USDA Natural Resources Conservation Service

Ecological site F149BY009MA
Well Drained Dense Till Uplands

Last updated: 9/17/2024
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): 149B–Long Island-Cape Cod Coastal Lowland

149B—Long Island-Cape Cod Coastal Lowland

This area is in the Embayed Section of the Coastal Plain Province of the Atlantic Plain. It is part of the partially submerged coastal plain of New England. It is mostly an area of nearly level to rolling plains, but it has some steeper hills (glacial moraines). Ridges border the lower plains. The Peconic and Carmans Rivers are on the eastern end of Long Island. The parts of this area in Massachusetts and Rhode Island have no major rivers. This entire area is made up of deep, unconsolidated glacial outwash deposits of sand and gravel. A thin mantle of glacial till covers most of the surface. Some moraines form ridges and higher hills in this area of generally low relief. Sand dunes and tidal marshes are extensive along the coastline.

Classification relationships

USDA-NRCS (USDA, 2006):
Land Resource Region (LRR): S—Northern Atlantic Slope Diversified Farming Region
Major Land Resource Area (MLRA): 149B—Long Island-Cape Cod Coastal Lowland
USDA-FS (Cleland et al., 2007):
Province: 221 Eastern Broadleaf Forest Province
Section: 221A Lower New England
Subsection: 221Ab Cape Cod Coastal Lowland and Islands
Subsection: 221An Long Island Coastal Lowland and Moraine

Ecological site concept

The site consists of very deep, well drained, coarse-loamy soils formed in dense glacial till. They are gently sloping to strongly sloping soils on or near terminal moraines. Representative soils are Nantucket and Montauk loam phase. The reference plant community is considered to be an Mixed oak-hardwood forest with occsional pines. Oaks were found to be dominant on terminal moraines within Cape Cod while pitch pine dominated sandy outwash sites (Parshall et al. 2003). Common oaks include black oak, scarlet oak, white, and scrub oak. Pitch pine is subdominant with lesser amounts of beech and hickories. Common shrubs include lowbush blueberry and black huckleberry. Post settlement clearing of forests and an increase in fire has led to a dominance of pitch pine over oaks on terminal moraines within Cape Cod (Parshall et al. 2003). In the absence of severe or frequent fire, oaks replaces pitch pine while other hardwoods such as beech and hickories become a larger component of the forests on more mesic sites. (Parshall et al. 2003).

Associated sites

F149BY010MA	**Moist Till Uplands** Moist Till Uplands

Similar sites

F149BY011MA	**Well Drained Till Uplands** Well-drained Till Upland
F149BY003MA	**Well Drained Lake Plain** Well-drained Lake Plain

Table 1. Dominant plant species

Tree	(1) *Quercus velutina* (2) *Fagus grandifolia*
Shrub	(1) *Vaccinium pallidum* (2) *Viburnum acerifolium*
Herbaceous	(1) *Carex swanii* (2) *Thelypteris noveboracensis*

Physiographic features

This site occurs in moraines and hills in upland landscapes and is not subject to flooding/ponding.

Table 2. Representative physiographic features

Landforms	(1) Upland > Moraine (2) Ground moraine (3) Hill
Runoff class	Low to very high
Flooding frequency	None
Ponding frequency	None
Elevation	0–305 m
Slope	0–65%
Water table depth	61–183 cm
Aspect	Aspect is not a significant factor

Climatic features

Coastal regions' climate generally considered maritime, experiences a more moderate climate than inland, i.e., cooler summers and warmer winters and delayed onset of spring. However, coastal regions do experience the brunt of extreme weather such as nor'easters and tropical storms, e.g., hurricanes

Table 3. Representative climatic features

Frost-free period (characteristic range)	165-182 days
Freeze-free period (characteristic range)	210-222 days
Precipitation total (characteristic range)	1,143-1,194 mm
Frost-free period (actual range)	159-189 days
Freeze-free period (actual range)	209-227 days
Precipitation total (actual range)	1,118-1,219 mm
Frost-free period (average)	174 days
Freeze-free period (average)	216 days

