Ecological site RX143X00Y901
Alpine Ridge Meadow

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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): 143X–Northeastern Mountains

MLRA 143, known as the Northeastern Mountains, covers approximately 23 million acres of mountains, hills, and valleys in northern Maine, New Hampshire, Vermont, New York, and Massachusetts. The area is sparsely populated, with less than five percent of the land area developed for agriculture, residential, and urban development. About 90 percent of the area is forested, most of which is actively managed for timber. Elevations are mostly between 1,000 to 4,000 feet, with a few isolated peaks more than 5,000 feet above sea level. The present day mountains are but remnants of a much larger ancient range that has been eroding for approximately 500 million years. Bedrock consists of mostly very old metamorphic rock (gneiss, schist, slate, marble, quartzite, etc.) with younger intrusions of igneous rock (e.g. granite and granodiorite) from the Triassic and Cretaceous periods. MLRA 143 differs somewhat geologically from its neighboring MLRAs (142, 144A, 144B, 145, and 146), which have greater amounts of nutrient-rich sedimentary rock. Compared to MLRA 143, they are all lower in elevation, with longer growing seasons large areas that were once submerged by the ocean following glaciation.

The characteristic landforms and soils of northern New England were derived from the massive continental ice sheet that engulfed the region during North America’s most recent glaciation. Mighty glaciers, embedded with sediment and rock fragments, scoured bedrock and compacted mineral beds in a steady march south and east toward the Atlantic Ocean. The softer sedimentary rocks were pulverized into fine silts and clays under the immense weight of ice a mile thick, while the more resistant igneous and metamorphic rocks were sculpted into steep mountains and hills or plucked and dragged along the base of the glacier. With a warming climate, the ice retreated northward, depositing a thin layer of unsorted glacial till sediment atop the newly-exposed bedrock and compacted mineral beds. Deeper mounds of unsorted till formed small hills, kames, moraines and drumlins. Enormous chunks of ice detached as the glacier retreated, melting slowly in place and forming many kettle lakes and basins where water and fine sediments collect. Raging torrents of glacial meltwater dissected much of the barren landscape, entraining coarse and fine sediments, carving river valleys, and leaving well-sorted deposits of mostly sand and gravel along the watercourse. By 10,000 years ago the ice sheet had fully receded from MLRA 143. Silty floodplains developed along perennial rivers, many of which occupy the same channels that once gushed with sediment-rich glacial meltwater. Over time, wet basins accumulated fine sediment, some dried out, and still others became acidified by organic matter inputs from colonizing vegetation.

In terms of climate, MLRA 143 is distinguished from neighboring MLRAs by a shorter growing season and the occurrence of cryic soil temperature regimes at high elevations. The majority of MLRA 143 averages 32 to 44 inches of precipitation annually with a five to six month growing season and frigid winter temperatures. However, the higher elevations may receive up to double the annual precipitation of the lower elevations, and have a three to four month growing season with extremely cold winters. As the northernmost MLRA in the region with the coldest temperatures and shortest growing season, the Northeastern Mountains have less overall tree diversity, fewer pine and oak trees, and more abundant spruce and fir trees than neighboring MLRAs.

Classification relationships

This site occurs in Ecological Site Group 9 (Alpine/Subalpine) of MLRA 143 (The Northeastern Mountains), in the Northeastern Forage and Forest Region (Land Resource Region R).

The Northeastern Forage and Forest LRR includes all of Maine, New Hampshire, Vermont, Rhode Island, and Connecticut, as well as large portions of Massachusetts, New York, New Jersey, Pennsylvania, and Ohio. Its southern boundary marks the extent of the Wisconsin ice sheet, which engulfed the entire LRR as recently as 10,000 to 15,000 years ago. Erosional and depositional processes associated with glaciation created many of the topographic patterns that distinguish MLRAs within the Northeastern region. Harder granitic and metamorphic bedrock to the north were more resistant to glacial erosion, resulting in the relatively nutrient poor mountains of MLRA 143; whereas nutrient-rich sedimentary bedrock of MLRAs 139, 140, and 146 resulted in relatively flat, fertile landscapes ideal for cultivation. Other areas were depressed below sea-level by the sheer mass of the glacier, resulting in pockets of marine sediments which distinguish MLRAs 142, 144A, 144B, and 145.

