

## Ecological site R144AY050RI Subaqueous Haline Flats

Last updated: 10/04/2024  
Accessed: 05/12/2025

### 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): 144A–New England and Eastern New York Upland, Southern Part

MLRA 144A: New England and Eastern New York Upland, Southern Part

The eastern half of the eastern part of this MLRA is in the Seaboard Lowland Section of the New England Province of the Appalachian Highlands. The western half of the eastern part and the southeastern half of the western part are in the New England Upland Section of the same province and division. The northwestern half of the western part is in the Hudson Valley Section of the Valley and Ridge Province of the Appalachian Highlands. This MLRA is a very scenic area of rolling to hilly uplands that are broken by many gently sloping to level valleys that terminate in coastal lowlands. Elevation ranges from sea level to 1,000 feet (0 to 305 meters) in much of the area, but it is 2,000 feet (610 meters) on some hills. Relief is mostly about 6 to 65 feet (2 to 20 meters) in the valleys and about 80 to 330 feet (25 to 100 meters) in the uplands.

This area has been glaciated and consists almost entirely of till hills, drumlins, and bedrock-controlled uplands with a mantle of till. It is dissected by narrow glacio-fluvial valleys. The southernmost boundary of the area marks the farthest southward extent of Wisconsinian glaciation on the eastern seaboard. The river valleys and coastal plains are filled with glacial lake sediments, marine sediments, and glacial outwash. The bedrock in the eastern half of the area consists primarily of igneous and metamorphic rocks of early Paleozoic age. Granite is the most common igneous rock, and gneiss, schist, and slate are the most common metamorphic rocks. In the parts of the MLRA in eastern and southeastern New York, Devonian- to Pennsylvanian-age sandstone, shale, and limestone are dominant. Carbonate rocks, primarily dolomite and limestone, are the dominant kinds of bedrock in the part of this MLRA in northwestern Connecticut.

### Ecological site concept

The Subaqueous Haline Flats ecological site consists of very deep, subaqueous soils permanently submerged beneath 10 through 150 cm of tidal estuarine water on flood tidal delta flats, washover fan flats in coastal lagoons and bays. Slope ranges from 0 through 2 percent. Representative soils are Massapog, Nagunt, and Rhodesfollly 0-1 meter depth.

Massapog soils are formed in sandy marine and estuarine sediments transported by flood tidal currents. Nagunt soils are formed in sandy marine deposits as a result of washover events, eolian deposition, and tidal flooding. Buried surface horizons and stratification are often identified. The Rhodesfollly soils are formed in sandy marine deposits. Some areas are vegetated with native macroalgae, eelgrass (*Zostera marina*) and/or widgeonweed (*Ruppia maritima*). Vegetative cover ranges from 0 to 35 percent. The site is used for recreation and support benthic aquatic habitat. Fishing is commonplace and the species found in the area are smelt, small cod, flounder, scup, menhaden, and white perch. Shellfish farming and recreational harvesting are common.

### Associated sites

R144AY047RI	Subaqueous Haline Glacial Deposits
R144AY048RI	Subaqueous Haline Low Energy Basins

R144AY049RI	<b>Subaqueous Haline Slopes</b>
-------------	---------------------------------

## Similar sites

R144AY047RI	<b>Subaqueous Haline Glacial Deposits</b>
R144AY048RI	<b>Subaqueous Haline Low Energy Basins</b>
R144AY049RI	<b>Subaqueous Haline Slopes</b>

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Zostera marina</i> (2) <i>Ruppia maritima</i>

## Physiographic features

The Subaqueous Haline Flats ecological site consists of very deep, subaqueous soils permanently submerged beneath 10 through 150 cm of tidal estuarine water on flood tidal delta flats, washover fan flats in coastal lagoons and bays.

**Table 2. Representative physiographic features**

Landforms	(1) Estuary > Flood-tidal delta flat (2) Bay > Lagoon (3) Washover-fan flat (4) Washover-fan slope (5) Beach (6) Shoal (7) Bay bottom (8) Washover fan
Runoff class	Negligible
Elevation	0 ft
Slope	0–15%
Water table depth	0 in
Aspect	Aspect is not a significant factor

## Climatic features

The Koppen-Geiger climate classification of the area in which this MLRA occurs varies between Dfb (Warm-summer humid continental) in the North, and Dfa (Hot-summer humid continental) in the southern portion of the MLRA. Precipitation is usually uniformly distributed throughout the year. Near the coast, however, it is slightly lower in summer. Precipitation is slightly higher in spring and fall in inland areas. Rainfall occurs as high-intensity, convective thunderstorms during the summer. During the winter, most of the precipitation occurs as moderate-intensity storms (northeasters) that produce large amounts of rain or snow. The freeze-free period increases in length to the south.