Precipitation total (average)	1,168 mm

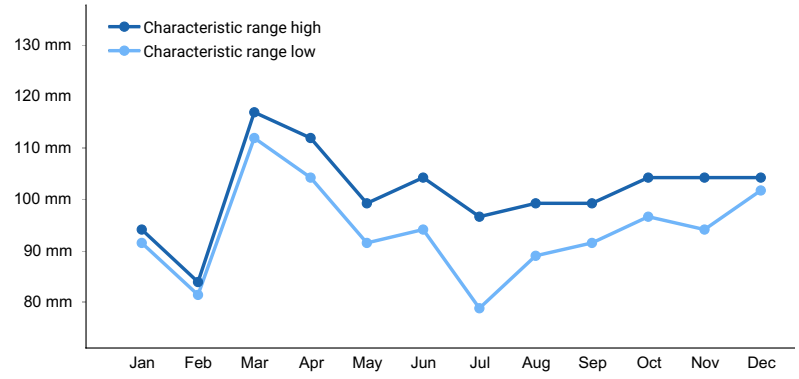


Figure 1. Monthly precipitation range

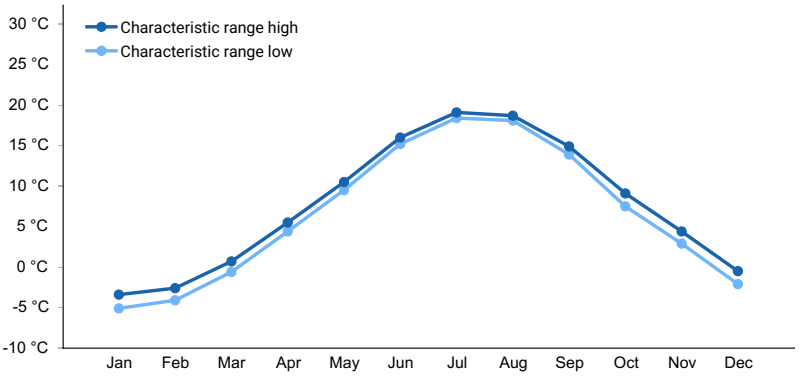


Figure 2. Monthly minimum temperature range

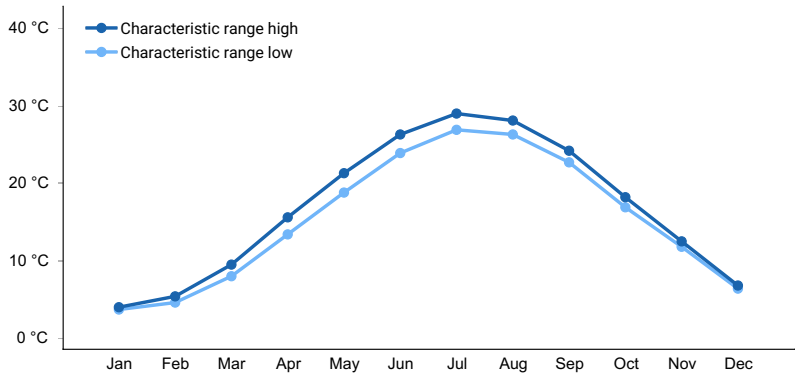


Figure 3. Monthly maximum temperature range

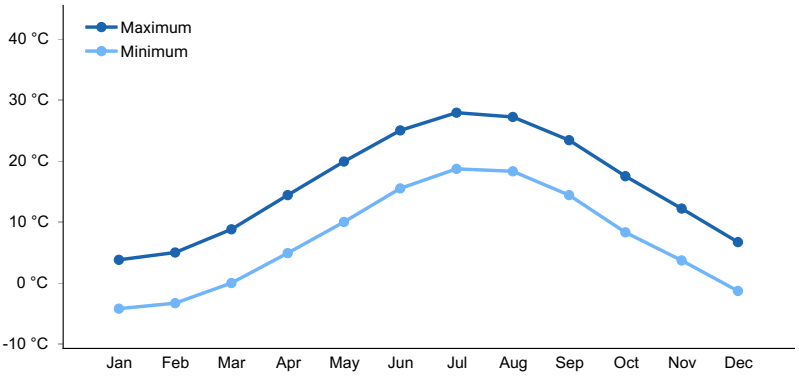


Figure 4. Monthly average minimum and maximum temperature

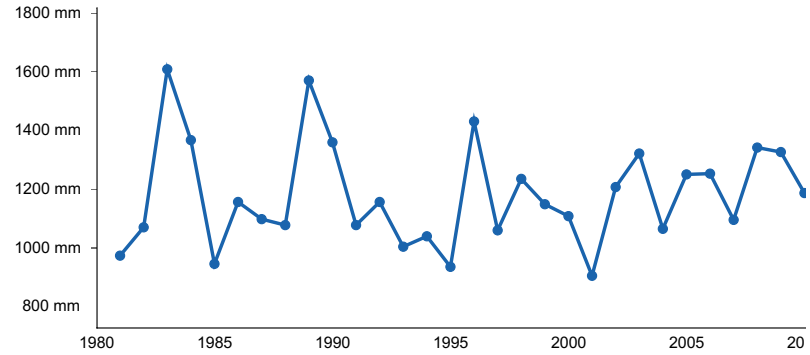


Figure 5. Annual precipitation pattern

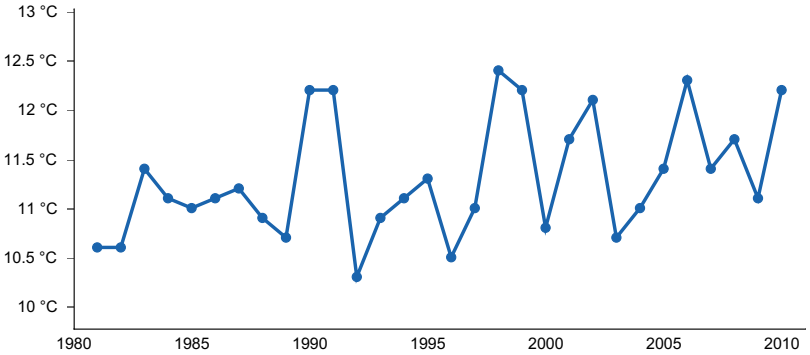


Figure 6. Annual average temperature pattern

Climate stations used

- (1) RIVERHEAD RSCH FM [USC00307134], Riverhead, NY
- (2) HYANNIS [USC00193821], Hyannis, MA
- (3) ISLIP LI MACARTHUR AP [USW00004781], Ronkonkoma, NY
- (4) MINEOLA [USC00305377], Mineola, NY

Influencing water features

N/A

Wetland description

N/A

Soil features

The site consists of moderate to very deep, well to excessively drained, coarse-loamy soils formed in glacial and wind deposited parent materials. Representative soils are Eastchop, Nantucket, and Montauk loam phase.

Table 4. Representative soil features

Parent material	(1) Till–granite and gneiss (2) Eolian deposits–schist (3) Glaciofluvial deposits
Surface texture	(1) Loam (2) Loamy sand (3) Sandy loam
Family particle size	(1) Coarse-loamy
Drainage class	Well drained to excessively drained

Permeability class	Very slow to moderate
Depth to restrictive layer	51–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–9%
Available water capacity (Depth not specified)	7.62–15.24 cm
Soil reaction (1:1 water) (Depth not specified)	3.5–6
Subsurface fragment volume <=3" (Depth not specified)	2–8%
Subsurface fragment volume >3" (Depth not specified)	0–9%