Precipitation is sufficient to support productive forestland throughout the Northeastern region. Still, a latitudinal temperature gradient from mesic to frigid soil temperatures results in a general transition from central hardwoods and pine in the southern MLRAs to northern hardwoods and spruce-fir forests farther north (no true boreal forests exist in the region). Elevations are generally low throughout the Northeastern region, with the exception of MLRA 143 which has many high mountain ecosystems with cryic temperature regimes and alpine vegetation above the tree line.

Ecological site concept

This site occurs on the most exposed landscape positions above treeline (often above 3500 to 4000 feet [1066 to 1220 meters] in elevation) where soil temperature regimes are cryic. A broad range of soils are included in this provisional site concept since the primary factors driving vegetation dynamics have to do with the exposed landscape position and high elevation of the site. Soils may be organic or mineral, shallow to deep, with or without rock fragments in the profile. All soils are well- to excessively-drained, and pH is typically between 3.4 and 6.0.

This site includes many distinctive alpine communities dominated by unique graminoids, herbs, and shrubs. Bigelow sedge meadows tend to occur on the flat table lands, while Diapensia shrublands dominate exposed slopes and ridges. Moist snowbank areas have their own unique plant communities, yet further study is needed to distinguish these as unique sites exhibiting repeatable patterns among soil properties and vegetation.

All of these communities are fairly resistant to disturbance, though foot traffic may decrease cover of Diapensia and other sensitive species, increase bare ground, and result in erosion-related degradation. This could potentially impact wildlife species in alpine meadow habitats.

Associated sites

RX143X00Y902	**Alpine Ridge Krummholz** These sites tend to occur immediately downslope from this site, and is an indicator of the treeline, often seen as stunted black spruce or balsam fir (less than 6.5 feet [2 meters] in height). Treeline will often be variable but is generally found less than 3500 to 4000 feet (1066 to 1220 meters) in MLRA 143.

Similar sites

RX143X00Y902	**Alpine Ridge Krummholz** These sites are dominated by stunted balsam fir or black spruce, whereas this site is dominated by graminoids, dwarf shrubs and herbs. Near the treeline, the Alpine Ridge Meadow may include small patches of balsam fir krummholz within a matrix of shrubs and herbs which characterize the site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Diapensia lapponica* (2) *Vaccinium*

Herbaceous	(1) *carex bigelowii* (2) *Juncus trifidus*

Legacy ID

F143XY901ME

Physiographic features

This site occurs on the most exposed landscape positions on mountain slopes, summits, and ridges above 3500 to 4000 feet (1066 to 1220 meters) to the highest peaks in the Northeast. Despite high rainfall, these landscape positions shed water rapidly, are exposed to high winds and heavy snows, and represent harsh growing conditions for vegetation.

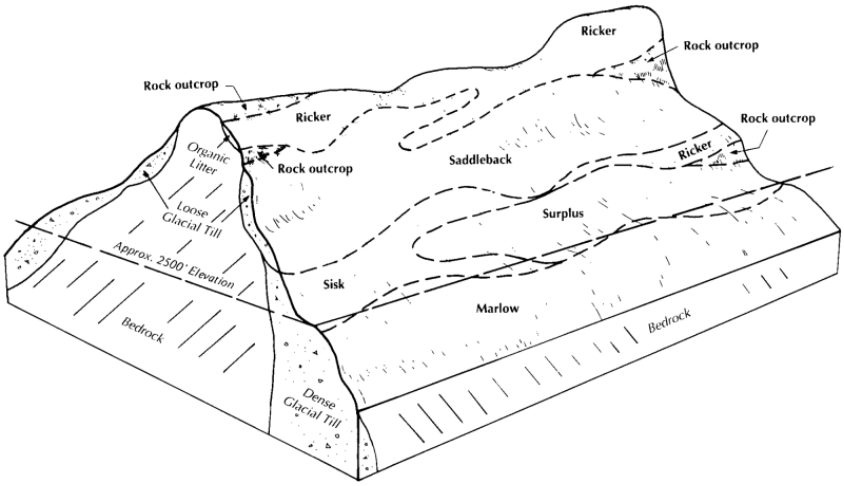


Figure 1. Typical patterns of soils and underlying material in the Saddleback-Ricker high elevation map unit in Grafton County, New Hampshire.

Table 2. Representative physiographic features

Geomorphic position, mountains	(1) Mountaintop
Hillslope profile	(1) Summit
Landforms	(1) Mountains > Ridge (2) Mountains > Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,067–1,917 m
Slope	5–100%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is much cooler that the typical climate of MLRA 143, with very cold snowy winters, high winds, cool rainy summers, and a very short growing season. Precipitation is fairly constant from month to month and averages about 83 inches annually. Growing degree days ranges from 88 to 124 days from June to September. Soil temperature regime is cryic on this site.

