USDA Natural Resources
Conservation Service

Ecological site F144BY303ME
Acidic Swamp

Last updated: 6/29/2020
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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): 144B–New England and Eastern New York Upland, Northern Part

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This major land resource area (MLRA) is characterized by plateaus, plains, and mountains. The climate is generally cool and humid with an average annual precipitation of 34 to 62 inches (865 to 1,575 millimeters). The average annual air temperature is typically 40 to 48 degrees F (4 to 9 degrees C). The freeze-free period generally is 130 to 200 days, but it ranges from 110 days in the higher mountains to 240 days in some areas along the Atlantic coast. The soils in this region are dominantly Entisols, Spodosols, and Inceptisols. They commonly have a fragipan. The dominant suborders are Ochrepts, Orthods, Aquepts, Fluvents, and Saprists. The soils in the region dominantly have a frigid soil temperature regime with some cryic areas at higher elevation, a udic soil moisture regime, and mixed mineralogy. Most of the land is forested, and 98 percent is privately owned. Significant amounts of forest products are produced including lumber, pulpwood, Christmas trees, and maple syrup. Principal agricultural crops include forage and grains for dairy cattle, potatoes, apples, and blueberries. Wildlife habitat and recreation are important land uses. Stoniness, steep slopes, and poor drainage limit the use of many of the soils.

Ecological site concept

This site occurs in relatively flat areas (mostly 0-3% slopes, up to 8%) near the bottom of watersheds where water saturates organic and coarse-textured mineral soils for most of the year. Soils are deep, poorly- to very poorly-drained and relatively more acidic than other wooded wetlands. The water table is seasonally high (within 18 inches of the surface) and typically dries out in late summer and fall. This site may have pit and mound topography, with ponding and organic matter accumulation in the low areas, and drier soil conditions on the mounds where most trees and shrubs are rooted. Black spruce, rhodora, Labrador tea, and other heath shrubs are abundant, with balsam fir, larch, and brown ash as common associates. Diverse herbs, shrubs, and bryophytes dominate the understory.

Associated sites

F144BY220ME	**Semi-acidic Peat Wetland Complex** The Semi-acidic Peat Wetland Complex site may occur downslope of the Acidic Swamp site, where water stagnates and lack of soil oxygen and/or nutrients limits tree growth to less than 20% cover.
F144BY230ME	**Acidic Peat Wetland Complex** The Acidic Peat Wetland Complex site may occur downslope of the Acidic Swamp site, where water stagnates and lack of soil oxygen and/or nutrients limits tree growth to less than 20% cover.

Similar sites

F144BY302ME	**Mucky Swamp** Both the Mucky Peat Swamp and the Loamy Till Swamp are dominated by northern white cedar, but the Mucky Peat Swamp is wetter, has a thicker organic soil surface layer, and typically has a more open canopy, allowing more light to reach the forest floor. As a result, the understory is often more productive in the Mucky Peat Swamp.
F144BY301ME	**Loamy Till Swamp** The Acidic Swamp site has a similar complex of poorly- and very poorly-drained soils, but tends to be wetter, more acidic, and usually has coarser soil textures and weak or non-existent dense compacted layer compared to the Loamy Till Swamp site. The Acidic Swamp is dominated by black spruce rather than northern white cedar.
F144BY305ME	**Wet Loamy Flat** The Wet Loamy Flat site is drier than the Acidic Swamp site, with poorly-drained mineral soils rather than very poorly- and very-poorly drained organic soils and mineral soils. Loamy wet flat typically supports more red spruce than black spruce.

Table 1. Dominant plant species

Tree	(1) *Picea mariana*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs in low-lying areas where large amounts of water collects and saturates sandy soil deposits, such as outwash and coarse till. Slopes are mostly 3% or less (rarely up to 8%) and elevations range from 0 to 2940 feet. Soils are saturated, often with surface ponding up to 6 inches deep in places, and with a water table at or just below the soil surface for most of the year. However, during the driest periods from June to September the water table may drop to more than 18 inches below the surface in places.

