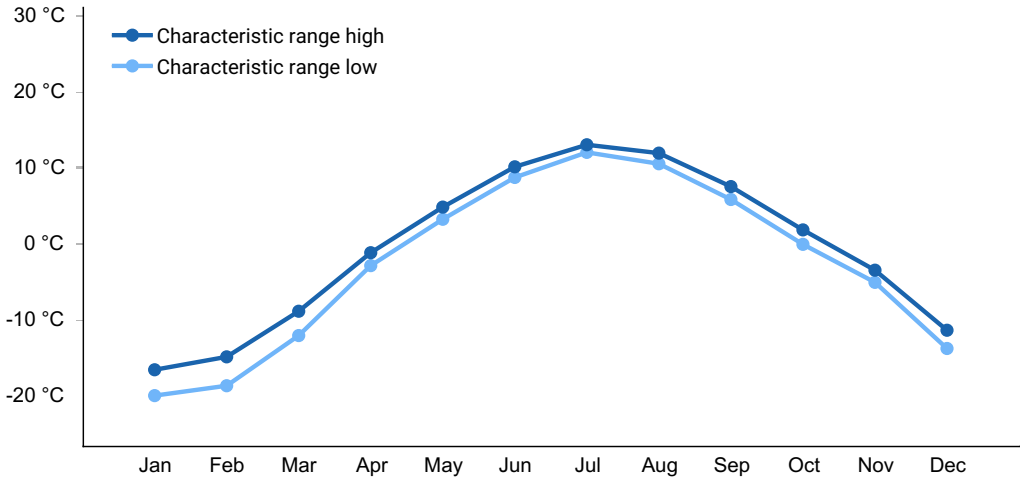


Figure 2. Monthly minimum temperature range

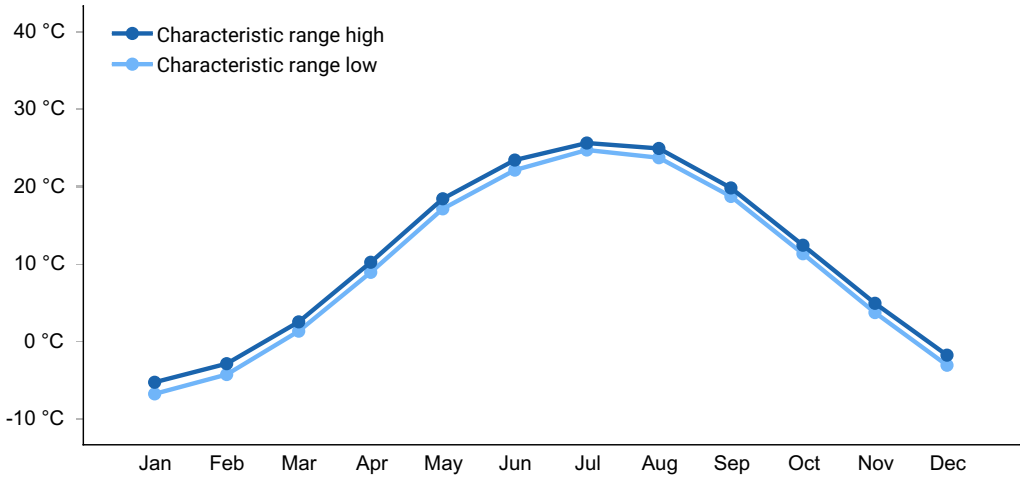


Figure 3. Monthly maximum temperature range

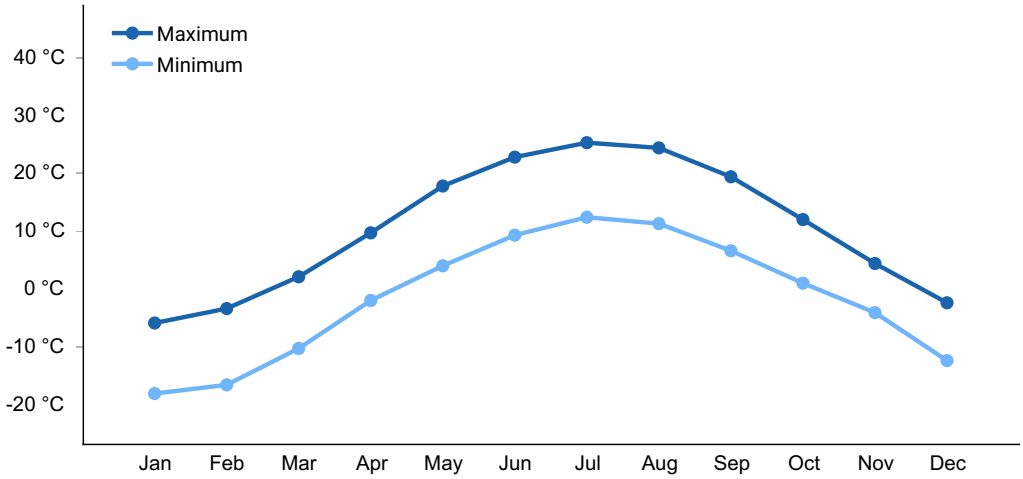


Figure 4. Monthly average minimum and maximum temperature

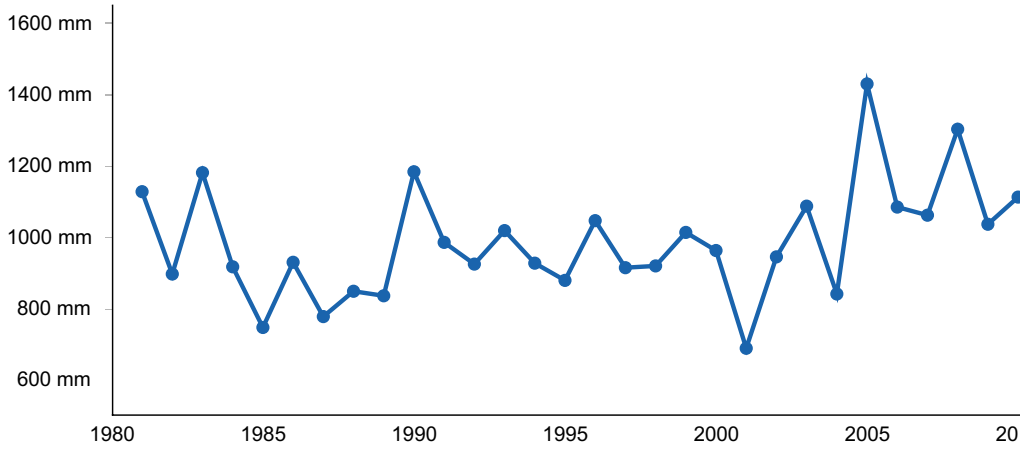


Figure 5. Annual precipitation pattern

