USDA Natural Resources
Conservation Service

Ecological site F145XY009CT
Well Drained Outwash

Last updated: 9/27/2024
Accessed: 05/13/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 145X–Connecticut Valley

Major Land Resource Area (MLRA): 145 – Connecticut Valley (USDA-NRCS, 2006).
The nearly level floor of the Connecticut Valley makes up most of the area. Nearly level to sloping lowlands are at the outer edges of the river valley. These lowlands are broken by isolated, north- to south-trending trap-rock ridges that are hilly and steep. Elevation ranges from sea level to 100 meters (330 feet) in the lowlands and from 50 to 100 meters (650 to 1,000 feet) on ridges. The geology of this rift valley is a late Triassic and early Jurassic sandstone, shale, and conglomerate sequence. Tilted basalt flows along rift zones form the trap rock ridges exhibiting the greatest landscape relief. Glaciation accounts for glacial lake deposits, outwash, and till. Following glacial retreat, wind-deposited loess caps some areas. Recent alluvium deposits form well-developed flood plain along the Connecticut River. These deposits created some of the most productive agricultural soils in New England. The dominant soils are entisols and inceptisols with a mesic temperature regime in combination with parent materials such as glacial lakebeds, glacial outwash, glacial till, and recent alluvium. From north-to-south within the Connecticut Valley, the climate transitions from humid-continental to humid temperate with pronounced seasons and frequent storms. The forests are predominately central hardwoods to the south and transition hardwoods to the north. Significant habitats include trap rock ridges, sandplains, and floodplains of the Connecticut River and major tributaries. Much of the area is currently in residential and urban development and agriculture. While much of the areas is also forested, habitat loss and fragmentation are widespread throughout the Connecticut Valley.

Classification relationships

USDA-NRCS (USDA, 2006):
Land Resource Region (LRR): R – Northeastern Forage and Forest Region
Major Land Resource Area (MLRA): 145 – Connecticut Valley

USDA-FS (Cleland et al, 2007):
Province: 221 – Eastern Broadleaf Forest
Section: 221A – Lower New England
Subsection: 221Af –Lower Connecticut River Valley
Province: M211 – Adirondack New England Mixed Forest – Coniferous Forest – Alpine Meadow (in part)
Section: M211B– New England Piedmont (in part)
Subsection: 211Bb – Southern Piedmont (in part)

Ecological site concept

This site consists of very deep, well drained soils formed in loamy over sandy and gravelly outwash. They are nearly level to strongly sloping soils on outwash plains and terraces. Representative soils include Branford, Pollux, Poocham.

The representative plant communities are varied but consist largely of oaks (chestnut, black, scarlet, and white), and

pines (pitch, white) e.g., “red oak / mapleleaf viburnum forest” (Metzler and Barrett 2006); “white pine - oak forest” (Swain and Kearsley 2001); “mixed oak forest/woodlands” (Swain and Kearsley 2001); “mixed pine red oak woodland” (Sperduto and Nichols 2011); “white pine red - oak black - oak forest” (Sperduto and Nichols 2011); plus open sites include big bluestem - indian grass (Metzler and Barrett 2006) or "cultural grassland” (Swain and Kearsley 2001). These sites are very similar to the well-drained counterpart, but have a more diverse understory.

These well-drained sites are subject to many disturbances including conversion by agricultural cropping - particularly turf farms, plantations, as well as development, burning, cutting from occasional tree harvests, and invasive species such as tree-of-heaven and black locust.

Associated sites

F145XY002MA	**Silty Low Floodplain**
F145XY010CT	**Moist Outwash**

Similar sites

F145XY008MA	**Dry Outwash**
F145XY010CT	**Moist Outwash**

Table 1. Dominant plant species

Tree	(1) *Quercus velutina* (2) *Pinus strobus*
Shrub	(1) *Gaylussacia baccata* (2) *Corylus cornuta*
Herbaceous	(1) *Pteridium aquilinum* (2) *Aralia nudicaulis*

Physiographic features

The site occurs on nearly level to steeply sloping soils on terraces and outwash plains and is not subject to flooding.