Table 2. Representative physiographic features

Landforms	(1) Outwash plain > Outwash plain (2) Till plain > Till plain (3) Terrace
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	0–896 m
Slope	0–8%
Ponding depth	0–15 cm
Water table depth	0–46 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is humid and temperate. It is characterized by warm summers and cold winters. The average first frost around October 1st and the last freeze of the season occurs around April 23rd. Temperature extremes in the summer can reach as high as 100 degrees F and as low as -33 degrees F in the winter. The average relative humidity is 71 percent. The sun shines on average 57 percent of the time. Bad storm events can come in from the northeast, thus the term “nor’easter”. Winter blizzards can result in several feet of snow, while summer hurricane events can produce 2-3 inches of rain per hour. Annual rainfall occurs quite evenly over the entire year with August being the driest month during the growing season from April through September. Rainfall during this period generally falls during thunderstorms, and fairly large amounts of rain may fall in a short time. Eighty-eight percent of the snowfall occurs from December through March and average total snowfall is 64 inches per year. This makes for

a “mud season” from March through April where runoff is high and ponding may occur because surface water runoff is very slow. The original data used in developing the table below was obtained from the USDA-NRCS National Water & Climate Center climate information database. All the climate station monthly averages for maximum and minimum temperature and precipitation were then added together and averaged to make this table. The precipitation and temperature data come from the years 1981 through 2010.

Table 3. Representative climatic features

Frost-free period (characteristic range)	117-140 days
Freeze-free period (characteristic range)	144-170 days
Precipitation total (characteristic range)	1,067-1,219 mm
Frost-free period (actual range)	98-146 days
Freeze-free period (actual range)	133-180 days
Precipitation total (actual range)	1,016-1,372 mm
Frost-free period (average)	126 days
Freeze-free period (average)	159 days
Precipitation total (average)	1,168 mm

