USDA Natural Resources
Conservation Service

# Ecological site F146XY032ME
# Loamy Till Bottom

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 typically occurs on relatively-flat areas (1-2 percent slopes) where water saturates glacial till deposits for much of the growing season. Often it is found in valley bottoms, near open wetlands and drainageways, or in surface water discharge areas such as slope breaks. Northern white cedar is the dominant overstory plant on this site, often with small diameter hardwoods and softwoods such as brown ash, balsam fir, and yellow birch present but not dominant. The plant community is characterized by 50-75 percent overstory canopy cover, with diverse, productive, herbaceous understory and generally few shrubs.

Soils formed in mineral glacial till deposits and consist of poorly-drained hummocks and very-poorly-drained depressions. Trees grow mostly on the hummocks, and diverse understory species occupy various niches associated with the complex microtopography. Dark organic materials are present on the soil surface, but the subsoil consists of lighter grey and brown mineral soils that are regularly saturated with water. These soils receive significant extra water from the above watershed, often with ponding in the depressions during wet periods.

## Associated sites

| | |
|---|---|
| F146XY051ME | **Rockland**<br>The mucky beat bottom site often intergrades with the loamy till bottom site as soils get wetter and organic deposits get deeper. |
| F146XY021ME | **Marsh**<br>The Marsh site may occur near this site as it grades into wetter soils with deeper organic deposits. Marsh sites are typically open herbaceous wetlands or red maple wetlands, rather than cedar woodlands found on loamy till bottoms. |

## Similar sites

| | |
|---|---|
| F146XY051ME | **Rockland**<br>This site has organic soil throughout the profile, rather than mineral soil under an organic surface layer. Both sites have abundant northern white cedar, but overstory canopy cover is usually less than 50 percent on the mucky peat bottom site, allowing for more herbaceous production in the understory than the loamy till bottom site. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Thuja occidentalis*<br>(2) *Picea mariana* |
| Shrub | (1) *Alnus incana ssp. rugosa*<br>(2) *Ilex verticillata* |
| Herbaceous | (1) *Carex trisperma*<br>(2) *Gaultheria hispidula* |

## Physiographic features

This site occurs in valley bottoms, near open wetlands and drainageways, or in surface water discharge areas such as slope breaks. It is characterized by pit and mound* topography, with frequent ponding of water in the pits and drier conditions on the mounds. In the pits, the water table is typically near the soil surface (or above when ponded), while on the mounds, the water table may be a foot or more below the soil surface. Slopes are typically less than 5 percent for this site, but can be as high as 8 percent. This site occurs throughout MLRA 146 at elevations between 120 and 2,500 feet.

*Pit and mound topography is formed by the natural process of falling trees, which removes soil from the pit as they are uprooted, and deposit the soil in a mound next to the pit as the tree decays. When pit and mound topography is eliminated by land-leveling practices, it can take decades or centuries to develop naturally on this site. Much of the species diversity of this site results from the high variability in soil and plant growing conditions associated with pit and mound topography.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Ground moraine<br>(2) Till plain |
| Runoff class | Negligible to low |
| Flooding frequency | None |
| Ponding duration | Brief (2 to 7 days)  to long (7 to 30 days) |
| Ponding frequency | Frequent |
| Elevation | 120–2,500 ft |
| Slope | 0–5% |
| Ponding depth | 0–4 in |
| Water table depth | 0–12 in |
| 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) | 37-42 in |
| Frost-free period (actual range) | 61-107 days |
| Freeze-free period (actual range) | 103-141 days |
| Precipitation total (actual range) | 36-42 in |
| Frost-free period (average) | 85 days |
| Freeze-free period (average) | 127 days |
| Precipitation total (average) | 39 in |