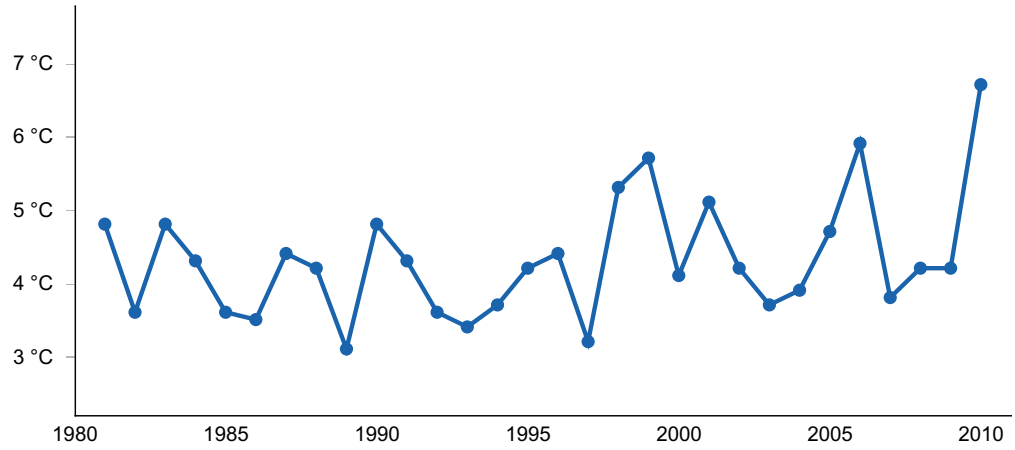


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

This site receives significant inputs of run-in water from surrounding uplands. This results in year-round saturation, extended surface ponding, and ultimately acidification. These water features influence plant community structure and dynamics on this site.