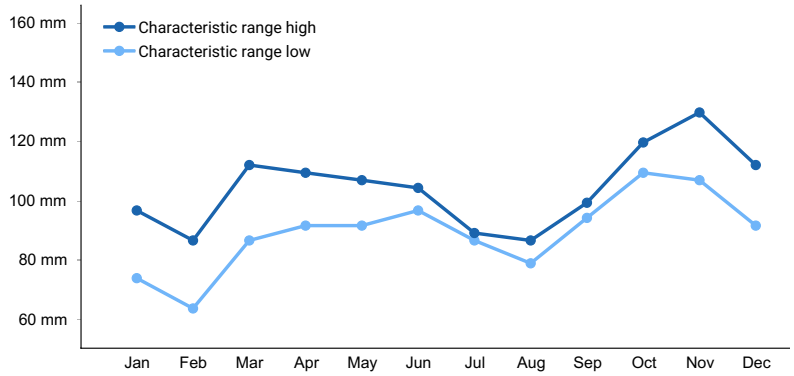


Figure 1. Monthly precipitation range

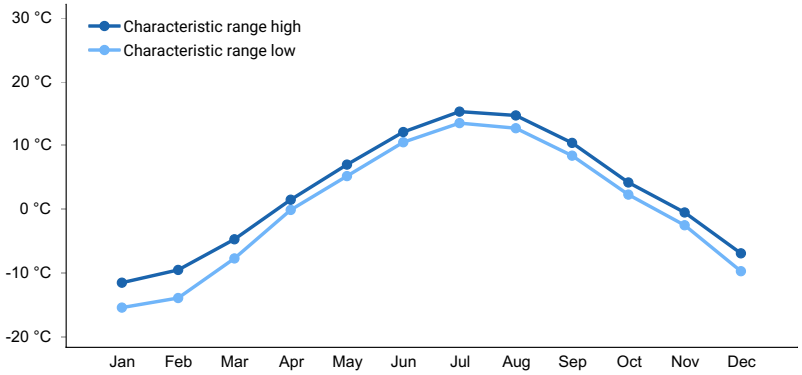


Figure 2. Monthly minimum temperature range

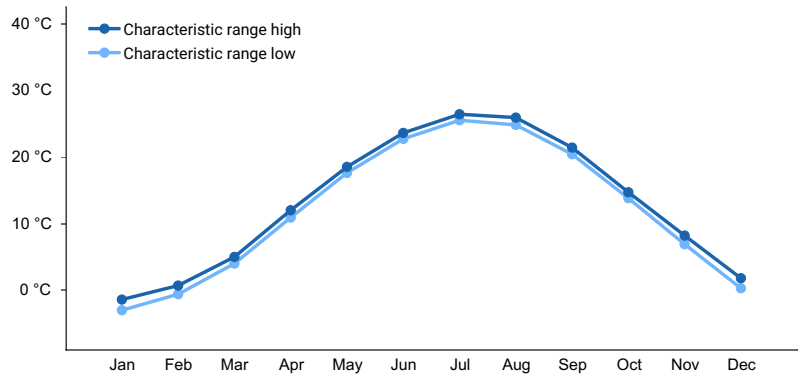


Figure 3. Monthly maximum temperature range

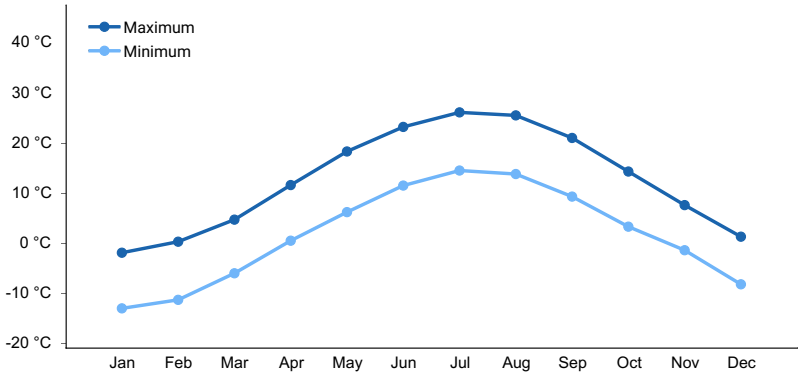


Figure 4. Monthly average minimum and maximum temperature

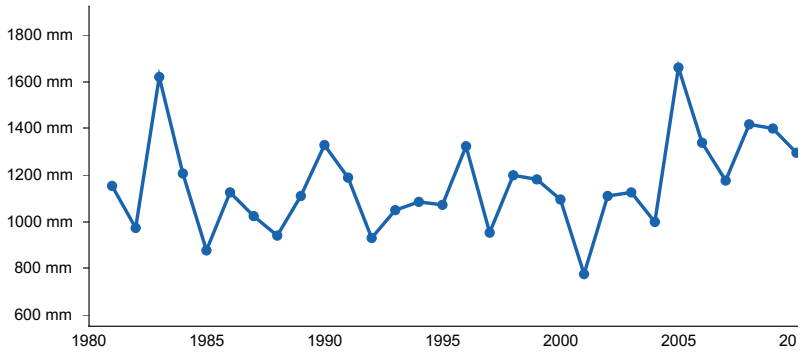


Figure 5. Annual precipitation pattern

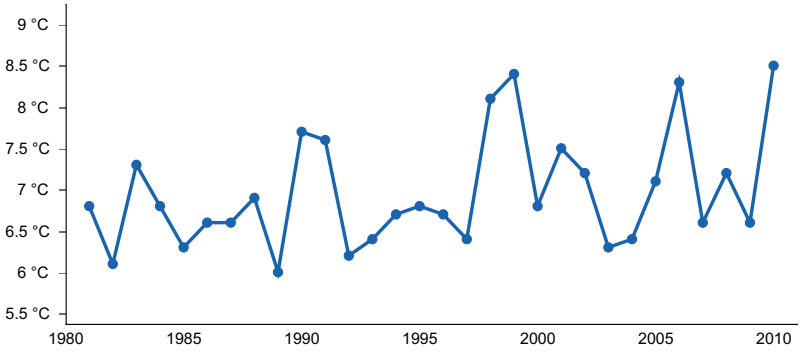


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BELFAST [USC00170480], Belfast, ME
- (2) ACADIA NP [USC00170100], Bar Harbor, ME
- (3) CORINNA [USC00171628], Corinna, ME