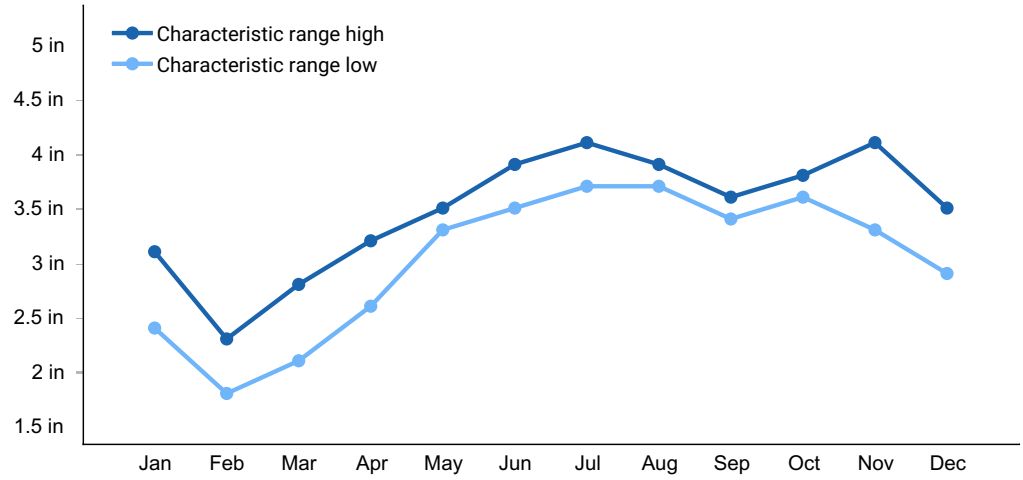



**Figure 1. Monthly precipitation range**

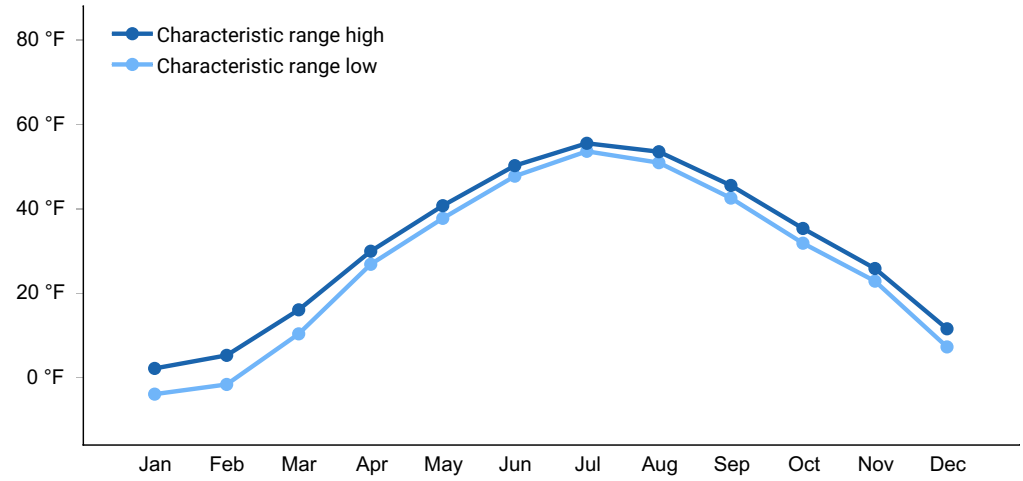



**Figure 2. Monthly minimum temperature range**

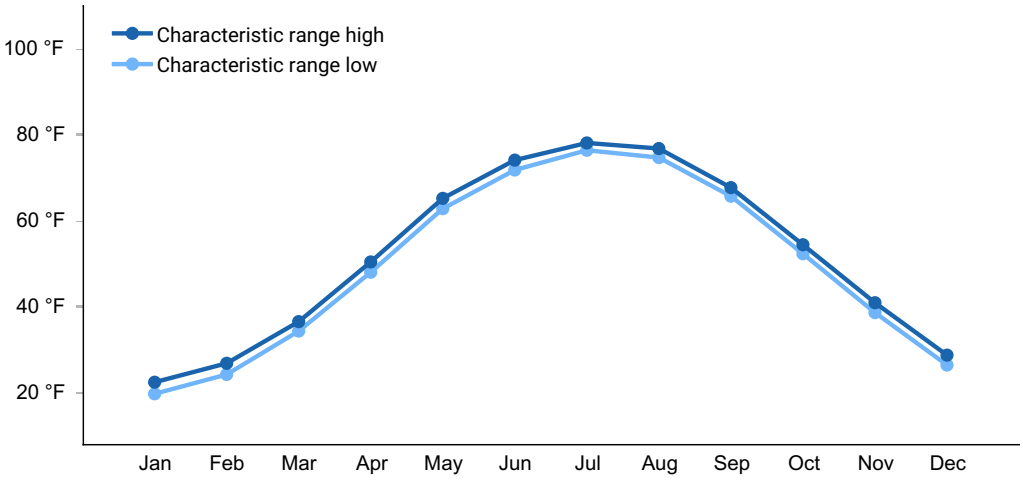



**Figure 3. Monthly maximum temperature range**

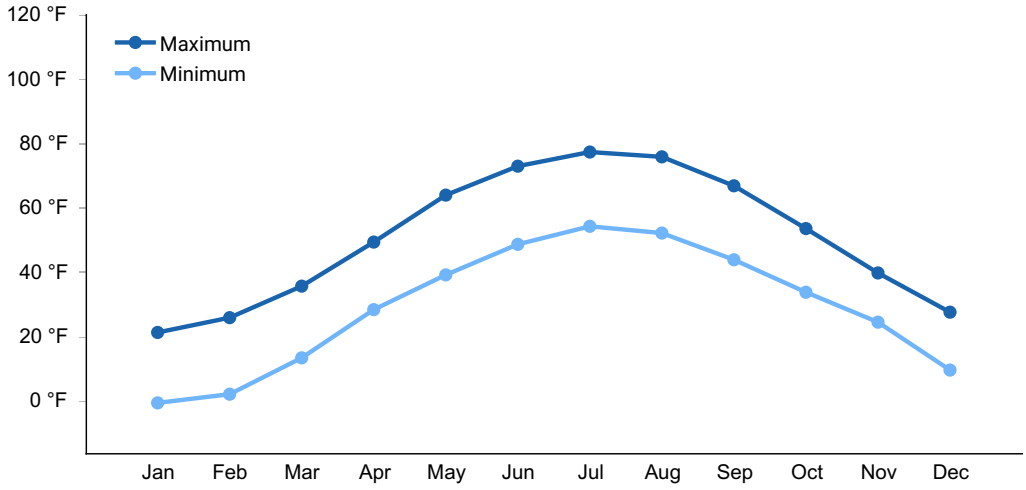



**Figure 4. Monthly average minimum and maximum temperature**

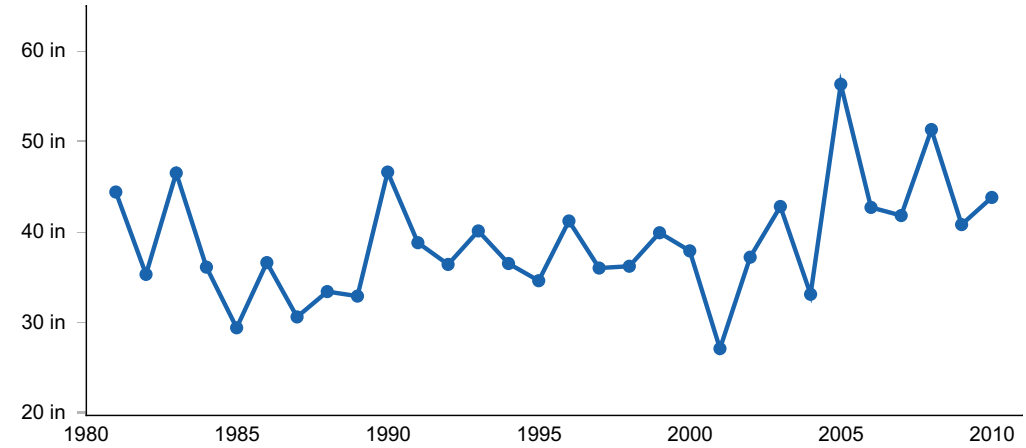



**Figure 5. Annual precipitation pattern**

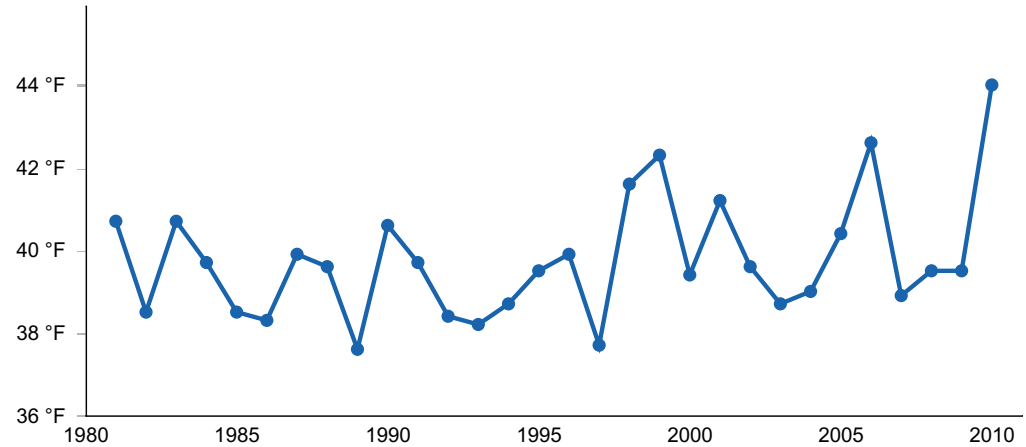



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) FT KENT [USC00172878], Fort Kent, ME
- (2) CARIBOU MUNI AP [USW00014607], Caribou, ME
- (3) ALLAGASH [USC00170200], Saint Francis, ME
- (4) BRIDGEWATER [USC00170833], Bridgewater, 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 receives extra moisture from neighboring watersheds which causes soil saturation for much of the growing season. The water table fluctuates throughout the year, often with ponding in depressions following spring runoff or large storm events. During dry periods, the water table may drop up to 1 foot beneath the soil surface.