Soil features

The soils of this site are deep, very poorly-drained loams formed in glacial outwash deposits. These saturated bog soils are acidic to very acidic with few rock fragments. The soil moisture regime is aquic and soil temperature regime is frigid.

Table 4. Representative soil features

Parent material	(1) Glaciofluvial deposits–granite
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Very poorly drained
Permeability class	Moderately slow
Soil depth	165 cm

Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	11.18–21.34 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)	3.6–5.3
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	20–25%

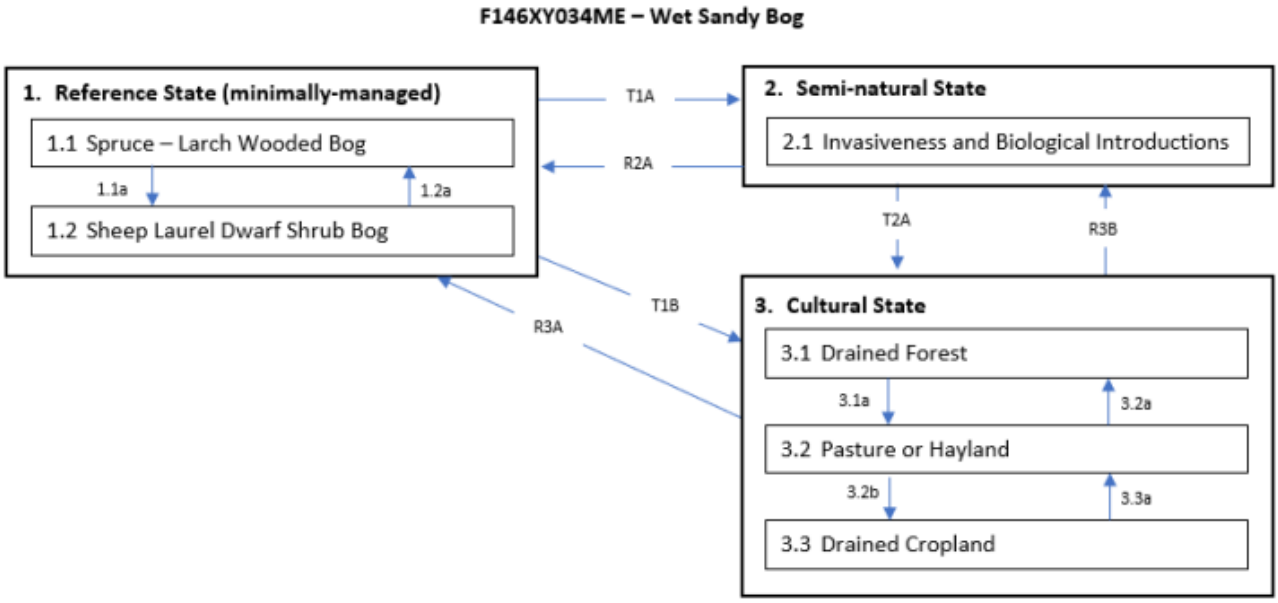
Ecological dynamics

[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).

Black spruce dominates the overstory, with diverse heath shrubs, herbs, and mosses dominating the understory and open patches. Increases in ponding depth due to beaver activity or man-made structures can cause mortality of these dominant species and a transition to a ponded, open wetland state. As ponding decreases to reference levels, this site may transition through a series of open wetland phases prior to re-establishment of reference state species.

Logging, insects (particularly spruce budworm), and windthrow may reduce overstory cover in patches. However, black spruce is expected to regain dominance on this site following these disturbances. In areas where this site is cleared and drained, hay, pasture, and sometimes crops may be cultivated with significant soil amendment.

