USDA Natural Resources Conservation Service

# Ecological site F094AB028MI
# Dry Sandy Slopes

Last updated: 2/18/2025
Accessed: 02/20/2025

## 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): 094A–Northern Michigan Sandy Highlands

"This area is dominated by outwash plains and moraines. The terrain can be steep on the moraines and flat in the areas of outwash. Elevation ranges from 177 to 520 m (580 to 1705 ft). Local topographic relief averages 14 m and ranges up to 188 m (45 to 615 ft). This area is covered entirely by drift. Bedrock consisting of Devonian limestone and dolomite with interbedded shale, chert, and anhydrite stringers is at various depths below the surface because of the curvature of the Michigan basin. However, bedrock exposures completely absent, as the depth of glacial drift ranges from 60 to 300 m (200-1000 ft). The Au Sable, Manistee, Au Gres, and Pine Rivers are the major streams draining this MLRA, in both the Lake Michigan and Lake Huron watersheds. The Muskegon River has its headwaters in this area.

About 70 percent of this area is forested, and about 15 percent is cropland or hayland. About one-third of the area is in small, privately owned holdings, and another one-third consists of national and State forests. The forests are used mainly for timber production and recreation. Dairy and beef operations are very important enterprises in the area. Forage and feed grains for dairy cattle and other livestock are the principal crops. Wheat, oats, corn, potatoes, and hay also are grown in the area. The Huron and Manistee National Forests, Hartwick Pines State Park, Camp Grayling (Department of Defense), Pigeon River Country State Forest are among the most notable conservation lands in the area. Reaches of the Au Sable and Pine Rivers are National Wild and Scenic Rivers.

Summary of existing land use:
Upland Forest (58%)
Hardwood (41%)
Conifer (15%)
Swamps and Marshes (14%)
Developed (11%)
Agricultural (10%)
Grassland (5%)
"

## Classification relationships

According to the USFS (Bailey) system of ecoregions, the site is located mostly within 212Hg (Kirtland's Warbler High Sand Plains) and 212Hh (Gladwin Silty Lake Plain) subsections. According to the EPA (Omernik) system of ecoregions, the site is located in 50ae (Mio Plateau), 50ah (Tawas Lake Plain) and eastern 50ad (Vanderbilt Moraines) level IV ecoregions. This site roughly cooresponds to PVCd, in the Kotar system. This site cooresponds to the Outwash Plains ecological land type phases 10-12, in the USFS Ecological Land Type system.

## Ecological site concept

The central concept of Dry Sandy Plains is uplands lacking a seasonal water table (excessively drained to

moderately well drained), lacking significant B horizon development in the soil profile, and on broadly flat landscapes with less than 15% slopes. Site occurs on sandy drift (outwash, ice contact, or lake plains) where soil textures are sand or loamy sand (upper 50 cm >70% sand). Site is outside the heavy snowfall belt, mostly east of Houghton Lake where fire was frequent. Vegetation trending towards xerophytic woodlands and barrens with a high fire frequency.

## Associated sites

| | |
|---|---|
| F094AB018MI | **Rich Sandy Drift**<br>Rich Sandy Drift has a greater amount of spodic development, which indirectly indicates higher productivity, or has higher pH, which drives higher productivity. Vegetation is similar. |
| F094AB020MI | **Acidic Sandy Depression**<br>Acidic Sandy Depression has a seasonally high water table, either moderately well drained or somewhat poorly drained. Consequently, there can be a transition to wetland species or higher cover of wintergreen. |
| F094AB019MI | **Dry Sandy Plains**<br>Dry Sandy Plains has a lower topographic roughness which tends to increase the size of wildfires. Consequently, there is more jack pine and less white pine and oak. |

