USDA Natural Resources Conservation Service

Ecological site R149BY012MA
Coastal Backbarrier Dune Flats

Last updated: 9/17/2024
Accessed: 05/10/2025

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). RThe 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, moderately well drained soils that are on interdunes, backs of barrier islands, spits and in low-lying areas (that are not wet) along the coastal zone. They are formed in sandy eolian and/or coastal over-wash deposits of marine origin. Slope ranges from 0 through 3 percent. Representative soil is Succotash. The site occurs on the transition from the excessively drained Coastal Dunes ecological site (Hooksan soils) and nearby wetlands, ponds, or marshes. The vegetation most closely coincides with northern bayberry dune shrublands community (Sneddon et al. 2010) however, with wetland border species such as highbush blueberry, inkberry, and black chokeberry other plant communities also occur.

Associated sites

R149BY002MA	**Coastal Dunes** Coastal Dunes

Table 1. Dominant plant species

Tree	(1) *Juniperus virginiana*
Shrub	(1) *Prunus serotina* (2) *Viburnum dentatum*
Herbaceous	(1) *Panicum virgatum*

Physiographic features

The site occurs on interdunes, back barriers of barrier islands, spits and in low-lying areas along the coastal zone and is not subject to flooding/ponding. Slope ranges from 0 through 3 percent.

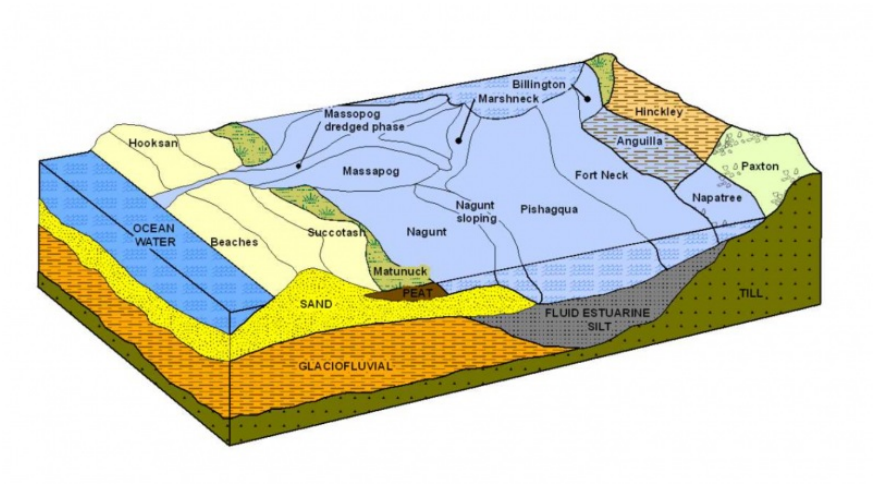


Figure 1.

Table 2. Representative physiographic features

Landforms	(1) Lowland > Back-barrier flat (2) Depression
Runoff class	Very low
Flooding frequency	None to rare
Ponding frequency	None
Elevation	0–98 ft
Slope	0–3%
Water table depth	6–29 in
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)	121-152 days
Freeze-free period (characteristic range)	163-202 days
Precipitation total (characteristic range)	44-48 in
Frost-free period (actual range)	109-156 days
Freeze-free period (actual range)	150-208 days

Precipitation total (actual range)	43-50 in
Frost-free period (average)	136 days
Freeze-free period (average)	182 days
Precipitation total (average)	46 in