Table 2. Representative physiographic features

Landforms	(1) River valley > Outwash terrace (2) Valley > Outwash plain (3) Terrace
Runoff class	Very low to high
Flooding frequency	None
Ponding frequency	None
Elevation	0–549 m
Slope	0–50%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The regional climate of the Connecticut Valley transitions north to south, from humid-continental to humid temperate, respectively, with pronounced seasons and frequent storms. (Beck et al., 2018; Bailey, 2014). Locally, the Silty High Floodplain ecological site is dependent upon extreme flood events coinciding with freshets in the early spring due to snowmelt and heavy precipitation events within the watershed at any time (Metzler and Damman 1985).

Climate change is occurring, and the resiliency of any ecological site will depend upon the direct and indirect effects upon component species and shifting atmospheric and soil conditions. On these ecological sites, xeric pine forests/woodland/scrub are at a low vulnerability risk to climate change with impacts considered to be neutral. Tolerances to drought and fire, as well as tolerance some disturbance allows these forest/woods/scrub to be moderately adaptive. However, warmer seasonal temperatures may amplify effects of insect pests and diseases. Several invasive species will continue to be a threat. (Janowiak et al, 2018).

Table 3. Representative climatic features

Frost-free period (characteristic range)	130-142 days
Freeze-free period (characteristic range)	154-186 days
Precipitation total (characteristic range)	1,168-1,295 mm
Frost-free period (actual range)	114-147 days
Freeze-free period (actual range)	146-188 days
Precipitation total (actual range)	1,118-1,321 mm
Frost-free period (average)	135 days
Freeze-free period (average)	170 days
Precipitation total (average)	1,219 mm