Ecological dynamics

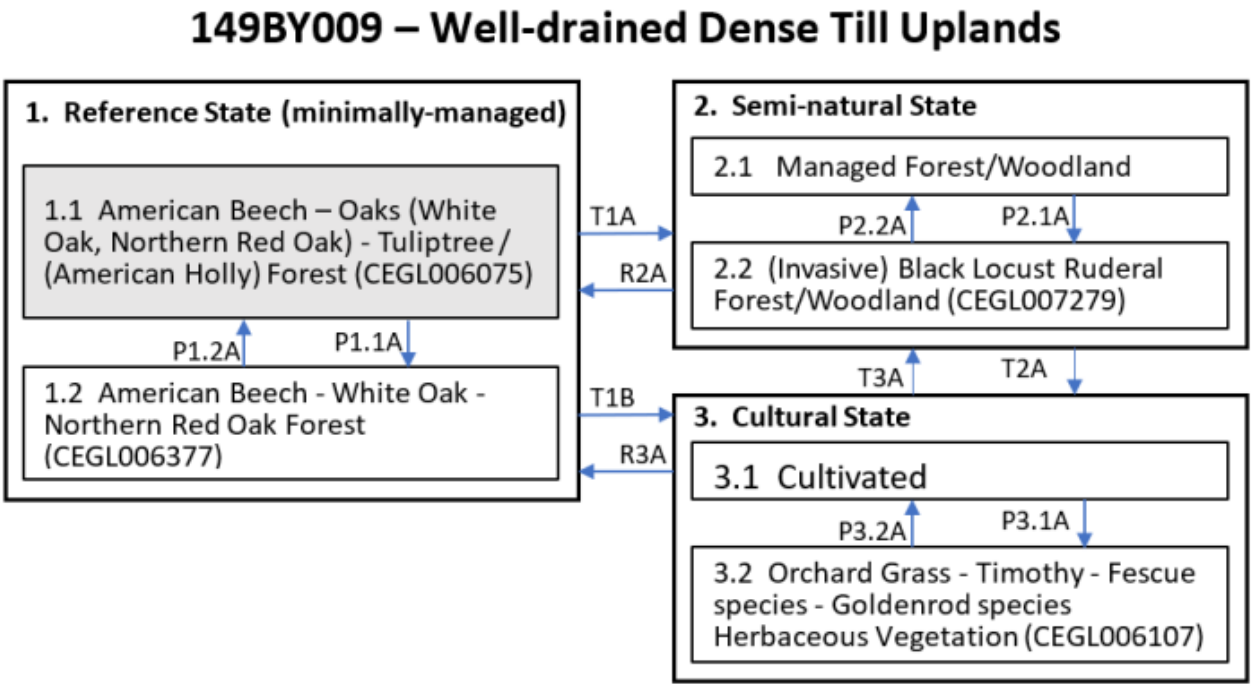
[Caveat: The vegetation information contained in this section and is only provisional, based on concepts, not yet validated with field work.*]

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 (associations) that tend to co-occur within landscapes with similar ecological processes, substrates, and/or environmental gradients. They are intended to provide a classification unit that is readily mappable, often from terrain and remote imagery, and readily identifiable by conservation and resource managers in the field. A 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; USNVC 2017). Each association will be named by the diagnostic and often dominant species that occupy the different height strata (tree, shrub, and herb). Within the NatureServe Explorer database, 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).

[*Caveat] The information presented is representative of very complex vegetation communities. Key indicator plants and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and geography. The reference plant community is not necessarily the management goal. The drafts of species lists are merely representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

This ecological site, set in well-drained dense till ecological site, supports reference plant communities of mixed hardwoods, such as oaks (Quercus, spp.), hickories (Carya spp.), American beech (Fagus gradifolia), and occasionally tuliptree (*Liriodendron tulipifera*) and occasional pines (Pinus spp.). Oaks were found to be dominant on terminal moraines within Cape Cod while pines dominated sandy outwash sites (Parshall et al. 2003). These plant communities coincide with Northern Atlantic Coastal Plain Dry Oak-Hardwood Forest system(CES203.475), and Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895). The prevailing ecological processes are related to coastal influences, such as a coastal climate and storms, and if within close proximity to the coast, maritime effects of wind exposure, salt spray, and sand movement. Fire can be an influence. Threats include development and fragmentation, fire-suppresion, off road vehicles, and invasive plants such as, but not limited to, black locust (*Robinia pseudoacacia*), tree-of-heaven (*Ailanthus altissima*), autumn olive (*Elaeagnus umbellata*), white poplar (*Populus alba*), multiflora rose (*Rosa multiflora*), Honeysuckles, (Lonicera spp.), oriental bittersweet (Celatrus orbiculatus), japanese knotweed (*Polygonum cuspidatum*) wineberry (*Rubus phoenicolasius*), and Asiatic tearthumb (*Polygonum perfoliatum*). (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]).