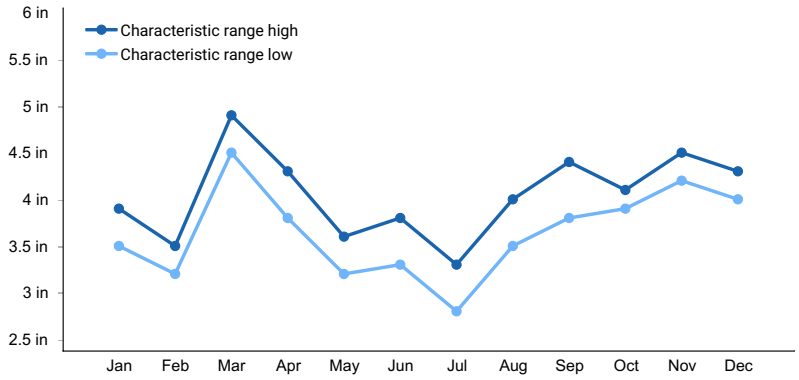


Figure 2. Monthly precipitation range

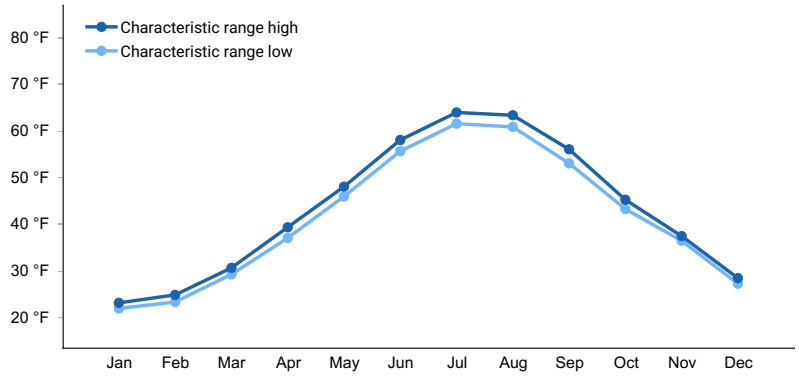


Figure 3. Monthly minimum temperature range

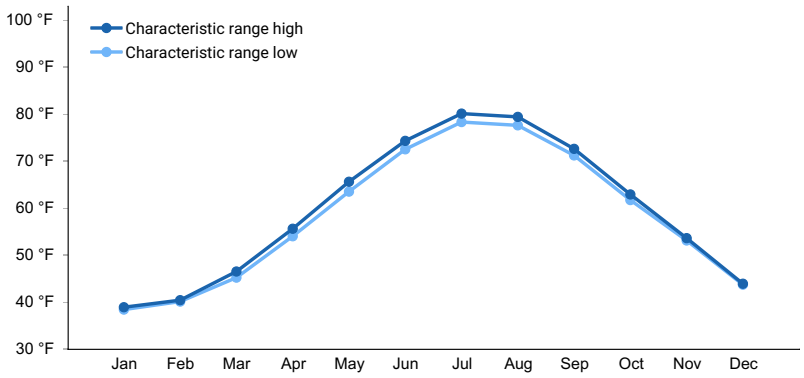


Figure 4. Monthly maximum temperature range

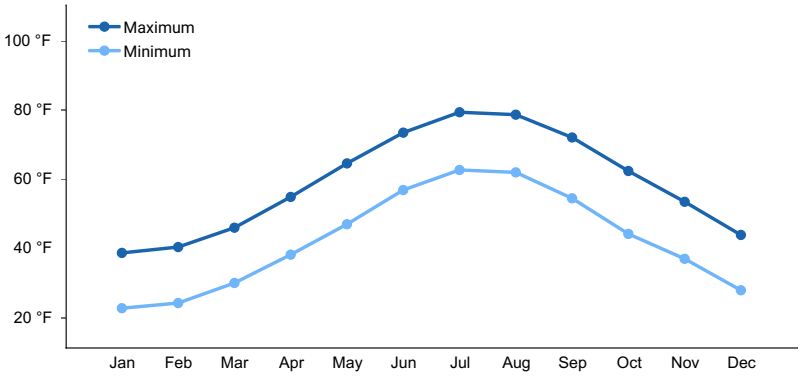


Figure 5. Monthly average minimum and maximum temperature

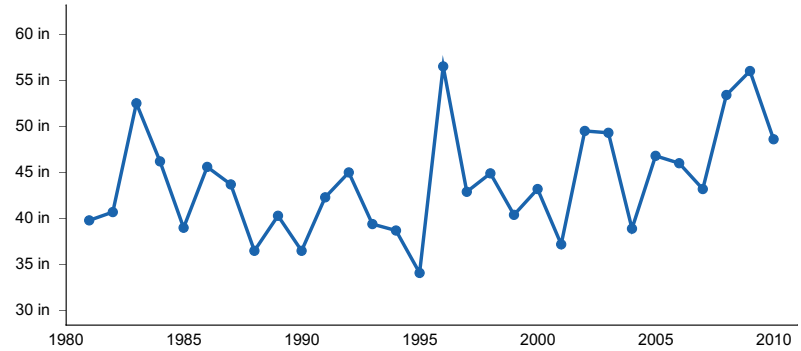


Figure 6. Annual precipitation pattern

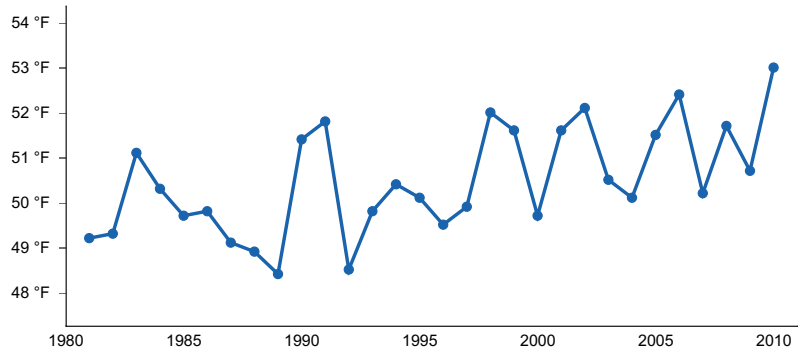


Figure 7. Annual average temperature pattern

Climate stations used

- (1) VINEYARD HAVEN AP [USW00094724], Edgartown, MA
- (2) HYANNIS [USC00193821], Hyannis, MA
- (3) BRIDGEHAMPTON [USC00300889], Sag Harbor, NY

Influencing water features

Poorly drained
Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. Internal free water occurrence is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow depth. Free water at shallow depth is common. The water table is commonly the result of low or very low saturated hydraulic conductivity, nearly continuous rainfall, or a combination of these.

Wetland description

National Wetland Classification (Cowardin et al., 1979):

Palustrine, class variable, leaf morphology variable, water regime variable, chemistry modifier variable.

Soil features

The site consists of very deep, poorly to moderately well drained soils that are on interdunes, backs of barrier islands, spits and in low-lying areas along the coastal zone. They are formed in sandy eolian and/or coastal over-wash deposits of marine origin. Representative soils are Succotash and Atsion.

Table 4. Representative soil features

Parent material	(1) Eolian deposits (2) Marine deposits
Surface texture	(1) Sand (2) Loamy sand
Family particle size	(1) Sandy
Drainage class	Poorly drained to moderately well drained
Permeability class	Slow
Soil depth	72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	3–5 in
Soil reaction (1:1 water) (Depth not specified)	3.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