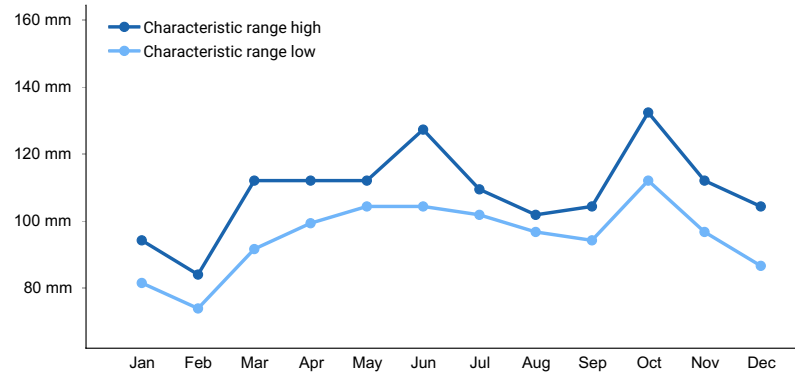


Figure 1. Monthly precipitation range

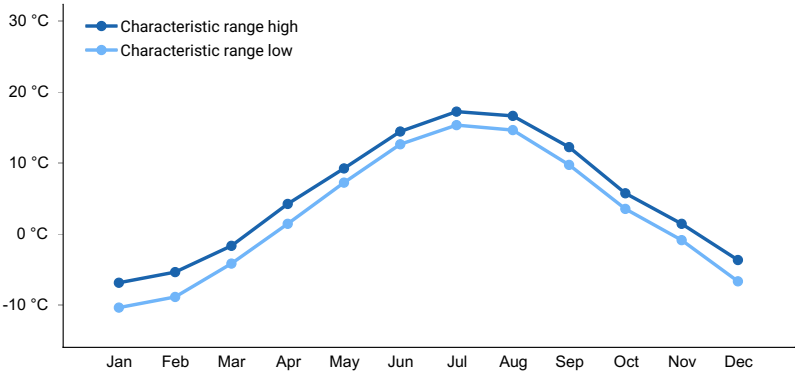


Figure 2. Monthly minimum temperature range

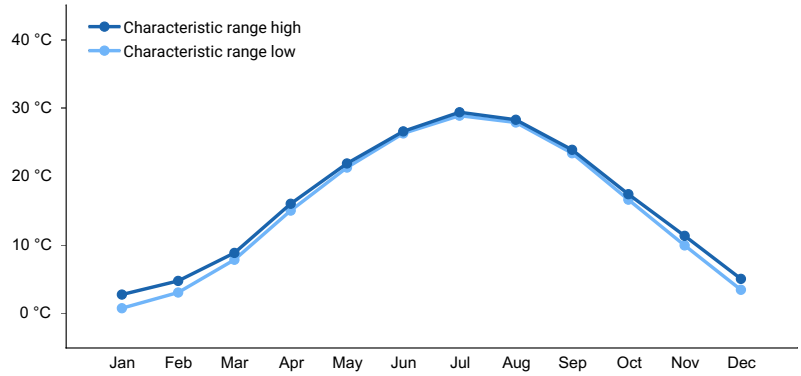


Figure 3. Monthly maximum temperature range

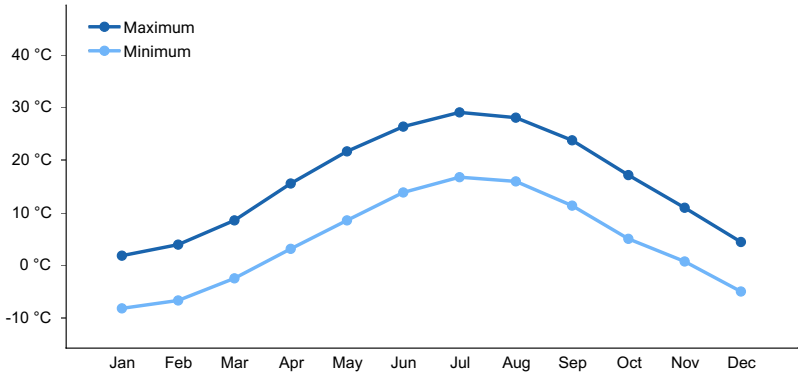


Figure 4. Monthly average minimum and maximum temperature

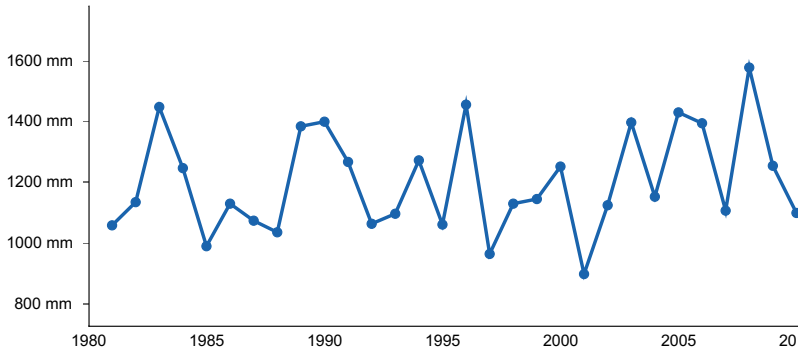


Figure 5. Annual precipitation pattern

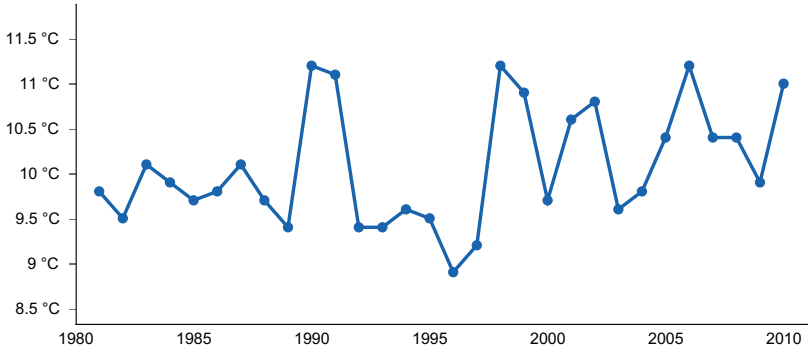


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MIDDLETOWN 4 W [USC00064767], Middlefield, CT
- (2) MT CARMEL [USC00065077], Hamden, CT
- (3) AMHERST [USC00190120], Amherst, MA