## Soil features

The soils of this site are characterized by two soil types that occur together due to pit and mound topography. The pits are natural depressions consisting of very poorly-drained, frequently ponded soil with about one foot of muck on top of light grey (gleyed) mineral soil. The mounds are typically poorly-drained, not ponded, and may or may not have a thin layer of organic matter (less than 3 inches) above the mineral soil, which may range from light grey to brown in color.

Soil depth is variable on this site depending on the presence or absence of a dense layer of compacted subsoil that restricts water movement and plant roots. This dense layer is the result of compaction by the weight of glaciers and may or may not be present in all areas where this site occurs.

These soils formed in glacial till deposits of either acidic or calcareous parent material. Parent materials which are calcareous tend to produce more and larger hardwoods compared to those with acidic parent materials. The soil temperature regime is frigid, and the soil moisture regime is aquic.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Lodgment till–quartzite<br>(2) Supraglacial meltout till–shale and siltstone |
| Surface texture | (1) Silt loam<br>(2) Gravelly silt loam<br>(3) Mucky |
| Family particle size | (1) Loamy |
| Drainage class | Poorly drained to very poorly drained |
| Permeability class | Slow to very slow |
| Soil depth | 20 in |
| Surface fragment cover <=3" | 0–15% |
| Surface fragment cover >3" | 0–3% |

| | |
|---|---|
| Available water capacity (0-40in) | 4–11.7 in |
| Calcium carbonate equivalent (0-40in) | 0% |
| Electrical conductivity (0-40in) | 0 mmhos/cm |
| Sodium adsorption ratio (0-40in) | 0 |
| Soil reaction (1:1 water) (0-40in) | 3.5–7.3 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–15% |
| Subsurface fragment volume >3" (Depth not specified) | 0–6% |

## 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).

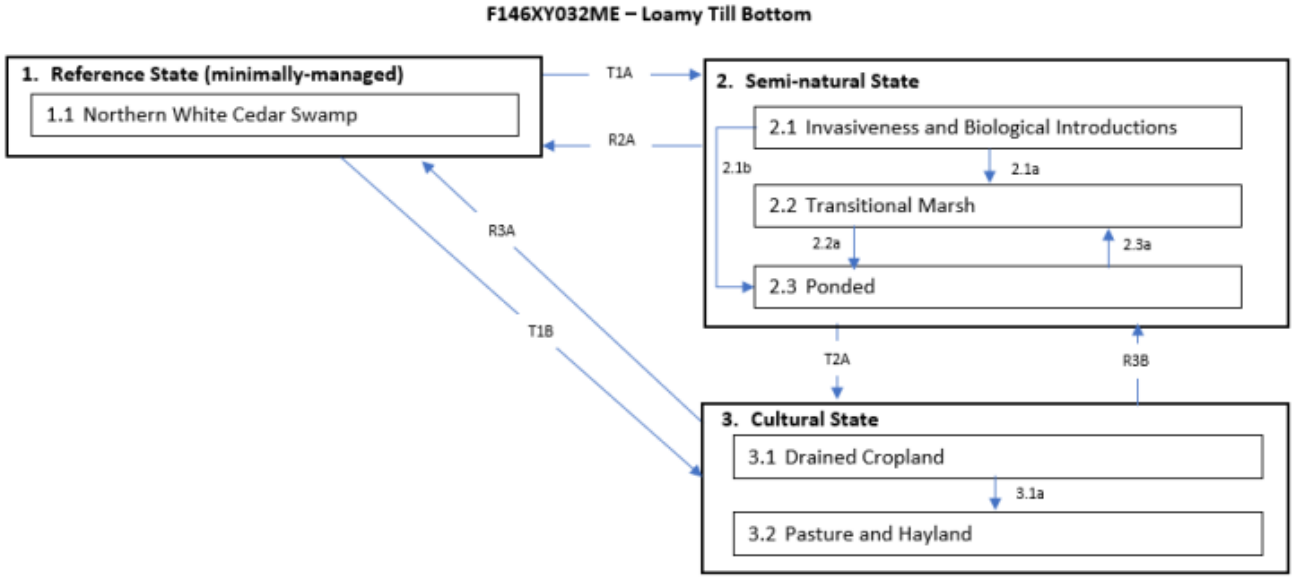
This ecological site is moderately to densely forested, often with little light penetrating to the forest floor. Northern white cedar is dominant (up to 95% cover), often forming a fairly uniform stand, but may be interspersed with various amounts of red maple (up to 25% cover ), black spruce (up to 40% cover), or, less frequently, larch, yellow birch or balsam fir. The variable shrub and ground layers form a lush mosaic of vegetated hummocks interspersed with moist hollows. The herb layer is well developed (>30% cover), with herbs more abundant than dwarf shrubs. Understory consists of mostly herbaceous wetland species and sphagnum mosses, generally with few shrubs.