**Table 3. Representative climatic features**

Frost-free period (characteristic range)	142-177 days
Freeze-free period (characteristic range)	173-215 days
Precipitation total (characteristic range)	46-48 in
Frost-free period (actual range)	122-181 days

Freeze-free period (actual range)	138-217 days
Precipitation total (actual range)	44-49 in
Frost-free period (average)	156 days
Freeze-free period (average)	190 days
Precipitation total (average)	47 in

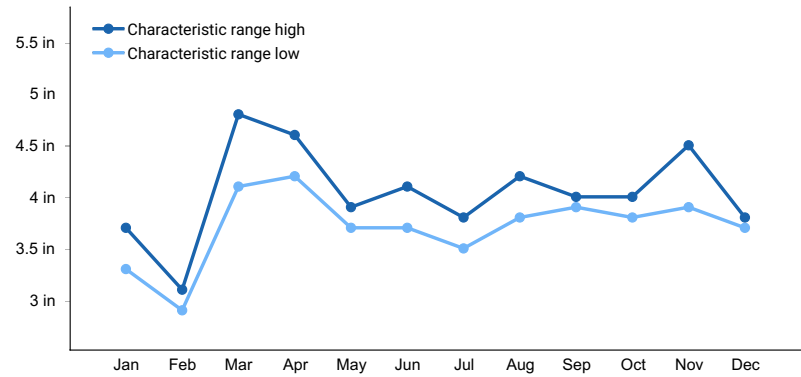


Figure 1. Monthly precipitation range

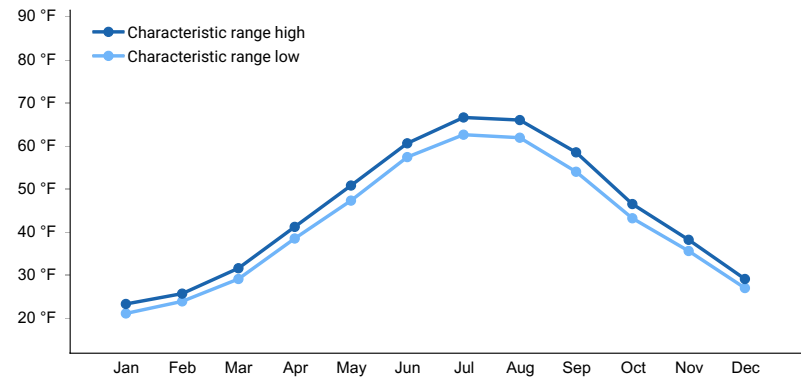


Figure 2. Monthly minimum temperature range

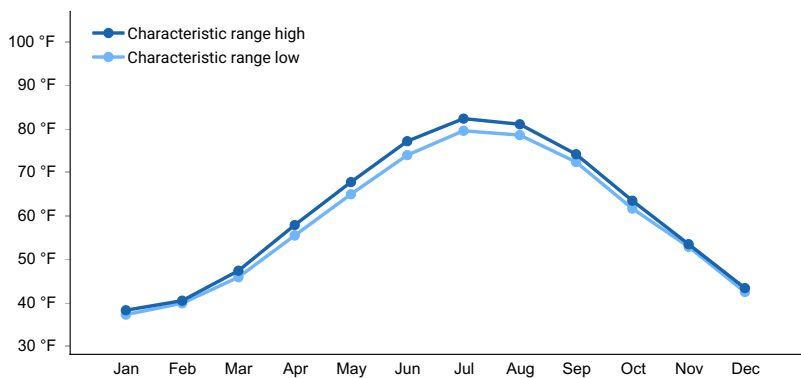
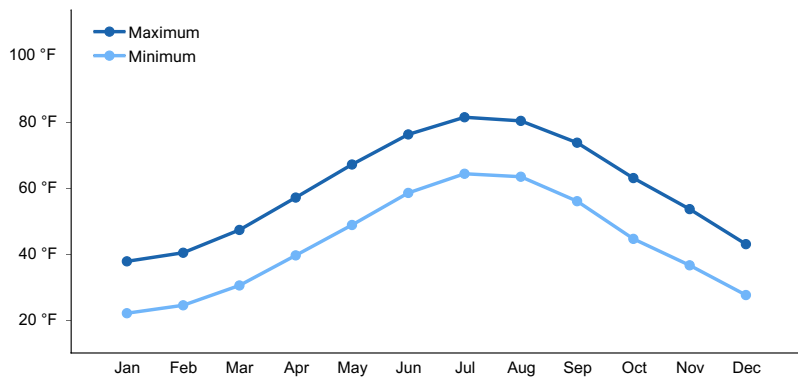
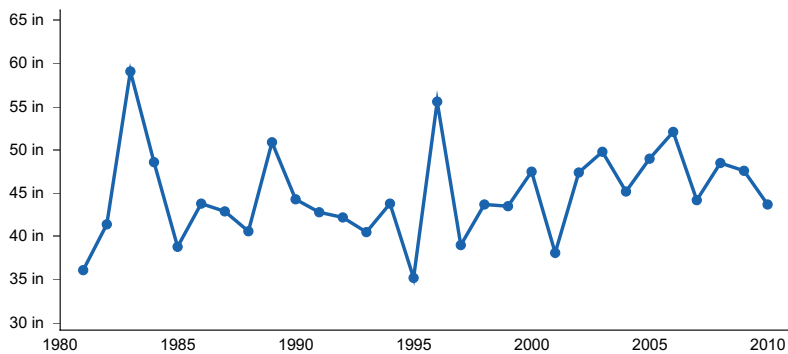


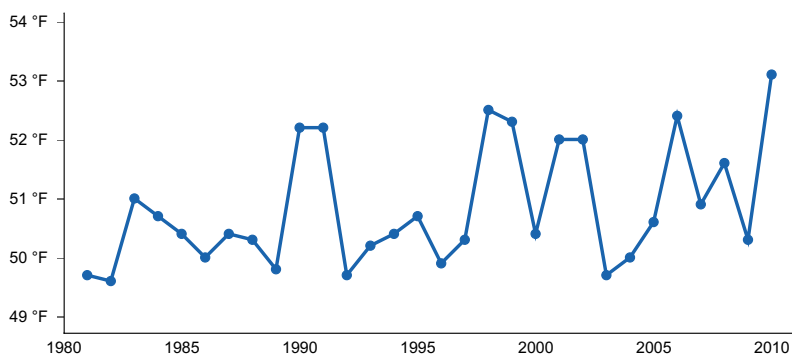
Figure 3. Monthly maximum temperature range



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



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) NEWPORT STATE AP [USW00014787], Middletown, RI
- (2) GROTON NEW LONDON AP [USW00014707], Groton, CT
- (3) PLYMOUTH MUNI AP [USW00054769], Carver, MA
- (4) WESTERLY STATE AP [USW00014794], Westerly, RI
- (5) BRIDGEPORT SIKORSKY MEM AP [USW00094702], Stratford, CT
- (6) TETERBORO AP [USW00094741], Moonachie, NJ

## Influencing water features

The Subaqueous Haline Flats ecological site consists of very deep, subaqueous soils permanently submerged beneath 10 through 150 cm of tidal estuarine water on flood tidal delta flats, washover fan flats in coastal lagoons and bays.

## Wetland description

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

System: Marine/estuarine

Subsystem: Subtidal

Class: Unconsolidated Bottom, Aquatic Bed, Unconsolidated Shore, Emergent

Subclass: Cobble-Gravel, Sand, Mud, Algal, Rooted/Floating Vascular, Organic, Persistent/Non-persistent

Water Regime: Subtidal

## Soil features

Representative soils are Massapog, Nagunt, and Rhodesfollly 0-1 meter depth.

Massapog soils are formed in sandy marine and estuarine sediments transported by flood tidal currents. Nagunt soils are formed in sandy marine deposits as a result of washover events, eolian deposition, and tidal flooding. Buried surface horizons and stratification are often identified. The Rhodesfollly soils are formed in sandy marine deposits.