- (4) HARTFORD BRADLEY INTL AP [USW00014740], Suffield, CT
- (5) VERNON [USC00438600], Vernon, VT
- (6) HARTFORD BRAINARD FLD [USW00014752], Wethersfield, CT

Influencing water features

NONE

Wetland description

NONE

Soil features

This site consists of moderately to very deep, well drained soils formed in wind and water deposited parent materials. Representative soils are Agawam, Branford, Enfield, Groveton, Haven, and Unadilla.

Table 4. Representative soil features

Parent material	(1) Glaciofluvial deposits–granite and gneiss (2) Eolian deposits–schist (3) Outwash–phyllite (4) Sandstone and shale (5) Basalt
Surface texture	(1) Fine sandy loam (2) Silt loam (3) Very fine sandy loam
Family particle size	(1) Coarse-loamy (2) Coarse-loamy over sandy or sandy-skeletal (3) Coarse-silty (4) Coarse-silty over sandy or sandy-skeletal
Drainage class	Well drained
Permeability class	Slow to moderate
Depth to restrictive layer	56–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	7.62–17.78 cm
Soil reaction (1:1 water) (0-101.6cm)	4.4–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–40%
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, not yet validated with 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). Terrestrial ecological SYSTEMS are specifically defined as a group of plant community-types called ASSOCIATIONS that tend to [co-]occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. Any given system will typically manifest itself in a landscape at intermediate geographic scales of tens-to-thousands of hectares and will persist for 50 or

more years. A vegetation association is a plant community that is much more specific to a given soil, geology, landform, climate, hydrology, and disturbance history. It is the basic unit for vegetation classification and recognized by the US National Vegetation Classification (US FDGC 2008). Each association will be named by the diagnostic and often dominant species that occupy the different height strata (tree, sapling, shrub, and herb). Within the NatureServe Explorer database (NatureServe, 2015), ecological systems are numbered by a Community Ecological System Code (CES) and individual vegetation associations are assigned an identification number called a Community Element Global Code (CEGL).