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

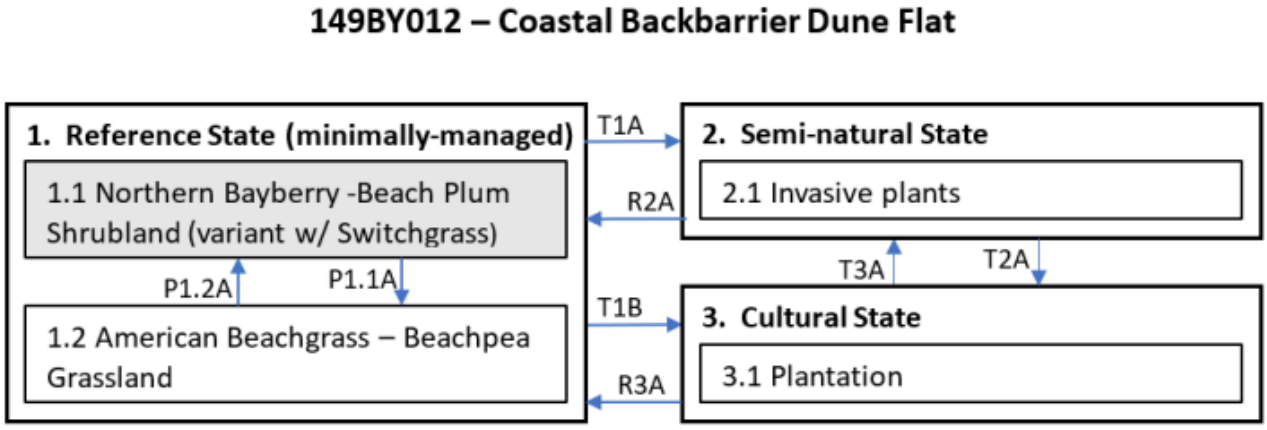
The vegetation groupings described in this section are based on the terrestrial ecological system classification and vegetation associations developed by NatureServe (Comer 2003). Terrestrial ecological systems are specifically defined as a group of plant community types (associations) that tend to co-occur 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.

Thie Coastal Backbarrier Dune Flats ecological site is characterized by a wide mix of moderately well-drained plant communities coinciding with the Northern Atlantic Coastal Plain Dune and Swale system (CES203.264). In this environmental setting, this includes plant communities of dune backbarriers and flats that are not wet, yet moderately influenced by the watertable. The plant communities are quite small, generally not exceeding 0.1 ha (0.25 ac.) hence may be considered “patch” communities (Smith et al. 2008). The prevailing ecological processes are not only due to the maritime environment, including frequent salt spray, wind exposure, overwash, and sand movement, but also local effects due to fluctuating depths to seasonal water table, blowouts, dune migration, distance from salt-spray, and floristic succession. Other disturbances considered as threats include: off-road vehicles, and invasive plants, such as Morrows honeysuckle (*Lonicera morrowii*).

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
P1.2A	succession
P1. 1A	disturbance, herbaceous weed treatment, plant removal, plant establishment, successional management

State 1
Reference State (minimally-managed)

Reference State The range in reference plant communities is highly mixed due to variations in local conditions such as fluctuating depths to seasonal water table, blowouts, dune migration, distance from salt-spray, and floristic succession. The prevailing plant communities are shrubby, and differ from the more xeric stable dunes by the presence of plants influenced by nearby groundwater – including small amounts of switchgrass (*Panicum virgatum*), highbush blueberry (*Vaccinium corymbosum*), smooth [northern] arrow-wood (*Viburnum dentatum* var.

lucidum [= V. recocognitum]), and red maple (*Acer rubrum*). • Northern Bayberry Dune Shrubland (Northern Bayberry - Beach Plum Shrubland, [*Morella pensylvanica - Prunus maritima* Shrubland] – CEGL006295). Other associated plant communities include: • North Atlantic Coast Backdune Grassland ((Northern Bayberry) / Shore Little Bluestem - Seaside Three-awn Shrub Grassland, [(*Morella pensylvanica*) / *Schizachyrium littorale - Aristida tuberculosa* Shrub Grassland] – CEGL006161) • Northern Beach-heather Dune Dwarf-shrubland (Woolly Beach-heather - Bearberry Dwarf-shrubland [*Hudsonia tomentosa - Arctostaphylos uva-ursi* Dwarf-shrubland] – CEGL006143), and • North Atlantic Coastal Plain Dune Vine/shrubland (Cat Greenbrier - Eastern Poison-ivy Vine-Shrubland [*Smilax glauca - Toxicodendron radicans* Vine-Shrubland] – CEGL003886).