## Similar sites

| | |
|---|---|
| F094AA006MI | **Snowy Sandy Drift**<br>Snowy Sandy Drift has a greater amount of annual snowfall, which leads to longer fire interval. Consequently, there is more white pine and northern hardwoods and less jack pine. |
| F094AB019MI | **Dry Sandy Plains**<br>Dry Sandy Plains has a lower topographic roughness which tends to increase the size of wildfires. Consequently, there is more jack pine and less white pine and oak. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Pinus strobus*<br>(2) *Quercus rubra* |
| Shrub | Not specified |
| Herbaceous | (1) *Pteridium aquilinum* |

## Physiographic features

Site occurs mostly on sandy outwash plains, with minor amounts of coarse textured ice contact, glacial till, and lake plain deposits with similar properties. Landforms are mostly gently sloping, but there are no upper limits to slope defined.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Kame<br>(2) Ice-contact slope |
| Runoff class | Negligible to medium |
| Elevation | 581–1,572 ft |
| Slope | 15–45% |
| Water table depth | 59 in |
| Aspect | W, NW, N, NE, E, SE, S, SW |

## Climatic features

Mean annual temperatures are 5.7 to 7.6 °C (42 to 46 °F). The warmest six months average 14.3 to 16.1 °C (58 to 61 °F). Mean July temperatures range from 19.1 to 20.8 °C (66 to 69 °F). Mean January temperatures range from -8.2 to -6.0 °C (17 to 21 °F). The maximum monthly average daily highs are 25.9 to 27.7 °C (79 to 82 °F). The

minimum monthly average daily lows are -13.2 to -10.7 °C (8 to 13 °F).Temperatures generally decrease with elevation and latitude. Mean annual precipitation ranges from 700 to 870 mm (28 to 34 in). Precipitation decreases from west to east. Average 0 °C (32 °F) frost-free season ranges from 73 to 144 days. Average -2 °C (28 °F) freeze-free season is 106 to 172 days. Mean annual snowfall ranges from 1.1 to 2.9 m (40 to 120 in). Snowfall decreases from northwest to southeast. Mean annual extreme minimum temperatures range from -33.3 to -23.1 °C (-28 to -10 °F), or hardiness zones 4a to 6a.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 76-110 days |
| Freeze-free period (characteristic range) | 119-143 days |
| Precipitation total (characteristic range) | 29-31 in |
| Frost-free period (actual range) | 52-113 days |
| Freeze-free period (actual range) | 114-150 days |
| Precipitation total (actual range) | 28-33 in |
| Frost-free period (average) | 92 days |
| Freeze-free period (average) | 133 days |
| Precipitation total (average) | 30 in |