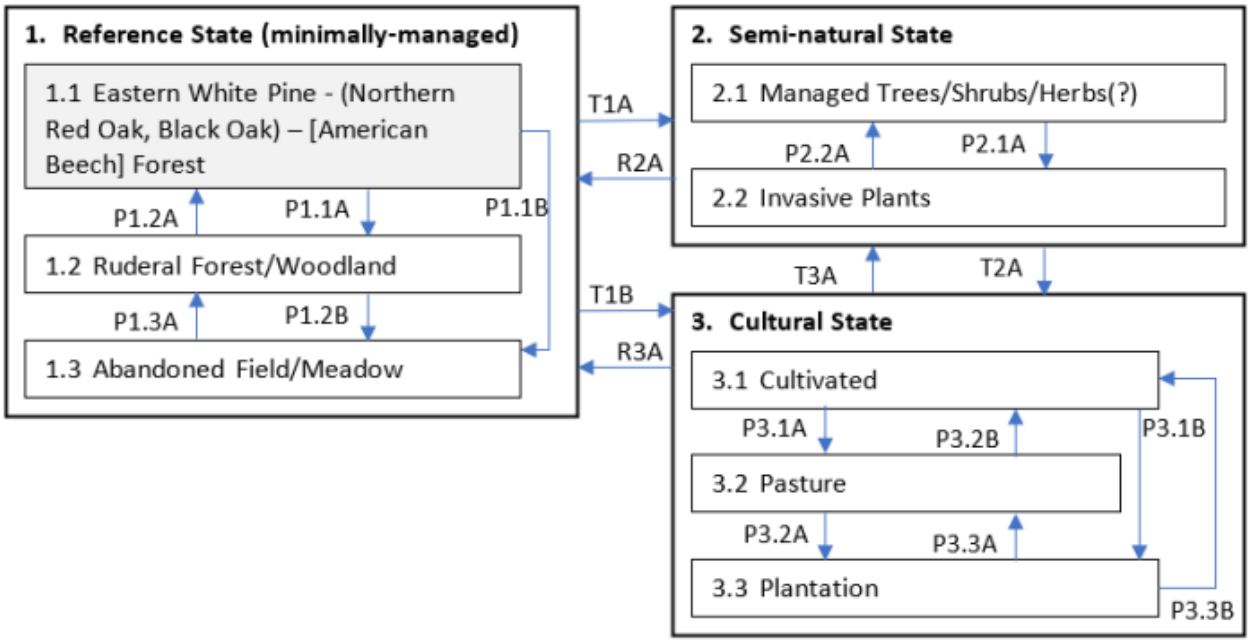
Additional and more localized vegetation information can be provided by the various State Heritage Programs. Additional insights to the vegetation were provided by: "The Vegetation of Connecticut: A Preliminary Classification" (Metzler and Barrett, 2006), "Classification of the Natural Communities of Massachusetts" (Swain and Kersley 2011), "Wetland, Woodland, Wildland" (Thompson and Sorenson 2000), and "Natural Communities of New Hampshire, 2nd Ed." (Spurduto and Nichols, 2011).

The Well Drained ecological site is widely distributed and characteristic of the Northeastern Interior Pine Barrens system (CES202.590), the Central Appalachian Dry Oak-Pine Forest system (CES202.591), the Northeastern Interior Dry-Mesic Forest system (CES202.592), the Laurentian-Acadian Pine-Hemlock-Hardwood Forest system (CES201.563), , and the Northern Atlantic Coastal Plain Pitch Pine Barrens system (CES203.269). The representative plant communities are highly varied but generally consist of pines (pitch pine (*Pinus rigida*), eastern white pine (*P. strobus*)) which may be also mixed with oaks (chestnut oaks (*Quercus montana*), black oak (*Q. velutina*), scarlet oak (Q. prinus) and , bear oak (*Q. ilicifolia*). Natural disturbances in lude climate extremes such as, excessive droughts, or storm activity ranging from windthrows to downbursts to ice-storms. Atmospheric deposition may effect trees at high elevations. Wildfires do happen but are largely suppressed. Other agents-of-change include land conversions and fragmentation by agricultural cropping, development, tree harvests, and disease white pine blister rust (Cronartium ribicola) and southern pine bark beetle (Dendrocdenus frontalis). Non-native pines include the Austrian pine (*Pinus nigra*), Japanese black pine (Pinus thunbergia), mugo pine (*Pinus mugo*), and Scotch pine (*Pinus sylvestris*) Austrian pine. A non-native deciduous tree threat is Tree-of-Heaven (Ailianthus altissima).

Other ecological states, a Semi-natural State and a Cultural State are recognized. The Semi-natural State would expect plant communities where ecological processes primarily operate with some conditioning by land management, e.g., managed forests, or plant communities that are an artifact of land management e.g., predominately invasive plants. The Cultural State is a completely converted or transformed state heavily or completely conditioned by land management, e.g., cultivated lands, pasture/haylands, vineyards, and plantations, etc. Generally, the form of vegetation in the Semi-natural State or the Cultural State is not able to be specified until field work is conducted.