- (4) DOVER-FOXCROFT WWTP [USC00171975], Dover Foxcroft, ME
- (5) FARMINGTON [USC00172765], Farmington, ME
- (6) GARDINER [USC00173046], Gardiner, ME
- (7) JONESBORO [USC00174183], Addison, ME
- (8) LEWISTON [USC00174566], Auburn, ME
- (9) MADISON [USC00174927], Anson, ME
- (10) NEWCASTLE [USC00175675], Newcastle, ME
- (11) ORONO [USC00176430], Old Town, ME
- (12) WATERVILLE TRTMT PLT [USC00179151], Waterville, ME
- (13) WEST ROCKPORT 1 NNW [USC00179593], Rockport, ME
- (14) AUGUSTA STATE AP [USW00014605], Augusta, ME
- (15) BANGOR INTL AP [USW00014606], Bangor, ME
- (16) PORTLAND INTL JETPORT [USW00014764], Portland, ME

Influencing water features

Large amounts of water enter this site as run-on from the watershed above. Gentle slopes allow water to pass laterally through the soil on this site before exiting downslope to even wetter, flatter sites below. Despite the sandy soils through which water flows freely, water saturates this site for much of the year. However, due to the porous nature of the substrate, the water table can fluctuate greatly during the growing season, permitting soil aeration needed to sustain its characteristic plant community.

Wetland description

Wetland Description: Cowardin
System: Palustrine
Subsystem: N/A
Class: Unknown

Soil features

The soils of this site are poorly- to very poorly-drained and formed in coarse outwash or till that was re-worked by glacial meltwater. Often there are pockets of deep organic soils in wet depressions within this site. The soil surface is usually 2-10 inches of organic (muck and peat) underlain by sandy or coarse-loamy mineral deposits. These soils may or may not have large amounts of rock.

Table 4. Representative soil features

Parent material	(1) Outwash–igneous, metamorphic and sedimentary rock (2) Till (3) Organic material
Surface texture	(1) Fine sandy loam (2) Loamy sand (3) Mucky
Drainage class	Very poorly drained to poorly drained
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–3%
Available water capacity (6.1-55.1cm)	Not specified
Calcium carbonate equivalent (0cm)	Not specified
Electrical conductivity (0cm)	Not specified
Sodium adsorption ratio (0cm)	Not specified

Soil reaction (1:1 water) (8.9-18.5cm)	Not specified
Subsurface fragment volume <=3" (0-76.2cm)	Not specified
Subsurface fragment volume >3" (0-12.7cm)	Not specified

Ecological dynamics

This site is dominated by black spruce, often with larch, balsam fir, red maple, and white pine present in small amounts. Most trees are rooted in the poorly-drained soil mounds rather than the very poorly-drained soil depressions. The understory is diverse with sphagnum moss, creeping snowberry, and three-seed sedge common.