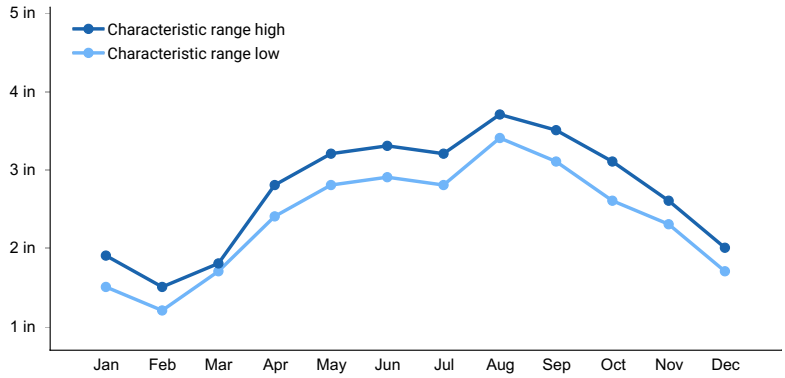



**Figure 1. Monthly precipitation range**

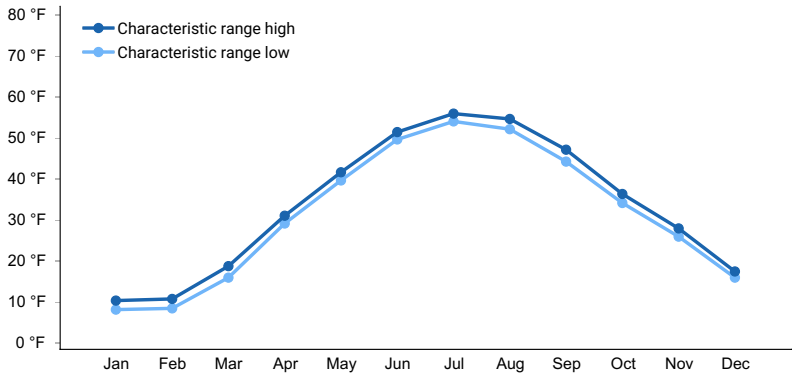



**Figure 2. Monthly minimum temperature range**

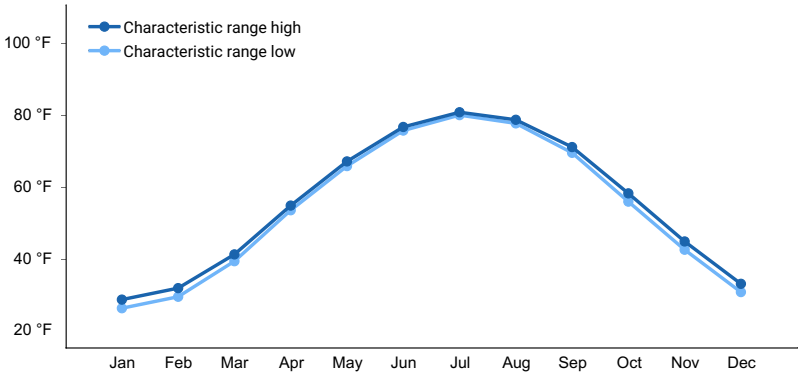



**Figure 3. Monthly maximum temperature range**

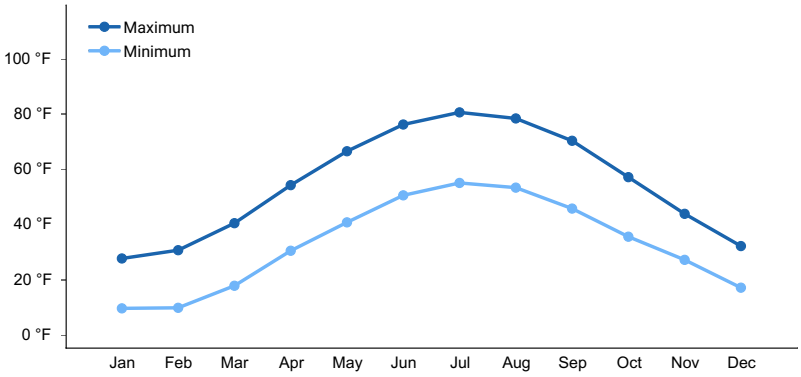



**Figure 4. Monthly average minimum and maximum temperature**

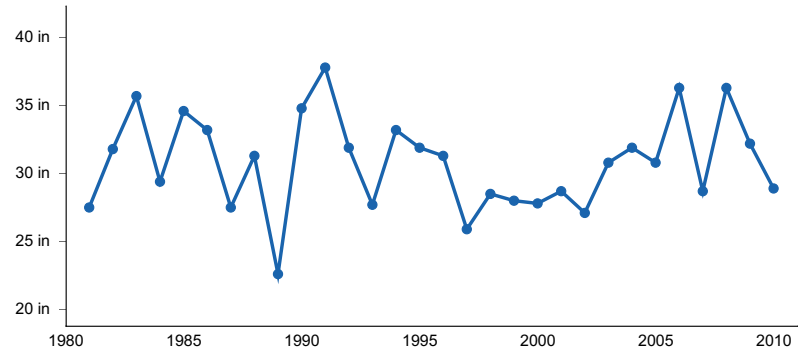



**Figure 5. Annual precipitation pattern**

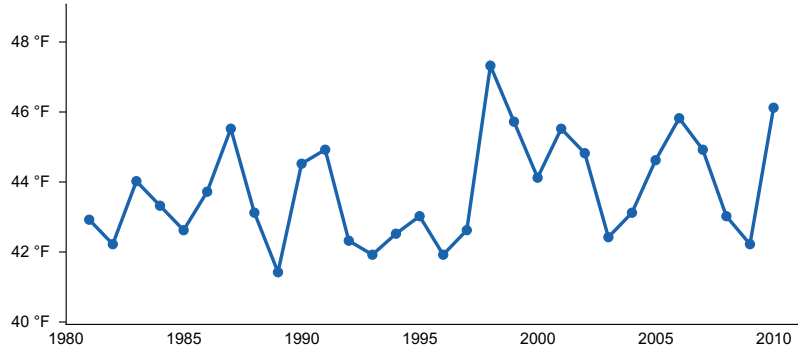



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) EAST TAWAS [USC00202423], Tawas City, MI
- (2) GRAYLING [USC00203391], Grayling, MI
- (3) MIO HYDRO PLT [USC00205531], Mio, MI

- (4) VANDERBILT 11ENE [USC00208417], Vanderbilt, MI
- (5) HOUGHTON LK ROSCOMMON AP [USW00094814], Houghton Lake, MI
- (6) HALE LOUD DAM [USC00203529], Glennie, MI
- (7) WEST BRANCH 3SE [USC00208800], West Branch, MI

## Influencing water features

No seasonal water table is expected.