Table 3. Representative climatic features

Frost-free period (average)	88 days
Freeze-free period (average)	124 days

Precipitation total (average)	2,108 mm

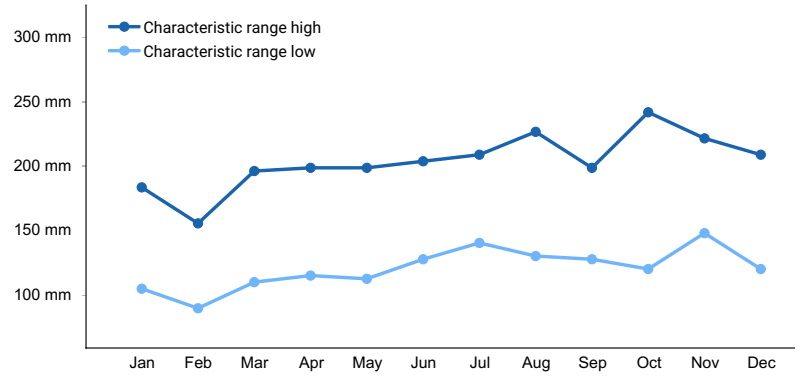


Figure 2. Monthly precipitation range

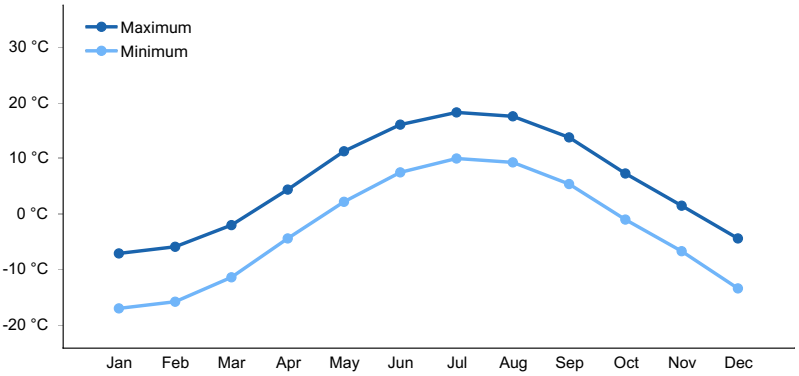


Figure 3. Monthly average minimum and maximum temperature

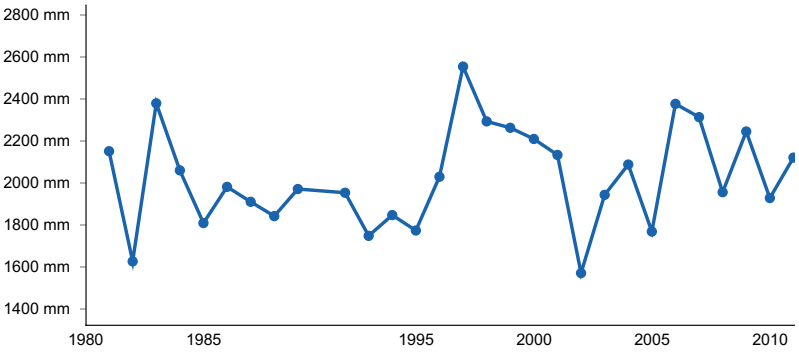


Figure 4. Annual precipitation pattern

Climate stations used

- (1) MT MANSFIELD [USC00435416], Underhill, VT
- (2) PINKHAM NOTCH [USC00276818], Sargents Purchase, NH
- (3) MT WASHINGTON [USW00014755], Sargents Purchase, NH

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

Soil features

There is a diverse set of soil taxa associated with site and is most influenced by abiotic climatic factors (high elevation and exposed landscape position) rather than soils. Soils are dominantly cryic (a mean annual temperature ranging from 32 to 46 degree Fahrenheit [0 to 8 degree Celsius]) in the cryod, orthents, and folist suborders. These include cryofolists (Mahoosuc, Ricker), humicryods (Couchsachraga, Enchanted, Ester, Glebe, Saddleback,

Santanoni, Sisk, Skylight, Stratton, Wallface), cryorthents (Londonderry), and haplocryods (Surplus). All soils are well- to excessively-drained with variable amounts of gravel and stones throughout the profile. The pH of the soil ranges from extremely acidic to slightly acidic.

Further study is needed to identify how the broad variability in soil properties correlates with particular herbaceous/shrubby plant communities in these landscape settings.