**Table 4. Representative soil features**

Parent material	(1) Marine deposits (2) Estuarine deposits (3) Eolian deposits
Surface texture	(1) Sand (2) Fine sand (3) Loamy fine sand (4) Loamy sand (5) Loamy coarse sand (6) Mucky loamy fine sand (7) Mucky loamy sand (8) Mucky loamy coarse sand (9) Coarse sand (10) Sandy loam (11) Very fine sandy loam (12) Fine sand (13) Mucky sand
Family particle size	(1) Sandy
Drainage class	Subaqueous
Permeability class	Very slow
Depth to restrictive layer	72 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Soil reaction (1:1 water) (Depth not specified)	3.9–8.8
Subsurface fragment volume <=3" (Depth not specified)	0–34%
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 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).

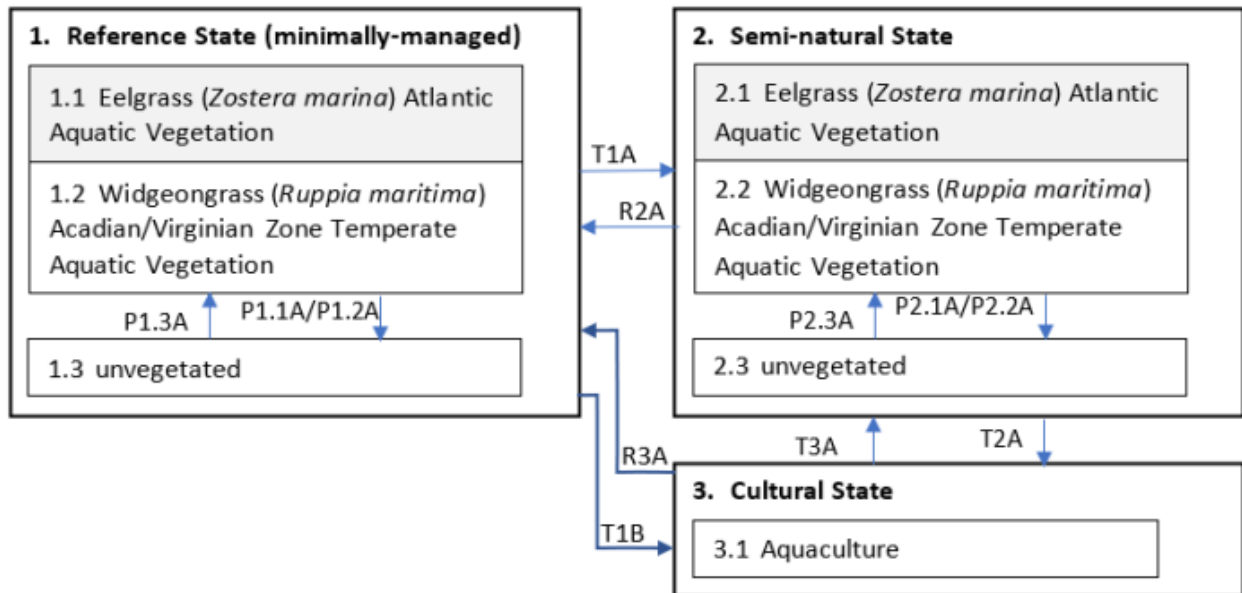
Additional and more localized vegetation information is provided by the State Natural Heritage Programs of Connecticut (Metzler and Barrett 2001), Massachusetts (Swain and Kearsley 2001), New Hampshire (Sperduto and Nichols, 2011), New York (Edinger et al., 2014), and Rhode Island (Enser and Lungren, 2006).

The Subaqueous Haline Flats ecological site is characterized by the the North Atlantic Tidal Sand Flat system (CES201.049), the North Atlantic Intertidal Mudflat system (CES201.050) and the Northern Atlantic Coastal Seagrass Bed system (CES203.246). The site occurs in on flood tidal delta flats, washover fan flats in coastal lagoons and bays. Benthic fauna such as tubeworms, clams, juvenile blue crabs, scallops and juvenile finfish are associated with this soil. Representative soils are Marshneck, and Nagunt. Benthic fauna such as tubeworms, clams, juvenile blue crabs, scallops and juvenile finfish are associated with this soil. Native vegetation includes eelgrass (*Zostera marina*) and widgeon grass (*Ruppia maritima*) and /or macroalgae. Vegetation cover ranges from 0 to 35 percent on sloping units of this soil. Areas of this soil are used for recreational fishing and boating. Commercial uses include fishing, boating, shell fishing and aquaculture.

[\*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.