## Soil features

Soils are well drained to excessively well drained sands. They are commonly classified Lamellic Udipsamments, Typic Udipsamments, and Arenic Glossudalfs, and commonly mapped as Graycalm, Grayling, and Typic Udipsamments series or components. The top 50 cm has a typical pH of 5 and is 90% sand and 0.8% organic matter. At depth, pH ranges up to 5.8, and texture averages 90% sand and 5% clay. Depth to impeded hydraulic conductivity or root restrictive layers averages >200 cm. Depth to carbonates averages >200 cm.

**Table 4. Representative soil features**

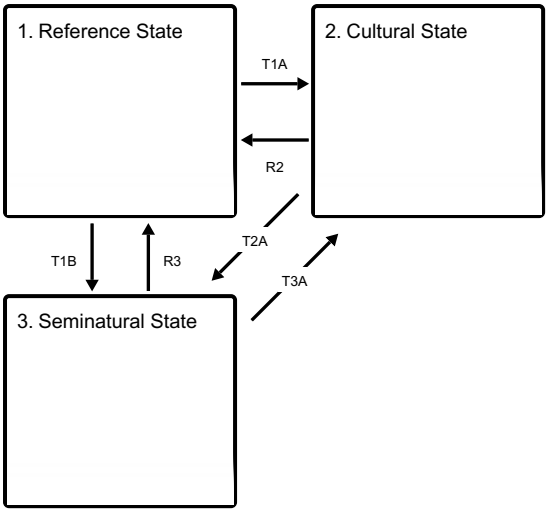
| | |
|---|---|
| Parent material | (1) Outwash |
| Surface texture | (1) Sand |
| Drainage class | Excessively drained to well drained |
| Permeability class | Moderately rapid to rapid |
| Soil depth | 79 in |
| Surface fragment cover <=3" | 0–1% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-39.4in) | 1.57–3.94 in |
| Soil reaction (1:1 water) (0-19.7in) | 3.5–6 |
| Subsurface fragment volume <=3" (0-59.1in) | 0–10% |
| Subsurface fragment volume >3" (0-59.1in) | 0–5% |