Figure 6. A potential taxadjunct of the Saddleback soil series found at high elevation in a Bigelow's Sedge Meadow. Mount Washington, New Hampshire. NASIS Pedon ID 2024NH007011.

Table 4. Representative soil features

Parent material	(1) Lodgment till–mica schist (2) Organic material–granite (3) Colluvium–phyllite
Surface texture	(1) Fine sandy loam (2) Silt loam (3) Loamy sand
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Soil depth	25–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–35%
Available water capacity (0-101.6cm)	2.54–38.1 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	3.4–6
Subsurface fragment volume <=3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0–22%

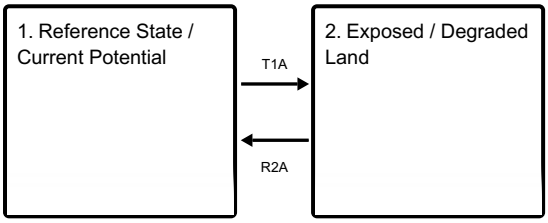
Ecological dynamics

The Alpine Ridge Meadow ecological site includes many distinctive alpine communities dominated by complex community mosaics in which patches of vegetation cover or grow among a matrix of bedrock, stone, talus, and / or gravel with or without thin organic soil layers. While many unique plant communities have been identified they may be characterized by their presence above treeline, exposure to high winds, short growing seasons, low temperatures, heavy cloud cover and fog, high precipitation and fog interception on poorly developed well- to excessively- drained soils with low nutrient availability and high organic matter content.

These communities are resilient to disturbances. However, extensive human use, often recreational foot traffic, may decrease or destroy cover of the native vegetation, increase bare ground, and result in erosion-related degradation. It is currently unclear whether the recently documented warming climate has contributed to greater observations of non-native plants or facilitated invasion (Sperduto et al, 2023). However, climate warming has contributed to the upper elevational shifts of all species, affecting biodiversity at all levels (Nelson et al, 2022). Any such changes could potentially impact floral and faunal species in alpine meadow and associated habitats and may lead to the displacement or loss of specific niche habitats and species over time. More detailed studies are needed to assess population dynamics of high elevation plants throughout the Northeast and the impact a changing climate may have. Studies and management may include preparing areas for managed relocation in areas undergoing rapid changes (Smetzer and Morelli 2019), identifying places that are buffered from shifts in extensive climate changes (increased drought, seasonal flooding, extreme temperatures) to be conserved to help enable persistence of target species and key resources (Morelli et al. 2020).

State and transition model

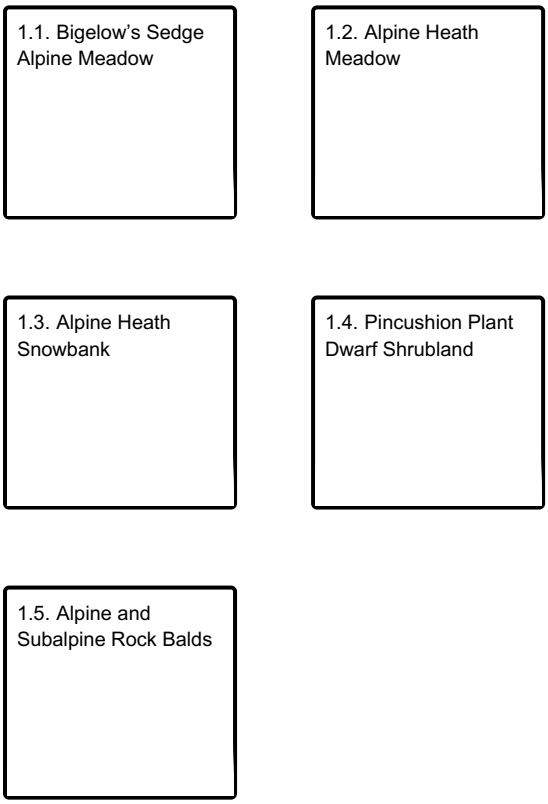
Ecosystem states



T1A - Soil Degradation / Erosion

R2A - Habitat protection, Seedbank Establishment

State 1 submodel, plant communities



State 2 submodel, plant communities

2.1. Bare / Exposed Soil Surface

State 1
Reference State / Current Potential

Figure 7. An Alpine Ridge Meadow - Bigelow Sedge Meadow (Community Phase 1.1) on the summit of Mount Washington, New Hampshire. NASIS Site ID 2024NH007011, Sept. 5th, 2024.