Community 1.1
Northern Bayberry - Beach Plum Shrubland (CEGL006295)

Northern Bayberry Dune Shrubland (Northern Bayberry - Beach Plum Shrubland, [*Morella pensylvanica - Prunus maritima* Shrubland] – CEGL006295) typically occurs on more stabilized dunes. Northern bayberry (*Morella pensylvanica* [= Myrica pensylvanica] and beach plum (*Prunus maritima*) dominate. Another common and often codominant shrub is seaside rose (*Rosa rugosa*), while not native, where naturalized it's restricted to duneland sites. Other common shrubs or stunted trees in less abundance can include: eastern baccharis (*Baccharis halimifolia*) and sporatic red cedar (*Juniperus virginiana*) and black cherry (*Prunus serotina*). The herbaceous layer tends to be sparse where shrub growth is dense, and can include dune grassland species: American beachgrass (*Ammophila breviligulata*), seaside goldenrod (*Solidago sempervirens*), wooly beachheather (*Hudsonia tomentosa*), beach pinweed (*Lechea maritima*), Greene's rush (*Juncus greenei*), seabeach sedge (*Carex silicea*), coastal jointweed (*Polygonella articulata*), annual saltmarsh American-aster (*Symphyotrichum subulatum* [= Aster subulatus]) or occasionally adjacent upland species such as, common wrinkleleaved goldenrod *Solidago rugosa* ssp.aspera, small flowered evening primrose (*Oenothera parviflora*),little bluestem (*Schizachyrium scoparium*), and others. Typical vine associates are poison ivy (*Toxicodendron radicans*), Virginia creeper *Parthenocissus quinquefolia*, and various Greenbriars (Smilax spp). Open, bare patches to sparsely vegetated sand are present in some (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]). Small amounts of highbush blueberry (*Vaccinium corymbosum*), sweet pepperbush (*Clethra alnifolia*), red maple (*Acer rubrum*), and black chokeberry (*Aronia melanocarpa*) are found in moister low areas (Enser et al. 2011). Cross-referenced plant community concepts (typically by political state): Maritime Shrubland (Swain 2016) [MA] Maritime Shrubland (Edinger et al. 2014) [NY] Maritime Herbaceous Dune (Enser et al. 2011 [RI] Northern Bayberry Dune Shrubland (Sneddon et al 2010) [Cape Cod National Seashore]

Community 1.2
American Beachgrass - Beach Pea Grassland (CEGL006274)

Northern Beachgrass Dune, (American Beachgrass - Beach Pea Grassland, [*Ammophila breviligulata - Lathyrus japonicus* Grassland] - CEGL006274) is the typical community type. This association is characterized and dominated by American beechgrass (*Ammophila breviligulata*), which is often the only plant present, especially on foredunes or other areas of active and rapid sand deposition. Beach pea (*Lathyrus japonicus*) is the most common associate and sometimes codominant. Other associated species include seaside goldenrod (*Solidago sempervirens*), beach pinweed (*Lechea maritima*), seaside threeawn (*Aristida tuberculosa*), little bluestem (*Schizachyrium scoparium*), beach sedge (*Carex silicea*), coastal jointweed (*Polygonella articulata*), and dusty miller (*Artemisia stelleriana*). Dwarf-shrubs, such as wooly beachheather (*Hudsonia tomentosa*), beach rose (*Rosa rugosa*), northern bayberry (*Morella pensylvanica* [= Myrica pensylvanica]), or stunted beach plum (*Prunus maritima*), can occur sporadically and form patches within the grassland (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]). Cross-referenced plant community concepts (typically by political state): Maritime Dunes (Swain 2016) [MA] Maritime Dunes (Edinger et al. 2014) [NY] Maritime Herbaceous Dune (Enser et al. 2011 [RI] Northern Beachgrass Dune (Sneddon et al 2010) [Cape Cod National Seashore]

Pathway P1.1A
Community 1.1 to 1.2

Disturbance

Pathway P1.2A
Community 1.2 to 1.1

Succession

State 2
Semi-natural State

Invasives e.g. Japanese black pine (*Pinus thunbergii*), beach rose (*Rosa rugosa*), and Morrows honeysuckle (*Lonicera morrowii*).

Community 2.1
Invasive plants

State 3
Cultural State

Planting of Japanese Pine (*Pinus thunbergii*).