State and transition model



Transition	*Drivers/practices*
T1A	disturbance, invasive plant establishment
T1B, T2A	cutting, land clearing, plant establishment, wind erosion control
R2A, R3A	herbaceous weed treatment, plant removal, plant establishment, successional management
T3A	abandonment, disturbance, invasive plant establishment
P1.1A	greater coastal proximity
P1.2A	lessor coastal proximity
P2.1A	Invasive species establishment
P2.2A	Invasive species management
P3.1A	Pastureland management
P3.2A	Cropland management

State 1
Reference State (Well-drained Dense Till Uplands)

The predominant plant communities of the Well-drained Dense Till Uplands ecological site's Reference State (minimally-managed) include: • Mid-Atlantic Mesic Mixed Hardwood Forest, (American Beech – Oaks (White Oak, Northern Red Oak) - Tuliptree / (American Holly) Forest, [*Fagus grandifolia* - Quercus (alba, rubra) - *Liriodendron tulipifera* / (*Ilex opaca*) Forest], - CEGL006075 • Northeastern Atlantic Coastal Beech - Oak Forest (American Beech - White Oak - Northern Red Oak Forest), [*Fagus grandifolia* - *Quercus alba* - *Quercus rubra* Forest, - CEGL006377 Other associated coastal/maritime communities can include: • Northeastern Coastal Oak / Heath Forest, (Scarlet Oak - Black Oak / Sassafras / Hillside Blueberry Forest), [*Quercus coccinea* - *Quercus velutina* / *Sassafras albidum* / *Vaccinium pallidum* Forest], - CEGL006375 • Coastal Oak / Mountain Laurel Forest, (Black Oak - Scarlet Oak - Chestnut Oak / Mountain Laurel Forest), [*Quercus velutina* - *Quercus coccinea* - *Quercus montana* / *Kalmia latifolia* Forest], - CEGL006374 (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]).

Community 1.1
American Beech – Oaks (White Oak, Northern Red Oak) - Tuliptree / (American Holly) Forest

This forest is characteristically a mixed forest dominated by American beech (*Fagus grandifolia*), white oak (*Quercus alba*), red oak (*Quercus rubra*), and tuliptree (*Liriodendron tulipifera*) in various proportions. Overstory

associates over the range include black oak (*Quercus velutina*), scarlet oak (*Quercus coccinea*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), blackgum (*Nyssa sylvatica*), mockernut hickory (*Carya tomentosa*), pignut hickory (*Carya glabra*), and white ash (*Fraxinus americana*); and on Staten Island NY may include southern red oak (*Quercus falcata*). The subcanopy is characterized by young American beech (*Fagus grandifolia*), red maple (*Acer rubrum*), American hornbeam (*Carpinus caroliniana*), flowering dogwood (*Cornus florida*), and Sassafras (*Sassafras albidum*). American holly (*Ilex opaca*) is particularly characteristic and abundant along the coast. The shrub layer is variable and may include mapleleaf viburnum (*Viburnum acerifolium*), smooth viburnum (*Viburnum dentatum*), and possibly American strawberry bush (*Euonymus americanus*). Heath shrubs, such as highbush blueberry (*Vaccinium corymbosum*) and hillside blueberry (*Vaccinium pallidum*), may be common but not abundant. Vines are common, including Virginia creeper (*Parthenocissus quinquefolia*), cat greenbrier (*Smilax glauca*), and poison ivy (*Toxicodendron radicans*). The herb layer is composed of Christmas fern (*Polystichum acrostichoides*), New York fern (*Thelypteris noveboracensis*), perfoliate bellwort (*Uvularia perfoliata*), pink lady's slipper (*Cypripedium acaule*), partridgeberry (*Mitchella repens*), crippled cranefly (*Tipularia discolor*), downy rattlesnake plantain (*Goodyera pubescens*), white wood aster (*Eurybia divaricata*), striped wintergreen (*Chimaphila maculata*), Swan's sedge (*Carex swanii*), Indian cucumber (*Medeola virginiana*), ladyfern (*Athyrium filix-femina*), slender woodland sedge (*Carex digitalis*), Willdenow's sedge (*Carex willdenowii*), beechdrops (*Epifagus virginiana*), Canada mayflower (*Maianthemum canadense*), naked tick trefoil (*Desmodium nudiflorum*) [= Hedysarum nudiflorum], King Soloman's seal (*Polygonatum biflorum*), mayapple (*Podophyllum peltatum*), Jack-in-the-pulpit (*Arisaema triphyllum*), and false Soloman's seal (*Maianthemum racemosum*). (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]). Cross-referenced plant community concepts (typically by political state): Coastal Forest /Woodland (Swain 2016) [MA] Coastal Oak-Beech Forest (Edinger et al. 2014) [NY]