## **State and transition model**

## 144AY050 – Subaqueous Haline Flats



Transition	Drivers/practices
T1A,	Disturbance, dredging
T1B, T2A	Aquacultural Practices
R2A, R3A	Seagrass establishment
T3A	Abandonment
P1.3A, P2.3A	Seagrass development
P1.1A/P1.2A, P2.1A/P2.2A	Disturbance

### State 1

#### Minimally-managed reference state

Reference State (minimally managed) Association • *Zostera marina* Atlantic Aquatic Vegetation Translated Name: Seawrack Atlantic Aquatic Vegetation Common Name: North Atlantic Seawrack Bed (CEGL004336) • *Ruppia maritima* Acadian/Virginian Zone Temperate Aquatic Vegetation Translated Name: Widgeongrass Acadian/Virginian Zone Temperate Aquatic Vegetation Common Name: North Atlantic Coast Widgeongrass Bed (CEGL006167) Other associations may include: • Intertidal Mudflats Sparse Vegetation Common Name: North Atlantic Coast Estuarine Intertidal Mudflats (CEGL006614)

### Community 1.1

#### Eelgrass (*Zostera marina*) Atlantic aquatic vegetation (CEGL004336)

*Zostera marina* Atlantic Aquatic Vegetation Translated Name: Seawrack Atlantic Aquatic Vegetation Common Name: North Atlantic Seawrack Bed (CEGL004336) Eelgrass (*Zostera marina*) is dominant and occurs most often in nearly pure stands. Widgeonweed (*Ruppia maritima*) can occur sporadically in this association, especially as waters become less saline. Additional associated species include various macroalgae, especially *Ulva lactuca*, *Enteromorpha* spp., *Cladophora* spp., and *Polysiphonia* spp. Where water is less saline, *Enteromorpha*, *Chaetomorpha*, *Gracilaria*, *Agardhiella*, and *Ectocarpus* can occur. Elevation/depth of the beds is determined by low tide level at the upper end and light penetration at the lower end, the latter being a function of water depth and

turbidity. The beds generally occur in areas with only moderate wave action where salinity fluctuations are minor. Eel-grass beds tend to stabilize and enrich substrate and provide habitat for epiphytes and other marine organisms. (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]). Cross-referenced plant community concepts (typically by political State): CT: Eelgrass Permanently Flooded Vegetation (Metzler and Barrett, 2006) MA: Seagrass community (Swain and Kearsley, 2001) NH: Eelgrass Bed (Sperduto and Nichols, 2011) NY: Marine Eelgrass Meadow (Edinger et al., 2014) RI: Marine Subtidal Aquatic Bed (Enser and Lundgren, 2006)

## **Community 1.2**

### **Widgeonweed (*Ruppia maritima*) Acadian/Virginian zone temperate aquatic vegetation (CEGL006167)**

*Ruppia maritima* Acadian/Virginian Zone Temperate Aquatic Vegetation Translated Name: Widgeongrass  
Acadian/Virginian Zone Temperate Aquatic Vegetation Common Name: North Atlantic Coast Widgeongrass Bed (CEGL006167) This brackish/saline tidal community of the central and northern Atlantic coast is dominated by widgeonweed (*Ruppia maritima*). It occurs in large beds in estuarine bays as well as small patches within saline/brackish tidal creeks. Substrates are sand or muck, and salinity is generally more brackish. Widgeonweed has a wide range of salinity tolerance and overlaps with other species, although generally not in the same locations. Common associates in more brackish/freshwater tidal conditions include horned pondweed (*Zannichellia palustris*), sago false pondweed (*Stuckenia pectinata*), and clasping-leaved pondweed (*Potamogeton perfoliatus*) or eelgrass (*Zostera marina*) as waters get deeper and more saline. There can also be a diverse array of macroalgae. (Source: NatureServe 2018 [accessed 2019], USNVC 2017 [accessed 2019]). Cross-referenced plant community concepts (typically by political State): CT: Widgeonweed Permanently Flooded Vegetation (Metzler and Barrett, 2006) MA: Seagrass community (Swain and Kearsley, 2001) NH: Undisclosed (Sperduto and Nichols, 2011) NY: Brackish Subtidal Aquatic Bed (Edinger et al., 2014) RI: Marine Subtidal Aquatic Bed (Enser and Lundgren, 2006)