This state consists of multiple community types found within the highest portion of the alpine zone (typically greater than 4000 feet [1220 meters]) composed of complex mosaics dominated by graminoids, dwarf-shrubs, forbs, and lichens. The different community variants outlined below will change based on slight differences in soil moisture, longevity of snowpack, elevation, and degree of exposure – as well as compounding influences due to accelerated trends in climate warming. These community types all correlate to the International Vegetation Classification (IVC) Hierarchy Group G909 “Northern Appalachian Alpine Tundra” and LandFire CES201.567 “Acadian-Appalachian Alpine Tundra” classifications.

Dominant plant species

- pincushion plant (*Diapensia lapponica*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- shrubby fivefingers (*Sibbaldiopsis tridentata*), shrub
- blueberry (*Vaccinium*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- highland rush (*Juncus trifidus*), grass
- northern bentgrass (*Agrostis mertensii*), grass
- Greenland stitchwort (*Minuartia groenlandica*), other herbaceous
- goldenrod (*Solidago*), other herbaceous

Dominant resource concerns

- Compaction
- Plant productivity and health
- Plant structure and composition
- Terrestrial habitat for wildlife and invertebrates

Community 1.1
Bigelow’s Sedge Alpine Meadow

Figure 8. Landscape photo of a Bigelow's Sedge Meadow on Mount Washington, New Hampshire, overlooking the Presidential Range in the background. NASIS Site ID 2024NH007011, Sept. 5th, 2024.

Figure 9. Ground cover layer of a Bigelow's Sedge Meadow on Mount Washington, New Hampshire. Carex bieglowii is dominant with mosses present as groundcover with graminoid litter. NASIS Site ID 2024NH007011, Sept. 5th, 2024.

These alpine meadows are dominated almost entirely by *Carex bigelowii*, with *Juncus trifidus*, *Minuartia groenlandica*, Sibbaldiopsis (=Potentilla) tridentata, *Vaccinium vitis-idaea*, *V. uliginosum*, and other heaths present in smaller amounts. They will often have greater than 50% cover of graminoids and other herbaceous species, low cover of dwarfed shrubs present. They are typically found at the highest elevations in alpine communities, on north and west slopes, where there is high moisture interception from fog or rain and relatively lower snow cover than other alpine communities. Soils of these meadow communities will often be thin, acidic, and have low moisture holding capacity, consisting of organic material over stone, gravel, or coarse sediment. Within the Northeast US, this community type correlates with Maine's "Dwarf heath – graminoid alpine ridge" concept (Gawler and Cutko 2010), New Hampshire's "Bigelow's sedge meadow" concept (Sperduto and Nichols 2012), New York's "Open alpine community" concept (Edinger et al. 2014), and Vermont's "Alpine Meadow" concept (Thompson, Sorenson, and Zaino 2019). This correlates with NatureServes '*Carex bigelowii* Alpine Meadow' Association (CEGL006081).

Dominant plant species

- shrubby fivefingers (*Sibbaldiopsis tridentata*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- highland rush (*Juncus trifidus*), grass
- Greenland stitchwort (*Minuartia groenlandica*), other herbaceous
- weak saxifrage (*Saxifraga rivularis*), other herbaceous
- fir clubmoss (*Huperzia selago*), other herbaceous
- pincushion plant (*Diapensia lapponica*), other herbaceous
- goldenrod (*Solidago*), other herbaceous

- polytrichum moss (*Polytrichum*), other herbaceous
- mnium calcareous moss (*Mnium*), other herbaceous
- greygreen reindeer lichen (*Cladina rangiferina*), other herbaceous