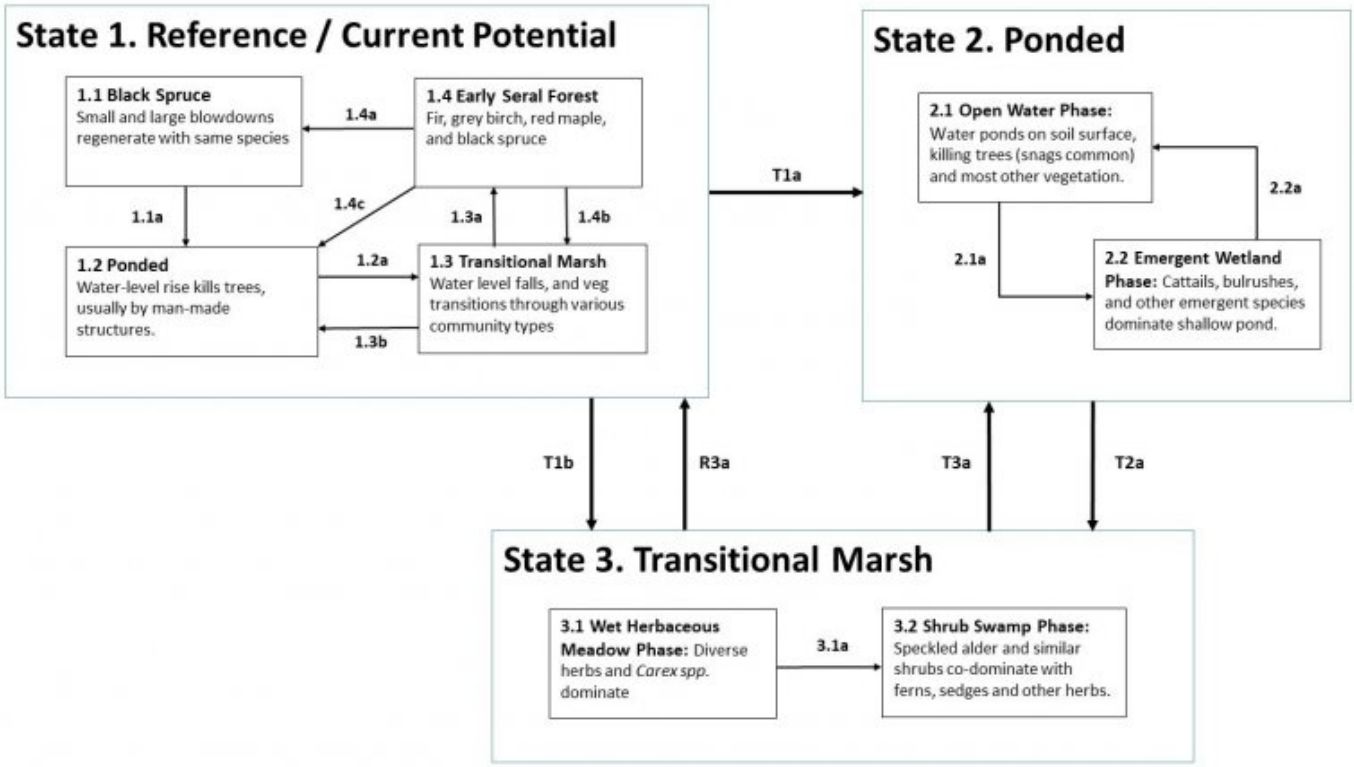
Treethrow, altered hydrology, and logging are common disturbances on this site. Small openings created by treethrow are typically colonized by species already present in the community and eventually return to black spruce dominance. Persistent ponding caused by beavers, man-made structures (such as roads, dams, etc.), or increased runoff in the watershed above can cause water levels to rise and kill cedar trees, resulting in an open ponded or marsh condition. If hydrology is restored to reference conditions, the site is likely to transition through a marsh and/or early seral forest phase before eventually returning to black spruce dominance.

Logging is not common due to the poor productivity of this site, and is limited to very dry years or winter harvest methods due to the wetness of this site. Tree removal may result in an early seral phase dominated by balsam fir, grey birch, red maple, and other colonizers before eventually reverting to black spruce dominance. In some areas, this site has been logged and converted to perennial grass hay land.

Relationship to Other Classification Systems
This site includes the following state natural heritage program types:
• Black Spruce Swamp (Sperduto and Nichols 2004)
• Black Spruce Bog (Gawler and Cutko 2010)
• Black Spruce Swamp (Thompson and Sorenson 2000)

State and transition model

F144BY303ME – Acidic Swamp



State 1
Reference / Current Potential

Community 1.1
Black Spruce

Small and large blowdowns regenerate with same species

Dominant plant species

- black spruce (*Picea mariana*), tree

Community 1.2
Ponded

Water-level rise kills trees, usually by man-made structures.