Community 3.1
Plantation

Planting of Japanese Pine (*Pinus thunbergii*).

Transition T1A
State 1 to 2

Disturbance, invasive plant establishment

Transition T1B
State 1 to 3

Cutting, land clearing, plant establishment, wind erosion control

Conservation practices

Land Clearing
Herbaceous Weed Control

Restoration pathway R2A
State 2 to 1

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

Conservation practices

Land Clearing
Restoration and Management of Rare and Declining Habitats
Upland Wildlife Habitat Management
Restoration and Management of Natural Ecosystems
Invasive Plant Species Control
Herbaceous Weed Control

Transition T2A
State 2 to 3

Cutting, land clearing, invasive plant removal, 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

Land Clearing
Restoration and Management of Rare and Declining Habitats
Restoration and Management of Natural Ecosystems
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.

References

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Coterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC. 1–92.

Comer, P., D. Faber-Langendoen, R. Evans, S. Grawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schultz, K. Snow, and J. Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, Virginia..

Edinger, G.J., D.J. Evans, S. Gebauer, T.J. Howard, D. Hunt, and A. Olivero. 2014. Ecological Communities of New York State, Second Edition: A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY..

FGDC [Federal Geographic Data Committee]. 2008. National Vegetation Classification Standard, Version 2. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC..

NatureServe. 2018 (Date accessed). NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org.. http://explorer.natureserve.org.

Smith, S.M. and K.T. Killingbeck. 2008. Development of vegetation in dune slack wetlands of Cape Cod National Seashore (Massachusetts, USA). Plant Ecology 194:243–256.

Swain, P.C. 2016. Classification of the natural communities of Massachusetts, Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife,.

Other references

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C. Carpenter, and W.H. McNab. 2007. Ecological Subregions: Sections and Subsections of the Coterminous United States. USDA Forest Service, General Technical Report WO-76. Washington, DC.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K., Snow, and J.Teague. 2003. Ecological Systems of the United States: A Working Classification of U.S. Terrestrial Systems. NatureServe, Arlington, Virginia.

Edinger, G.J., Evans, D.J., Gebauer, S., Howard, T.G., Hunt, D.M., and A.M. Olivero, A.M. (eds.). 2014. Ecological Communities of New York State, Second Edition: A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

FGDC [Federal Geographic Data Committee]. 2008. National Vegetation Classification Standard, Version 2. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC.

Greller, A. A Classification of Mature Forests on Long Island, New York. Bulletin of the Torrey Botanical Club 104:376–382.

NatureServe 2018. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org. (Accessed: January 2019).

Parshall, T., D.R. Foster, E. Faison, D. MacDonald, and B.C.S. Hansen. 2003. Long-term history of vegetation and fire in pitch pine–oak forests on cape cod, Massachusetts. Ecology 84:736–748.

Sneddon, L. A., Zaremba, R. E., and M. Adams. 2010. Vegetation classification and mapping at Cape Cod National Seashore, Massachusetts. Natural Resources Technical Report NPS/NER/NRTR--2010/147. National Park Service, Philadelphia, PA.

Swain, P.C. 2016. Classification of the Natural Communities of Massachusetts. Version 2.0. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough, MA.

Smith, R. D., et. al. 1995. An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices. Technical Report WRP-DE-9, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Smith, S. M., Hanley, M., & Killingbeck, K. T. 2008. Development of vegetation in dune slack wetlands of Cape Cod National Seashore (Massachusetts, USA). Plant Ecology, 194(2), 243-256.

United States Department of Agriculture, Natural Resources Conservation Service, 2006. Land Resource Regions and Major land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

United States Department of Agriculture, Natural Resources Conservation Service, 2015. National Soils Information System (NASIS).

USNVC [United States National Vegetation Classification]. 2017. United States National Vegetation Classification Database, V2.01. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. http://usnvc.org/explore-classification/ (Accessed: 2018)

Contributors

Nels Barrett, Ph.D.
Joshua Hibit

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	05/21/2020
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:**