## **Community 1.3**

### **Unvegetated**

unvegetated

## **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., dredging, moorings.

## **Community 2.1**

### **Eelgrass (*Zostera marina*) Atlantic aquatic vegetation (CEGL004336)**

## **Community 2.2**

### **Widgeonweed (*Ruppia maritima*) Acadian / Virginian zone temperate aquatic vegetation (CEGL004336)**

## **Community 2.3**

### **Unvegetated**

## **State 3**

### **Cultural state**

## **Community 3.1**

### **Aquaculture**

## **Transition T1A**

### **State 1 to 2**

Dredging



## **Transition T1B**

### **State 1 to 3**

Aquacultural practices

## **Restoration pathway R2A**

### **State 2 to 1**

Fill and seagrass planting

## **Transition T2A**

### **State 2 to 3**

Aquacultural practices

## **Restoration pathway R3A**

### **State 3 to 1**

Fill and seagrass planting

## **Transition T3A**

### **State 3 to 2**

Dredging

## **Additional community tables**

## **Inventory data references**

Future work is needed, as described in a future project plan, to validate the information presented in this provisional ecological site description. Future work includes field sampling, data collection and analysis by qualified vegetation ecologists and soil scientists. As warranted, annual reviews of the project plan can be conducted by the Ecological Site Technical Team. A final field review, peer review, quality control, and quality assurance reviews of the ESD are necessary to approve a final document.

## **Other references**

### **REFERENCES**

Bradley, M.P. and Stolt, M.H., 2003. Subaqueous soil-landscape relationships in a Rhode Island estuary. *Soil Science Society of America Journal*, 67(5)\_1487-1495.

Cleland, D.T., J.A. Freeouf, J.E. Keys, G.J. Nowacki, C.A. Carpenter, and W.H.McNab. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. [Map. presentation scale 1:3,500,000, colored; A.M. Sloan, cartographer] Gen. Tech. Report WO-76D. U.S. Department of Agriculture, Forest Service, Washington, DC. (<https://www.fs.fed.us/research/publications/misc/73326-wo-gtr-76d-cleland2007.pdf>)

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.

Cowardin, L.M. et. al. 1979. Classification of Wetlands and Deepwater habitats of the United States. FWS/OBS-79/31, U.S. Department of the Interior, Fish and Wildlife Service, Washington, DC.

Ditzler, C.A., Ahrens, R.J., Rabenhorst, M.C., Stolt, M., Hipple, K., and Turenne, J. s.d. Classification, Mapping, and Interpretation of Subaqueous Soils. Unpubl. Manuscript.

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.

Enser, R.W. and Lundgren, J.A. 2006. Natural Communities of Rhode Island. A joint project of the Rhode Island Dept. of Environmental Management Natural Heritage Program and The Nature Conservancy of Rhode Island. Web published by R.I. Natural History Survey, Kingston, RI. [www.rinhs.org](http://www.rinhs.org).

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

Gawler, S.C. and Cutko, A., 2010. Natural landscapes of Maine: a guide to natural communities and ecosystems. Maine Natural Areas Program, Department of Conservation.

Metzler, K.J. and Barrett, J.P., 2006. The Vegetation of Connecticut, a Preliminary Classification. Department of Environmental Protection, State Geological and Natural History Survey of Connecticut. Rpt of Investigations No. 12.

NatureServe 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://explorer.natureserve.org>. (Accessed: December 2015).

PRISM Climate Group, Oregon State University. Available <http://prism.oregonstate.edu>, (created February 26, 2013).

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. Agricultural Handbook 296. ([https://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_051845.pdf](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051845.pdf)).

Stolt, M., Bradley, M., Turenne, J., Payne, M., Scherer, E., Cicchetti, G., Shumchenia, E., Guarinello, M., King, J., Boothroyd, J. and Oakley, B., 2011. Mapping shallow coastal ecosystems: a case study of a Rhode Island lagoon. Journal of Coastal Research, 27(6A)\_1-15.

Sperduto, D.D., & Nichols, W.F. 2011. Natural Communities of New Hampshire, Second Ed. NH Natural Heritage Bureau, Concord, NH. Publ. UNH Cooperative Extension.

Swain, P.C. and Kearsley, J.B., 2001. Classification of the natural communities of Massachusetts. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife.

USNVC [United States National Vegetation Classification]. 2017 (Date accessed). United States National Vegetation Classification Database V2.01. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC.

## **Contributors**

Nels Barrett, Ph.D.  
Michael Margo

## **Approval**

Greg Schmidt, 10/04/2024

## **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	05/12/2025
Approved by	Greg Schmidt
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:**
-