## Ecological dynamics

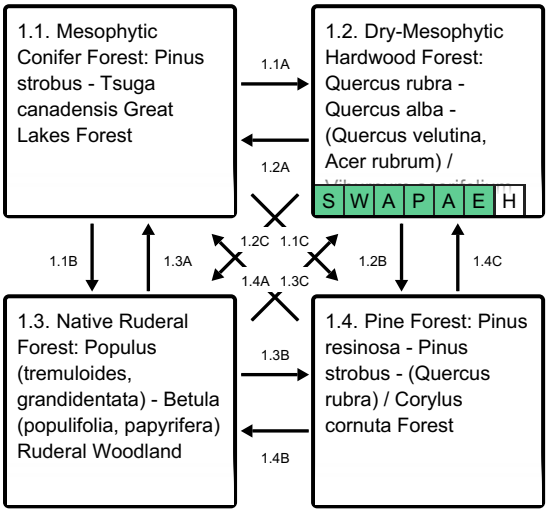
Dry Sandy Slopes tends to share the same ecological dynamics as Natureserve/Landfire system, Laurentian-Acadian Northern Pine(-Oak) Forest. Stand replacing fires occurred every 150-600 years, with light surface fires every 30-115 years. Overstory was dominated by fire dependent, early successional pine (Pinus spp.) or oak (Quercus spp.). Understory is composed of shade-tolerant, acid-tolerant forbs such as Canada mayflower (*Maianthemum canadense*). Kotar community, PArVVb (*Pinus strobus-Acer rubrum*/Vaccinium spp.-*Viburnum acerifolium*), understory indicator species include: *Acer saccharum*, *Aralia nudicaulis*, *Eurybia macrophylla*, *Galium triflorum*, *Gaultheria procumbens*, *Hamamelis virginiana*, *Lonicera canadensis*, Lysimachia borealis, *Maianthemum canadense*, *Mitchella repens*, Polygaloides paucifolia, *Polygonatum pubescens*, *Pteridium aquilinum*, *Trillium grandiflorum*, *Vaccinium angustifolium*, and *Viburnum acerifolium* (Sugar Maple, Wild Sarsaparilla, Big-leaved Aster, Fragrant Bedstraw, Teaberry, Witch-hazel, Canadian Fly Honeysuckle, Star-flower, Canada Mayflower, Partridge-berry, Fringed Polygala, Downy Solomon's-seal, Bracken Fern, Great White Trillium, Northern Lowbush Blueberry, and Maple-leaved Viburnum).

## State and transition model

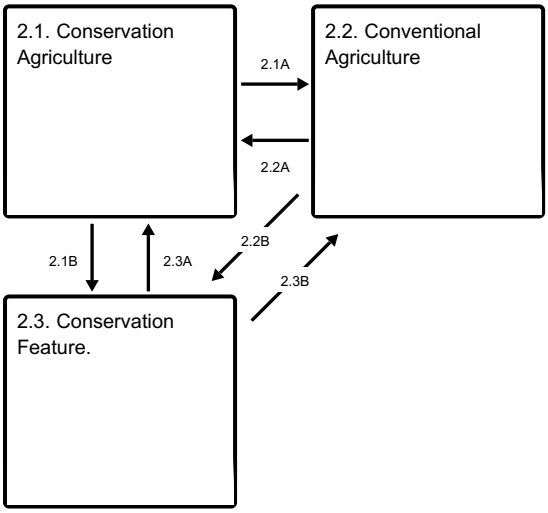
**Ecosystem states**



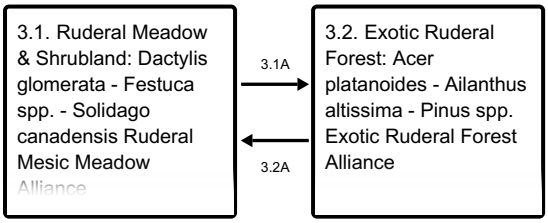

**State 1 submodel, plant communities**




**State 2 submodel, plant communities**




**State 3 submodel, plant communities**



## State 1
## Reference State

### Community 1.1
### Mesophytic Conifer Forest: Pinus strobus - Tsuga canadensis Great Lakes Forest

### Community 1.2
### Dry-Mesophytic Hardwood Forest: Quercus rubra - Quercus alba - (Quercus velutina, Acer rubrum) / Viburnum acerifolium Forest

**Resilience management.** This is an oak dominated variant which has become more prevalent after harvesting of pine followed by wildfire which kills regenerating pine. Over time, without fire, the stand will gradually become more dominated by red maple through a process of mesophication as it is more shade tolerant and more fire sensitive than oak. Too much maple will render the stand less flammable, crossing a threshold towards an alternative mesophytic state.