State and transition model



Transition	*Drivers*
1.1a, 1.2a	Canopy cover reduction, timber harvesting, climate change
T1A	Climate change, disturbances, shifts in community composition and ecological dynamics, introduction of invasive species, pests, and/or pathogens, development of minerotrophic conditions
R2A	Removal, remediation, or control of invasive species, pests, and/or pathogens
T2A	Hydrological alteration, mechanical landscape alteration and soil disturbance
R3B, R3A	Remediation of hydrological alteration, actively managed restoration, seeding/planting
3.1a, 3.2a	Hydrological alteration; remediation of hydrological alteration
3.2b, 3.3a	Mechanical soil disturbance, clearing, landscape alteration, seeding or planting
T1B	Hydrological alteration, mechanical landscape alteration and soil disturbance

State 1
Reference State (minimally-managed)

This site occurs on gently-sloping, very-poorly drained glacial outwash deposits that are frequently ponded for much or all of the year. Soils are deep loams formed, often with a mucky peat surface layer. These saturated bog soils are acidic to very acidic with few rock fragments. The soil moisture regime is aquic and soil temperature regime is frigid. This site receives significant inputs of run-in water from surrounding uplands. This results in year-round saturation, extended surface ponding, and ultimately acidification. These water features influence plant community structure and dynamics on this site.

Community 1.1
Spruce - Larch Wooded Bog

Sites occur in a peatland setting, usually <1200’ elevation, characteristic of nutrient poor or highly acidic peatlands (pH 4.2-5.2). These bogs may occur as part of fens, especially in kettleholes, and are standard constituents of raised (ombrotrophic) bogs. This open

canopy peatland type is characterized by black spruce and/or larch trees over typical bog vegetation of heath shrubs, graminoids, and peat mosses. It is the most common type of ‘forested bog’ in Maine. Canopy closure is usually 20-50% and occasionally ranges up to 85%. Black spruce is usually dominant, but in some cases larch (or rarely fir) may be more abundant. Red maple may be a component in somewhat more minerotrophic portions, and white pine may occur on hummocks. The shrub layer, including small trees, is usually well developed (>30% cover). The bryoid layer has close to 100% cover and is dominated by peat mosses. (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. Black spruce bogs generally occur as part of larger peatlands. Maintaining the hydrologic integrity of the entire wetland with upland buffers is key. The trees mostly remain small and have limited economic use. Several known sites are in public ownership. (Gawler and Cutko, 2010)

Dominant plant species

- black spruce (*Picea mariana*), tree
- European larch (*Larix decidua*), tree
- balsam fir (*Abies balsamea*), tree
- gray birch (*Betula populifolia*), tree
- red spruce (*Picea rubens*), tree
- eastern white pine (*Pinus strobus*), tree
- catberry (*Ilex mucronata*), shrub
- rhodora (*Rhododendron canadense*), shrub
- sheep laurel (*Kalmia angustifolia*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- black huckleberry (*Gaylussacia baccata*), shrub
- velvetleaf huckleberry (*Vaccinium myrtilloides*), shrub
- threeseeded sedge (*Carex trisperma*), grass
- cinnamon fern (*Osmunda cinnamomea*), other herbaceous
- creeping snowberry (*Gaultheria hispidula*), other herbaceous
- lowbush blueberry (*Vaccinium angustifolium*), other herbaceous

Dominant resource concerns

- Ponding and flooding
- Surface water depletion
- Pesticides transported to surface water
- Pesticides transported to ground water
- Pathogens and chemicals from manure, biosolids, or compost applications transported to surface water
- Pathogens and chemicals from manure, biosolids, or compost applications transported to ground water

- Petroleum, heavy metals, and other pollutants transported to surface water
- Petroleum, heavy metals, and other pollutants transported to ground water
- Elevated water temperature
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates
- Aquatic habitat for fish and other organisms

Community 1.2
Sheep Laurel Dwarf Shrub Bog

This type occurs within raised portions of peatlands, where ombrotrophic conditions prevail (plant growth is raised above the water table, and virtually all nutrients come from precipitation). Although standing water may not be visible, the peat is commonly saturated with water throughout most of the year. The substrate is highly acidic. A dense layer of dwarf heath shrubs dominates this prototypical open peatland community. Stunted and scattered black spruce and larch trees form <25% cover. Heath shrubs carpet the hummocks and hollows of the peat substrate. Sedges contribute little cover (usually <15%, occasionally 20-25%). The ground surface is covered by a spongy carpet of peat mosses. The floristic composition varies depending upon bog morphology and nutrient availability. (Gawler and Cutko, 2010) Maine Natural Areas Program State Rank: 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.