This community typically occupies level, poorly drained basins along stream flowages or the perimeter of ponds. The substrate is usually shallow peat (< 50 cm) over mineral soil; some sites are on deep peat accumulations. The characteristically alkaline conditions in this community type provide suitable habitat for a number of rare plant species.

In some areas, this site may be disturbed by ponding associated with beaver activity or road and other structures that impede runoff from the site. When ponded, cedar and other trees typically die, and only return following the removal of beaver dams or structures impeding runoff. Once ponding is removed, this site may transition through various open wetland phases and/or early seral forest communities prior to cedar re-establishment and

dominance. Logging and wind may open up patches of tree canopy which result in increased herb production. In areas where this site is cleared, drained, and cultivated, it is used for mostly hay and pasture, or rarely as cropland.

## State and transition model




| *Transition* | *Drivers/practices* |
|---|---|
| T1A | wind erosion, climate change, hydrological alteration (beaver activity), significant increase in flooding events and annual precipitation, introduction of invasive species, pests, and pathogens |
| R2A | remediation of hydrologic alteration, management of invasive species, pests, and pathogens |
| T1B | hydrologic alteration (anthropogenic), timber harvesting, mechanical soil disturbance |
| T2A | hydrologic alteration (barrier, obstruction, dam), landscape prepared for cultivation, mechanical soil disturbance |
| 2.1a, 2.1b | introduction of invasive species, pests, and pathogens as a result of shifts between states or communities, highly influenced by pressures from disturbance and climate change |
| 2.2a, 2.3a | hydrologic alteration (beaver, road construction, drainage blockage), increase in significant flooding events and annual precipitation |
| R3A, R3B | remediation of hydrologic alteration, seeding, planting, significant flooding events and increase in annual precipitation, compacted soil |
| 3.1a | mechanical soil disturbance, seeded, irrigated |

## State 1
## Reference State (minimally-managed)

This site typically occurs on relatively-flat areas (1-2 percent slopes) where water saturates glacial till deposits for much of the growing season. Often it is found in valley bottoms, near open wetlands and drainageways, or in surface water discharge areas such as slope breaks. Northern white cedar is the dominant overstory plant on this site, often with small diameter hardwoods and softwoods such as brown ash, balsam fir, and yellow birch present but not dominant. Soils formed in mineral glacial till deposits, and consist of poorly-drained hummocks and very-poorly-drained depressions. (Gawler and Cutko, 2010)

**Characteristics and indicators.** Sites are basin wetlands with >60% tree canopy cover

and northern white cedar as the dominant tree. Peat mosses are the dominant bryophytes. The substrate is organic peat or muck. (Gawler and Cutko, 2010)

**Resilience management.** In some areas, this site may be disturbed by ponding associated with beaver activity or road and other structures that impede runoff from the site. When ponded, cedar and other trees typically die, and only return following the removal of beaver dams or structures impeding runoff. Once ponding is removed, this site may transition through various open wetland phases and/or early seral forest communities prior to cedar re-establishment and dominance. Logging and wind may open patches of tree canopy which result in increased herb production. In areas where this site is cleared, drained, and cultivated, it is used for mostly hay and pasture, or rarely as cropland.