**Table 5. Canopy structure (% cover)**

| Height Above Ground (Ft) | Tree | Shrub/Vine | Grass/ Grasslike | Forb |
|---|---|---|---|---|
| <0.5 | – | 5-7% | 9-13% | 0-5% |
| >0.5 <= 1 | 4-15% | 7-24% | 9-13% | 6-13% |
| >1 <= 2 | 4-15% | 2-22% | – | 6-13% |
| >2 <= 4.5 | 0% | 0-6% | – | – |
| >4.5 <= 13 | 14-27% | – | – | – |
| >13 <= 40 | 49-65% | – | – | – |
| >40 <= 80 | 60-70% | – | – | – |
| >80 <= 120 | – | – | – | – |
| >120 | – | – | – | – |

### Community 1.3
### Native Ruderal Forest: Populus (tremuloides, grandidentata) - Betula (populifolia, papyrifera) Ruderal Woodland

### Community 1.4
### Pine Forest: Pinus resinosa - Pinus strobus - (Quercus rubra) / Corylus cornuta Forest

### Pathway 1.1A
### Community 1.1 to 1.2

Blowdown/clearcut followed by fire a few years after, destroying conifer regeneration, deferentially favoring oak regeneration.

**Conservation practices**

| |
|---|
| Prescribed Burning |
| Forest Stand Improvement |

### Pathway 1.1B
### Community 1.1 to 1.3

Blowdown/clearcut

**Conservation practices**

| |
|---|
| Early Successional Habitat Development/Management |
| Forest Stand Improvement |

### Pathway 1.1C
### Community 1.1 to 1.4

Crown fire, or blowdown/clearcut with fire in close succession.

**Conservation practices**

| |
|---|
| Prescribed Burning |
| Forest Stand Improvement |

### Pathway 1.2A
### Community 1.2 to 1.1

Succession

### Pathway 1.2C
### Community 1.2 to 1.3

Blowdown/clearcut

### Pathway 1.2B
### Community 1.2 to 1.4

Crown fire, or blowdown/clearcut with fire in close succession.

**Conservation practices**

| |
|---|
| Prescribed Burning |
| Forest stand improvement for habitat and soil quality |

### Pathway 1.3A
### Community 1.3 to 1.1

Succession

**Conservation practices**

| |
|---|
| Tree/Shrub Site Preparation |
| Tree/Shrub Establishment |

### Pathway 1.3C
### Community 1.3 to 1.2

Succession if fire consumed any subsequent pine regeneration.

### Pathway 1.3B
### Community 1.3 to 1.4

Light fire removes the leaf litter, allowing for pine seedlings to establish followed by succession.

### Pathway 1.4A
### Community 1.4 to 1.1

Succession.

### Pathway 1.4C
### Community 1.4 to 1.2

Blowdown/clearcut followed by fire a few years after, destroying conifer regeneration, deferentially favoring oak regeneration.

### Pathway 1.4B
### Community 1.4 to 1.3

Blowdown, clearcut, or crown fire, with establishment of clonal tree species.

## State 2
## Cultural State

Site is generally undesirable to farm due to steep slopes, short growing season, and infertile soil.

### Community 2.1
### Conservation Agriculture

### Community 2.2
### Conventional Agriculture

### Community 2.3
### Conservation Feature.

Can be a grassed waterway, conservation reserve, a small patch pollinator garden, or other land taken out of its primary cultural production to mitigate or reduce impacts of adjacent land use, and is not by itself a permanent restoration of a complete native biological community and associated ecosystem services.

### Pathway 2.1A
### Community 2.1 to 2.2

Apply unsustainable farming techniques.

### Pathway 2.1B
### Community 2.1 to 2.3

Establish conservation feature.