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. This community type is well represented in Maine and is fairly stable in extent, with many examples on public lands and private conservation lands. Peat harvesting is a direct threat to a few sites. Changes to bog hydrology, through impoundment or draining, lead to vegetation changes. Slow vegetation growth rates, due to the nutrient poor environment, result in slow recovery from physical disturbances, such as recreational trail use. If disturbance, such as foot traffic, is a necessity, traversing during frozen conditions or using boardwalks can minimize impacts. (Gawler and Cutko, 2010)

Dominant plant species

- black spruce (*Picea mariana*), tree
- sheep laurel (*Kalmia angustifolia*), shrub
- rhodora (*Rhododendron canadense*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- black huckleberry (*Gaylussacia baccata*), shrub
- leatherleaf (*Chamaedaphne calyculata*), shrub
- small cranberry (*Vaccinium oxycoccos*), shrub
- bog laurel (*Kalmia polifolia*), shrub

- tall cottongrass (*Eriophorum angustifolium*), grass
- purple pitcherplant (*Sarracenia purpurea*), other herbaceous

Dominant resource concerns

- Organic matter depletion
- Ponding and flooding
- Surface water depletion
- Ground water depletion
- Pesticides transported to surface water
- Pathogens and chemicals from manure, biosolids, or compost applications transported to surface water
- Petroleum, heavy metals, and other pollutants transported to surface water
- Elevated water temperature
- Plant productivity and health
- Plant structure and composition
- Plant pest pressure
- Terrestrial habitat for wildlife and invertebrates
- Aquatic habitat for fish and other organisms

Pathway 1.1a
Community 1.1 to 1.2

Reduction (significant) in canopy cover

Conservation practices

Forest Stand Improvement
Forest Land Management
Multi-story cropping, sustainable management of nontimber forest plants
Monitoring and Evaluation

Pathway 1.2a
Community 1.2 to 1.1

Seeding, planting, seed dispersal

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.

Community 3.1
Drained Forest

Hydrologically altered wetland resulting in a drained forest for timber management and products

Community 3.2
Pasture or Hayland

Site used for grazing pasture or hay cultivation

Community 3.3
Drained Cropland

Hydrological alteration and mechanical landscape alteration for crop production

Pathway 3.1a
Community 3.1 to 3.2

Hydrological alteration

Pathway 3.2a
Community 3.2 to 3.1

Hydrological alteration

Pathway 3.2b
Community 3.2 to 3.3

Mechanical soil disturbance, clearing, landscape alteration, seeding or planting

Pathway 3.3a
Community 3.3 to 3.2

Cultivated cropland through mechanical landscape alteration and soil disturbance

Transition T1A
State 1 to 2

Shifts in community composition and ecological dynamics in response to climate change and associated disturbances. Introduction of invasive species, pests, and/or pathogens

Conservation practices

Monitoring and Evaluation

Transition T1B
State 1 to 3

Hydrological alteration, mechanical landscape alteration and soil disturbance

Conservation practices

Deep Tillage
Clearing and Snagging
Dam, Diversion
Diversion
Land Clearing
Tree/Shrub Site Preparation

Restoration pathway R2A
State 2 to 1

Removal, remediation, or control of invasive species, pests, and/or pathogens

Conservation practices

Wetland Restoration
Wetland Enhancement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Pathogen Management
Forest Land Management
Invasive Plant Species Control
Invasive Species Pest Management
Monitoring and Evaluation

Transition T2A
State 2 to 3

Hydrological alteration, mechanical landscape alteration and soil disturbance.

Restoration pathway R3A
State 3 to 1

Remediation of hydrological alteration, actively managed restoration, seeding/planting

Restoration pathway R3B
State 3 to 2

Remediation of hydrological alteration, actively managed restoration, seeding/planting

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
Jamin Johanson

Approval

Greg Schmidt, 5/20/2025

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	05/06/2025
Approved by	Greg Schmidt
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:**