State and transition model

145AX009 – Well-Drained Outwash



Transition	*Drivers/practices*
T1A	Forest mgmt., Disturbance
T1B, T2A	Disturbance/cutting/clearing, Brush removal
R2A, R2B	Restoration & Mgmt, Forest Stand Improvement, Early Successional Habitat Development, Upland Wildlife Mgmt, Invasive spp. Control, Plant establishment
T3A	Abandonment, Plant establishment, Forest mgmt.
P2.1A	Disturbance, Invasive species establishment
P2.2A	Invasive spp. Control, Forest mgmt..
P1.3A, P1.2A	Abandonment, succession
P3.1A, P3.2A, P3.3A, P3.1B, P3.2B, P3.3B	Changing agricultural phases
P1.1A, P1.1B, P1.2B	Disturbance, Early Successional Habitat Development

State 1
Reference State (minimally-managed)

• *Pinus strobus* - Quercus (rubra, velutina) - *Fagus grandifolia* Forest Translated Name: Eastern White Pine - (Northern Red Oak, Black Oak) - American Beech Forest Common Name: Northeastern White Pine - Oak Forest (CEGL006293) Other communities include: • *Quercus montana* - Quercus (rubra, velutina) / Vaccinium (angustifolium, pallidum) Forest Translated Name: Chestnut Oak - (Northern Red Oak, Black Oak) / (Lowbush Blueberry, Blue Ridge Blueberry) Forest Common Name: Lower New England High Slope Chestnut Oak Forest (CEGL006282) • *Pinus rigida* - Quercus (velutina, montana) Forest Translated Name: Pitch Pine - (Black Oak, Chestnut Oak) Forest Common Name: Inland Pitch Pine - Oak Forest (CEGL006290) • *Pinus rigida* - *Quercus coccinea* / *Vaccinium pallidum* - (*Morella pensylvanica*) Woodland Translated Name: Pitch Pine - Scarlet Oak / Blue Ridge Blueberry - (Northern Bayberry) Woodland Common Name: Pitch Pine - Scarlet Oak Woodland (CEGL006381) • *Pinus strobus* - *Pinus resinosa* - *Pinus rigida* Forest Translated Name: Eastern White Pine - Red Pine - Pitch Pine Forest Common Name: Northeastern Dry Pine Forest (CEGL006259) Other plant communities closer to the coast: • *Pinus rigida* / *Quercus ilicifolia* / *Morella pensylvanica* Woodland Translated Name: Pitch Pine /

Bear Oak / Northern Bayberry Woodland Common Name: Coastal Pitch Pine / Bear Oak Barrens (CEGL006315) • *Juniperus virginiana* / *Morella pensylvanica* Woodland Translated Name: Eastern Red-cedar / Northern Bayberry Woodland Common Name: Maritime Red-cedar Woodland (CEGL6212)

Community 1.1
Eastern White Pine - (Northern Red Oak, Black Oak) – [American Beech] Forest (CEGL006293)