**Conservation practices**

| |
|---|
| Conservation Cover |
| Grassed Waterway |

### Pathway 2.2A
### Community 2.2 to 2.1

Apply sustainable farming techniques.

**Conservation practices**

| |
|---|
| Conservation Crop Rotation |
| Cover Crop |
| Nutrient Management |
| Integrated Pest Management (IPM) |

### Pathway 2.2B
### Community 2.2 to 2.3

Establish conservation feature.

**Conservation practices**

| |
|---|
| Conservation Cover |
| Grassed Waterway |

### Pathway 2.3A
### Community 2.3 to 2.1

Revert to sustainable agriculture.

**Conservation practices**

| |
|---|
| Conservation Crop Rotation |
| Cover Crop |
| Nutrient Management |
| Integrated Pest Management (IPM) |

### Pathway 2.3B
### Community 2.3 to 2.2

Revert to unsustainable agriculture.

## State 3
## Seminatural State

Vegetation consists of a mix of native and non-native species.

### Community 3.1
### Ruderal Meadow & Shrubland: Dactylis glomerata - Festuca spp. - Solidago canadensis

**Ruderal Mesic Meadow Alliance**

### Community 3.2
### Exotic Ruderal Forest: Acer platanoides - Ailanthus altissima - Pinus spp. Exotic Ruderal Forest Alliance

### Pathway 3.1A
### Community 3.1 to 3.2

Succession

### Pathway 3.2A
### Community 3.2 to 3.1

Blowdown/clearcut

### Transition T1A
### State 1 to 2

Clear vegetation; cultivate domesticated species

### Transition T1B
### State 1 to 3

Clear vegetation, invasive species introduced

### Restoration pathway R2
### State 2 to 1

Remove domesticated species; restore native species

**Conservation practices**

| |
|---|
| Brush Management |
| Tree/Shrub Site Preparation |
| Tree/Shrub Establishment |
| Restoration and Management of Rare and Declining Habitats |
| Upland Wildlife Habitat Management |
| Herbaceous Weed Control |

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

Abandoned, succession

### Restoration pathway R3
### State 3 to 1

Control invasive species; restore native species

**Conservation practices**

| |
|---|
| Brush Management |
| Tree/Shrub Site Preparation |
| Tree/Shrub Establishment |

| |
|---|
| Restoration and Management of Rare and Declining Habitats |
| Upland Wildlife Habitat Management |
| Herbaceous Weed Control |

## Transition T3A
## State 3 to 2

Clear vegetation; cultivate domesticated species

## Additional community tables

**Table 6. Community 1.2 forest overstory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (Ft) | Canopy Cover (%) | Diameter (In) | Basal Area (Square Ft/Acre) |
|---|---|---|---|---|---|---|---|
| **Tree** | | | | | | | |
| northern red oak | QURU | *Quercus rubra* | Native | 45.9–69.2 | 40.7–58.7 | 11.4–16.1 | – |
| red maple | ACRU | *Acer rubrum* | Native | 32.8–57.4 | 3–38.3 | 5.1–14.6 | – |
| red maple | ACRU | *Acer rubrum* | Native | 19.7–39.4 | 19.3–24.7 | – | – |
| eastern white pine | PIST | *Pinus strobus* | Native | 6.6–26.2 | 0–8 | – | – |
| white oak | QUAL | *Quercus alba* | Native | 32.8–62.3 | 0–5.3 | 13.8–15 | – |