Community 1.2
American Beech - White Oak - Northern Red Oak Forest

Northeastern Atlantic Coastal Beech - Oak Forest (American Beech - White Oak - Northern Red Oak Forest), [*Fagus grandifolia* - *Quercus alba* - *Quercus rubra* Forest, - CEGL006377 This plant association comprises coastal oak-beech forests of the north Atlantic Coast and occurs on dry well-drained, loamy sand of morainal coves. It has a mixed canopy of American beech (*Fagus grandifolia*), white oak (*Quercus alba*), and black oak (*Quercus velutina*) in varying proportions. Red oak *Quercus rubra*) is a common associate, although it never occurs in abundance. Occasional canopy associates that occur with low cover can include scarlet oak (*Quercus coccinea*), and chestnut oak (*Quercus montana*) [= Q. prinus]. There are relatively few shrubs and the herb layer includes tree seedlings, especially of Quercus spp. and Americn beech (*Fagus grandifolia*), plus Swan's sedge (*Carex swanii*), Canada mayflower (*Maianthemum canadense*), white wood aster (*Eurybia divaricata*), beechdrops (*Epifagus virginiana*), and false Soloman's seal (*Maianthemum racemosum*). (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]). Coastal Forest /Woodland (Swain 2016) [MA] Oak-tulip tree forest (Edinger et al. 2014) [NY] Northeastern Atlantic Coastal Beech - Oak Forest (Sneddon et al. 2010) [Cape Cod National Seashore]

Pathway P1.1A
Community 1.1 to 1.2

Disturbance, greater fire frequency, coastal proximity

Pathway P1.2A
Community 1.2 to 1.1

Succession, Reduced fire frequency

State 2
Semi-natural State

Vegetation on lands somewhat conditioned by land use, e.g., managed native plant communities or invasive plant communities.

Community 2.1
Managed Forest Woodland

Community 2.2
Black Locust Ruderal Forest

Ruderal Black Locust Forest, (Black Locust Ruderal Forest), [*Robinia pseudoacacia* Ruderal Forest], - CEGL007279 Black locust (*Robinia pseudoacacia*) can establish on abandoned croplands, pasturing, and former homesites. Associated plants can vary from site to site and include black cherry (*Prunus serotina*), red ceadr (*Juniperus virginiana*), American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*), shagbark hickory (*Carya ovata*), hackberry (*Celtis occidentalis*), black walnut (*Juglans nigra*), red oak (*Quercus rubra*), and in some areas Norway Maple (*Acer platanoides*) or tree-of-heaven (*Ailanthus altissima*). The understory vegetation is also highly variable depending on site history and often includes (poisen ivy) *Toxicodendron radicans*; northern spicebush (*Lindera benzoin*) is sometimes present in loamy , more mesic conditions. The invasive non-native shrub multiflora rose (*Rosa multiflora*) and bramble wineberry (*Rubus phoenicolasius*) can be present. Other non-native plants like, garlic mustard (*Alliaria petiolata*), major celindine (*Chelidonium majus*), ground ivy (*Glechoma hederacea*), and European lily-of-the-valley (*Convallaria majalis*), can characterize the herb layer, which may also include native plants. (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]). Other non-native plants can include white poplar (*Populus alba*), winged burningbush (*Euonymus alatus*), Japanese knotweed (japanese knotweed (*Polygonum cuspidatum*), and oriental bittersweet (Celatrus orbiculatus) Cross-referenced plant community concepts (typically by political state): Successional southern hardwoods (Edinger et al. 2014) [NY] Black Locust successional forest (Sneddon et al. 2010) [Cape Cod National Seashore]

Pathway P2.1A
Community 2.1 to 2.2

Invasive plant establishment

Pathway P2.2A
Community 2.2 to 2.1

Invasive plant management

Conservation practices

Invasive Plant Species Control

State 3
Cultural State

Landscapes heavily conditioned by land use, e.g., Plantations/gardens/croplands/hayfields.