Pinus strobus - Quercus (rubra, velutina) - *Fagus grandifolia* Forest Translated Name: Eastern White Pine - (Northern Red Oak, Black Oak) – [American Beech] Forest Common Name: Northeastern White Pine - Oak Forest (CEGL006293) The tree canopy is dominated by a mixture of white pine (*Pinus strobus*)and oaks, including black oak (*Quercus velutina*), red oak (*Quercus rubra*), white oak (*Quercus alba*), chestnut oak (*Quercus montana*), and scarlet oak (*Quercus coccinea*). American beech (*Fagus grandifolia*) is sometimes diagnostic but not always present. Other less frequent canopy associates may include red maple (*Acer rubrum*), sweet birch (*Betula lenta*), mockernut hickory (*Carya tomentosa*), quaking aspen (*Populus tremuloides*), white ash (*Fraxinus americana*), and possibly eastern hemlock (*Tsuga canadensis*), paper birch (*Betula papyrifera*) and bigtooth aspen (*Populus grandidentata*). The subcanopy is highly variable and may include witchhazel (*Hamamelis virginiana*) or black cherry (*Prunus serotina*); and possibly flowering dogwood (*Cornus florida*), and blackgum (*Nyssa sylvatica*). Ericaceous shrubs are typically well-developed including black huckleberry (*Gaylussacia baccata*), mountain laurel (*Kalmia latifolia*), hillside blueberry (*Vaccinium pallidum*) and lowbush blueberry (*Vaccinium angustifolium*), and sometimes sheep laurel (*Kalmia angustifolia*), as well as blackberries (Rubus spp.), American hazelnut(*Corylus americana*), eastern teaberry (*Gaultheria procumbens*), sassafras (*Sassafras albidum*). The herb layer ranges from sparse to moderately dense cover, with species including sarsparilla (*Aralia nudicaulis*), fibrous root sedge (*Carex communis*), Pennsylvania sedge (*Carex pensylvanica*), Blue Ridge sedge (*Carex lucorum*), striped wintergreen (Chimaphila maculate), naked tick-trefoil (Hylodesmun nudiflorum [=*Desmodium nudiflorum*]), downy rattlesnake plantain (*Goodyera pubescens*), rattlesnake hawkweed (*Hieracium venosum*), large bluet (*Houstonia purpurea*), feathery false Solomon's seal (*Maianthemum racemosum* [=Smilicina racemosa]), Canada mayflower (*Maianthemum canadense*), Indian cucumber (*Medeola virginiana*), narrowleaf cowwheat (*Melampyrum lineare*), partridgeberry (*Mitchella repens*), Indian pipes (*Monotropa uniflora*), wavy hairgrass (Deschampsi flexuosa), sweet fern (*Comptonia peregrina*), Christmas fern (*Polystichum acrostichoides*), braken fern (*Pteridium aquilinum*. (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2022]). Cross-referenced plant community concepts (typically by political state): CT: Undisclosed (Metzler and Barret, 2006) MA: White Pine - Oak Forest (Swain and Kearsley, 2001) ME: Oak-Pine Forest (Grawler and Cutko, 2010) NH: Dry red oak - white pine forest (Sperduto and Nichols, 2011) NY: Appalachian oak-pine forest (Edinger et al., 2014) RI: Mixed Pine-Oak Forest (Enser and Lundgren, 2006)

State 2
Semi-natural State

The Semi-natural State would expect plant communities where ecological processes are primarily operating with some land conditioning in the past or present, e.g., managed forests, or plant communities that are an artifact of land management e.g., predominately invasive plants.

Community 2.1
Managed forest/woodland [vegetation]

Community 2.2
Invasive plants

Pathway P2.1A
Community 2.1 to 2.2

Disturbance, Invasive species establishment

Pathway P2.2A
Community 2.2 to 2.1

Invasive spp. Control, Forest mgmt..

State 3
Cultural State

The Cultural State is a completely converted or transformed state, heavily or completely conditioned by land management, e.g., cultivated lands, pasture/haylands, vineyards, and plantations, etc.

Community 3.1
Cultivated

Community 3.2
Pasture

Community 3.3
Plantation

Transition T1A
State 1 to 2

Invasion, disturbance

Transition T1B
State 1 to 3

Disturbance/cutting/clearing, Brush removal

Restoration pathway R2A
State 2 to 1

Invasive species removal, native outplanting, restoration management

Transition T2A
State 2 to 3

Disturbance/cutting/clearing, Brush removal

Restoration pathway R3A
State 3 to 1

Restoration management

Transition T3A
State 3 to 2

Abandonment, Plant establishment, Forest mgmt.

Additional community tables

Inventory data references

Site Development and Testing Plan
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.

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Contributors

Nels Barrett, Ph.D.

Approval

Nels Barrett, 9/27/2024

Acknowledgments

Michael Margo and tech team assisted w/drafts.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/13/2025
Approved by	Nels Barrett
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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

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

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

bare ground):

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

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

7. **Amount of litter movement (describe size and distance expected to travel):**

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

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

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

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**