**Dominant plant species**

- arborvitae (*Thuja occidentalis*), tree

**Dominant resource concerns**

- Aggregate instability
- 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

## Community 1.1
## Northern White Cedar Swamp

This ecological site is heavily dominated by a fairly uniform stand of Northern white cedar that greatly reduces light penetrating to the forest floor. The variable shrub and ground layers form a lush mosaic of vegetated hummocks interspersed with moist hollows. The herb layer is well developed, with herbs more abundant than dwarf shrubs. Small cedar trees and an array of boreal herbs grow on the fallen logs and hummocks, mosses blanket the hummocks, hollows, and fallen logs. This site typically occupies level, poorly drained basins along stream flowages or the perimeter of ponds. The substrate is usually shallow peat (< 50 cm) over mineral soil; some sites are on deep peat accumulations. The characteristically alkaline conditions in this community type provide suitable habitat for a number of rare plant species. (Gawler and Cutko, 2010)

**Resilience management.** Maine Natural Areas Program State Rank: S4 Apparently secure in Maine– 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 examples of northern white cedar swamps have been logged at least once in the past. Cedar swamps in northern Maine can be very extensive, running into hundreds of acres, and therefore it is more problematic to maintain examples not subject to human disturbance. Although the overall extent of this community type appears stable, there are some indications that it is difficult to regenerate cedar rather than fir through harvest practices. There has been little permanent conversion to other land uses or forest types. Some sites have been significantly altered by beaver activity. (Gawler and Cutko, 2010)

**Dominant plant species**

- arborvitae (*Thuja occidentalis*), tree
- black spruce (*Picea mariana*), tree
- red spruce (*Picea rubens*), tree
- tamarack (*Larix laricina*), tree
- white spruce (*Picea glauca*), tree
- speckled alder (*Alnus incana ssp. rugosa*), shrub
- common winterberry (*Ilex verticillata*), shrub
- threeseeded sedge (*Carex trisperma*), grass
- creeping snowberry (*Gaultheria hispidula*), other herbaceous

**Dominant resource concerns**

- 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

## 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.

**Dominant resource concerns**

- Organic matter depletion
- Aggregate instability
- Ponding and flooding
- Surface water depletion
- Ground water depletion
- 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 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**

- Organic matter depletion
- Aggregate instability
- Ponding and flooding
- Ground water depletion
- 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 2.2
## Transitional Marsh

**Dominant resource concerns**

- Ponding and flooding
- Surface water depletion
- Ground water depletion
- 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 2.3
## Ponded

**Dominant resource concerns**

- Surface water depletion
- 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 2.1a
## Community 2.1 to 2.2

## Pathway 2.1b
## Community 2.1 to 2.3

## Pathway 2.2a
## Community 2.2 to 2.3

## Pathway 2.3a
## Community 2.3 to 2.2

## 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**

- Wind erosion
- Compaction
- Organic matter depletion
- Plant productivity and health
- Feed and forage imbalance
- Energy efficiency of equipment and facilities

- Energy efficiency of farming/ranching practices and field operations

## Community 3.1
## Drained Cropland

Moderately well drained cultivated field.

## Community 3.2
## Pasture and Hayland

## Pathway 3.1a
## Community 3.1 to 3.2

hydrologically-altered for cultivation, mechanical soil disturbance, seeded

## Pathway 3.2a
## Community 3.2 to 3.1

hydrologically-altered for cultivation, mechanical soil disturbance, seeded

## Transition T1A
## State 1 to 2

wind erosion, climate change, hydrological alteration (beaver activity), significant increase in flooding events and annual precipitation, introduction of invasive species, pests, and pathogens

## Transition T1B
## State 1 to 3

hydrologic alteration (anthropogenic), timber harvesting, mechanical soil disturbance

## Restoration pathway R2A
## State 2 to 1

remediation of hydrologic alteration, management of invasive species, pests, and pathogens

**Conservation practices**

| |
|---|
| Obstruction Removal |
| Restoration and Management of Natural Ecosystems |
| Native Plant Community Restoration and Management |

Invasive Plant Species Control

### Transition T2A
### State 2 to 3

remediation of hydrologic alteration, significant flooding events and increase in annual precipitation, compacted soil

### Restoration pathway R3A
### State 3 to 1

remediation of hydrologic alteration, seeding, planting, significant flooding events and increase in annual precipitation, compacted soil

### Restoration pathway R3B
### State 3 to 2

remediation of hydrologic alteration, seeding, planting, significant flooding events and increase in annual precipitation, compacted soil

## 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:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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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:

---

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:**

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