Community 3.1
Cultivated

Community 3.2
Orchard Grass - Timothy - Fescue species - Goldenrod species Herbaceous Vegetation

This is a broadly defined vegetation type of pastures and is largely composed of non-native cool-season grasses and herbs (generally of European origin) in the early stages of succession. The fields are typically mowed at least annually. Species composition varies from site to site, from site to site but generally feature Orchard Grass (*Dactylis glomerata*). Timothy (*Phleum pratense*)- Fescue grasses (Festuca spp.), and some goldenrods (Solidago spp.). Other graminoid associates may include creeping bentgrass (*Agrostis stolonifera*), winer bentgrass (*Agrostis hyemalis*), creeping wildrye (*Elymus repens*), smooth brome (*Bromus inermis*), cheatgrass (*Bromus tectorum*), perennial ryegrass (*Lolium perenne*), Kentucky bluegrass (*Poa pratensis*), Canada bluegrass (*Poa compressa*), and sweet vernalgrass (*Anthoxanthum odoratum*). Forbs scattered among the grasses are varied but include hawkweeds (Hieracium spp.), yellow oxalis (*Oxalis stricta*), common yarrow (*Achillea millefolium*), common milkweed (*Asclepias syriaca*), wrinkleleaf goldenrod (*Solidago rugosa*), gray goldenrod (*Solidago nemoralis*), early goldenrod (*Solidago juncea*), Canada goldenrod (*Solidago canadensis*), tall goldenrod (*Solidago altissima*), flattop goldenrod (*Euthamia graminifolia*), field chickweed (*Cerastium arvense*), evening primrose (*Oenothera biennis*), common cinquefoil (*Potentilla simplex*), calico American-aster (*Symphyotrichum lateriflorum*), New England

American-aster (*Symphyotrichum novae-angliae*), white panicle American -aster (*Symphyotrichum lanceolatum*), Queen Anne's lace (*Daucus carota*), annual agweed (*Ambrosia artemisiifolia*), bird vetch (*Vicia cracca*), sweetclover (Trifolium spp.), and many others (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]). Cross-referenced plant community concepts (typically by political state): Cultural Grassland (Swain Swain 2016) [MA] Successional Old Field (Edinger et al. 2014) [NY] Nothestern Old Field (Sneddon et al. 2010) [Cape Cod National Seashore]

Pathway P3.1A
Community 3.1 to 3.2

Pastureland management

Pathway P3.2A
Community 3.2 to 3.1

Cropland management

Transition T1A
State 1 to 2

Disturbance, invasive plant establishment

Conservation practices

Forest Land Management

Transition T1B
State 1 to 3

Cutting, land clearing, plant establishment, wind erosion control

Conservation practices

Brush Management
Land Clearing

Restoration pathway R2A
State 2 to 1

Herbaceous weed treatment, plant removal, plant establishment, successional management

Conservation practices

Brush Management
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Forest Land Management
Invasive Plant Species Control
Monitoring and Evaluation

Transition T2A
State 2 to 3

Cutting, land clearing, plant establishment, wind erosion control

Conservation practices

Land Clearing
Invasive Plant Species Control
Herbaceous Weed Control

Restoration pathway R3A
State 3 to 1

Herbaceous weed treatment, plant removal, plant establishment, successional management

Conservation practices

Brush Management
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Invasive Plant Species Control
Monitoring and Evaluation
Herbaceous Weed Control

Transition T3A
State 3 to 2

Abandonment, disturbance, invasive plant establishment

Additional community tables

Inventory data references

Site Development and Testing Plan
Future work is needed, as described in a 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

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Approval

Nels Barrett, 9/17/2024

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	05/23/2020
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:**