**Table 7. Community 1.2 forest understory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (Ft) | Canopy Cover (%) |
|---|---|---|---|---|---|
| **Grass/grass-like (Graminoids)** | | | | | |
| Pennsylvania sedge | CAPE6 | *Carex pensylvanica* | Native | 0.3–0.7 | 9.2–10.1 |
| roughleaf ricegrass | ORAS | *Oryzopsis asperifolia* | Native | 0.3–0.7 | 0–1.5 |
| rosette grass | DICHA2 | *Dichanthelium* | Native | 0.7–1.6 | 0–0.1 |
| eastern bottlebrush grass | ELHY | *Elymus hystrix* | Native | 0.7–1.6 | 0–0.1 |
| **Forb/Herb** | | | | | |
| starflower | TRBO2 | *Trientalis borealis* | Native | 0–0.3 | 0–4.7 |
| Canada mayflower | MACA4 | *Maianthemum canadense* | Native | 0–0.3 | 0–2.1 |
| wood anemone | ANQU | *Anemone quinquefolia* | Native | 0.7–1.6 | 0–0.6 |
| narrowleaf cowwheat | MELI2 | *Melampyrum lineare* | Native | 0–0.3 | 0.1–0.4 |
| bigleaf aster | EUMA27 | *Eurybia macrophylla* | Native | 0.7–1.6 | 0–0.1 |
| feathery false lily of the valley | MARA7 | *Maianthemum racemosum* | Native | 0.3–0.7 | 0–0.1 |
| **Fern/fern ally** | | | | | |
| western brackenfern | PTAQ | *Pteridium aquilinum* | Native | 0.7–1.6 | 7–9.7 |
| **Shrub/Subshrub** | | | | | |
| lowbush blueberry | VAAN | *Vaccinium angustifolium* | Native | 0.7–1.6 | 0–24 |
| lowbush blueberry | VAAN | *Vaccinium angustifolium* | Native | 1.3–2.6 | 0–7.3 |
| eastern teaberry | GAPR2 | *Gaultheria procumbens* | Native | 0.3–0.7 | 4.3–7 |
| mapleleaf viburnum | VIAC | *Viburnum acerifolium* | Native | 0.7–1.6 | 0–0.8 |
| black huckleberry | GABA | *Gaylussacia baccata* | Native | 0.7–1.6 | 0–0.1 |
| **Tree** | | | | | |
| red maple | ACRU | *Acer rubrum* | Native | 0.7–1.6 | 0–16 |
| red maple | ACRU | *Acer rubrum* | Native | 8.2–16.4 | 0–14 |
| eastern white pine | PIST | *Pinus strobus* | Native | 8.2–16.4 | 0–13.3 |
| American witchhazel | HAVI4 | *Hamamelis virginiana* | Native | 8.2–16.4 | 0–3.3 |
| common serviceberry | AMAR3 | *Amelanchier arborea* | Native | 0.7–1.6 | 0–2.3 |
| American witchhazel | HAVI4 | *Hamamelis virginiana* | Native | 0.7–1.6 | 0–1.5 |
| white oak | QUAL | *Quercus alba* | Native | 0.7–1.6 | 0.5–1.5 |
| black cherry | PRSE2 | *Prunus serotina* | Native | 0.7–1.6 | 0.1–0.7 |
| bigtooth aspen | POGR4 | *Populus grandidentata* | Native | 0.7–1.6 | 0–0.3 |
| red pine | PIRE | *Pinus resinosa* | Native | 8.2–16.4 | 0–0.1 |
| white ash | FRAM2 | *Fraxinus americana* | Native | 0.7–1.6 | 0–0.1 |
| red pine | PIRE | *Pinus resinosa* | Native | 0.7–1.6 | 0–0.1 |
| northern red oak | QURU | *Quercus rubra* | Native | 0.7–1.6 | 0.1 |
| eastern white pine | PIST | *Pinus strobus* | Native | 0.7–1.6 | 0–0.1 |
| white oak | QUAL | *Quercus alba* | Native | 8.2–16.4 | 0–0.1 |
| **Vine/Liana** | | | | | |
| limber honeysuckle | LODI2 | *Lonicera dioica* | Native | 0.7–1.6 | 0–0.3 |
| **Nonvascular** | | | | | |
| Moss | 2MOSS | *Moss* | Native | – | 0–0.3 |

## Inventory data references

Verification data was collected in 2024 from 3 sites representing one community phase.

## Approval

Nels Barrett, 2/18/2025

## 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 | 02/20/2025 |
| 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:**