Community 1.3
Transition Marsh

Water level falls, and veg transitions through various community types

Community 1.4
Early Seral Forest

Fir, yellow birch, red maple, and black spruce

Forest overstory. Picea mariana
Abies balsamea
Acer rubrum

Betula allegheniensis

Dominant plant species

- black spruce (*Picea mariana*), tree

Pathway P1.1-1.2
Community 1.1 to 1.2

conversion to open water, impoundment by beavers, debris

Pathway P1.1-1.4
Community 1.1 to 1.4

windthrow, blowdown

Pathway P1.2-1.3
Community 1.2 to 1.3

beaver migration, debris removal, abandonment, vegetation development

Pathway P1.3-1.2
Community 1.3 to 1.2

beaver impoundment or debris dam (reconstructed)

Pathway P1.3-1.4
Community 1.3 to 1.4

vegetation development

Pathway P1.4-1.1
Community 1.4 to 1.1

vegetation development (succession)

Pathway P1.4-1.2
Community 1.4 to 1.2

beaver impoundment, debris dam, conversion to open water

Pathway P1.4-1.3
Community 1.4 to 1.3

windthrow, blowdown

State 2
Ponded

Community 2.1
Open Water Phase

Water ponds on soil surface, killing trees (snags common) and most other vegetation.

Dominant resource concerns

- Ponding and flooding

Community 2.2
Emergent Wetland Phase

Cattails, bulrushes, and other emergent species dominate shallow pond.

Dominant plant species

- broadleaf cattail (*Typha latifolia*), other herbaceous
- bulrush (*Schoenoplectus*), other herbaceous

Pathway P2.1-2.2
Community 2.1 to 2.2

littoral zone development, abandonment, dam or dike removal, water control structure manipulation

Conservation practices

Wetland Wildlife Habitat Management
Shallow Water Development and Management
Early Successional Habitat Development/Management
Wetland Restoration
Wetland Creation
Wetland Enhancement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Invasive Plant Species Control

Pathway P2.2-2.1
Community 2.2 to 2.1

dam or dike construction, water control structure

Conservation practices

Dike
Dam
Structure for Water Control

State 3
Transition Marsh

Community 3.1
Wet Herbaceous Meadow Phase

Diverse herbs and Carex spp. dominate

Dominant plant species

- sedge (*Carex*), other herbaceous

Community 3.2
Shrub Swamp Phase

Speckled alder and similar shrubs co-dominate with ferns, sedges and other herbs.

Dominant plant species

- speckled alder (*Alnus incana ssp. rugosa*), shrub

Pathway P3.1-3.2
Community 3.1 to 3.2

Transition T1-2
State 1 to 2

dam or berm construction, tree elimination

Conservation practices

Dike
Dam
Structure for Water Control

Transition T1-3
State 1 to 3

Dam or dike construction

Conservation practices

Dike
Dam

Transition T2-3
State 2 to 3

dam removal, littoral shoreline vegetation development,

Conservation practices

Wetland Wildlife Habitat Management
Shallow Water Development and Management
Early Successional Habitat Development/Management
Wetland Restoration
Wetland Creation
Wetland Enhancement
Restoration and Management of Natural Ecosystems
Native Plant Community Restoration and Management
Invasive Plant Species Control

Restoration pathway R3-1
State 3 to 1

vegetation development (sucession)

Conservation practices

Wetland Wildlife Habitat Management

Wetland Restoration
Wetland Enhancement
Record Keeping

Transition T3-2
State 3 to 2

Open water creation, dam, dike

Conservation practices

Dike
Pond
Dam

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.

Other references

Gawler, S. and A. Cutko. 2010. Natural Landscapes of Maine. A Guide to Natural Communities and Ecosystems. Maine Natural Areas Program, Maine Department of Conservation, Augusta, ME.

Johanson, J. K., Butler, N. R. and C. Bickford. 2016. Classifying Northern New England Landscapes for Improved Conservation. Rangelands 38:6.

Sperduto, D.D. and W.F. Nichols. 2004. Natural Communities of New Hampshire. New Hampshire Natural Heritage Bureau and The Nature Conservancy.

Thompson, E. H., and E. R. Sorenson. 2000. Wetland, woodland, wildland: A guide to the natural communities of Vermont. The Nature Conservancy and the Vermont Department of Fish and Wildlife. University Press of New England, Hanover, NH. 456 pp.

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Contributors

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Approval

Nels Barrett, 6/29/2020

Acknowledgments

Nels Barrett, Ph.D.

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	08/17/2024
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:**

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

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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:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**