Community 1.2
Alpine Heath Meadow

These alpine meadows are often patchy and often dominated by dwarf-shrubs, with some shrub- or graminoid-dominated patches being present. Characteristic dwarf-shrub species include *Vaccinium uliginosum* in association with *V. vitis-idaea*, *V. boreale*, *Betula glandulosa*, *Empetrum nigrum*, *Empetrum eamesii* ssp. atropurpureum, *Rhododendron lapponicum*, *Diapensia lapponica*, Salix uvi-ursi, and *Arctostaphylos uva-ursi*. Graminoids and herbs may be present in low abundances, scattered among the small shrubs, and may include *Juncus trifidus*, *Carex bigelowii*, Sibbaldiopsis (=Potentilla) tridentata, *Minuartia groenlandica*, *Solidago multiradiata*, *Anthoxanthum monticola* (=Hierochloe alpina), *Agrostis mertensii*, *Prenanthes boottii*, and *Huperzia appalachiana*. Shrub cover typically ranges 40 to 60%, with herb and graminoid cover typically less than, but ranging up to, 50%. These will often occur on exposed mountain summits, ridges, and bedrock- dominated tablelands, with substrates ranging from gravelly flats to exposed rocks with limited soils that are often well-drained gravels and stones with shallow organic accumulation. These will have short snow-free seasons, frequent fog, cutting winds, and intense solar radiation that are hallmarks to this community. Within the Northeast US, this community type correlates with Maine's "Dwarf heath-graminoid alpine ridge" concept (Gawler and Cutko 2010), New Hampshire's "Sedge-rush-heath meadow" and "Subalpine dwarf shrubland" concepts (Sperduto and Nichols 2012), New York's "Open alpine community" concept (Edinger et al. 2014), and Vermont's "Alpine Meadow" concept (Thompson, Sorenson, and Zaino 2019). This correlates with NatureServes '*Vaccinium uliginosum* - *Rhododendron lapponicum* / *Juncus trifidus* Dwarf-shrubland' Association (CEGL006298).

Dominant plant species

- bog blueberry (*Vaccinium uliginosum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- northern blueberry (*Vaccinium boreale*), shrub
- resin birch (*Betula glandulosa*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- purple crowberry (*Empetrum eamesii ssp. atropurpureum*), shrub
- Lapland rosebay (*Rhododendron lapponicum*), shrub
- pincushion plant (*Diapensia lapponica*), shrub
- bearberry willow (*Salix uva-ursi*), shrub
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- highland rush (*Juncus trifidus*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- alpine sweetgrass (*Anthoxanthum monticola*), grass
- northern bentgrass (*Agrostis mertensii*), grass
- shrubby fivefingers (*Sibbaldiopsis tridentata*), other herbaceous
- Greenland stitchwort (*Minuartia groenlandica*), other herbaceous
- goldenrod (*Solidago*), other herbaceous
- alpine rattlesnakeroot (*Prenanthes boottii*), other herbaceous
- Appalachian clubmoss (*Huperzia appalachiana*), other herbaceous

Community 1.3
Alpine Heath Snowbank

These alpine habitats are characterized by dwarf shrubs with herbs scattered in openings among the shrubs or locally abundant on rock shelves. Dominant species include *Vaccinium cespitosum*, *V. uliginosum*, *Ledum groenlandicum*, and *Empetrum nigrum*. Other characteristic species that may not be dominant include *Harrimanella hypnoides*, *Phyllodoce caerulea*, and *Loiseleuria procumbens*. Other important herbs include *Deschampsia flexuosa*, *Carex bigelowii*, and *Solidago macrophylla*. Lower-elevation herbs may also be present here, including *Maianthemum canadense* and *Cornus canadensis*. The setting and the presence of alpine species *Harrimanella hypnoides*, *Loiseleuria procumbens*, and *Phyllodoce caerulea* differentiate this community from other alpine heathlands and krummholz communities. Shrub cover typically is dominant, ranging from 65 to 90% cover. These

will often occur just below the rims of alpine cirques or over the brow of alpine cliffs, where significant snow accumulates on the lee side of rocks and ledges and is the last snow to melt in the spring. Soils will often be moderately well drained, thin and gravelly. Within the Northeast US, this community typically correlates with Maines “Bilberry-Mountain heath alpine snowbank” concept (Gawler 2002), New Hampshire’s “Alpine heath snowbank” concept (Sperduto and Nichols 2012), and New York’s “Open alpine community” (Edinger et al. 2014). This community has primarily been identified in New Hampshire’s Presidential Range and Maine’s Mount Katahdin, but the exact extent and typical size of this community are relatively unknown. This correlates with NatureServes '*Vaccinium uliginosum - Harrimanella hypnoides - Loiseleuria procumbens* Dwarf-shrubland' Association (CEGL006155).

Dominant plant species

- dwarf bilberry (*Vaccinium cespitosum*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- wavy hairgrass (*Deschampsia flexuosa*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- mossplant (*Harrimanella hypnoides*), other herbaceous
- blue mountainheath (*Phyllodoce caerulea*), other herbaceous
- alpine azalea (*Loiseleuria procumbens*), other herbaceous
- largeleaf goldenrod (*Solidago macrophylla*), other herbaceous
- Canada mayflower (*Maianthemum canadense*), other herbaceous
- bunchberry dogwood (*Cornus canadensis*), other herbaceous

Community 1.4
Pincushion Plant Dwarf Shrubland

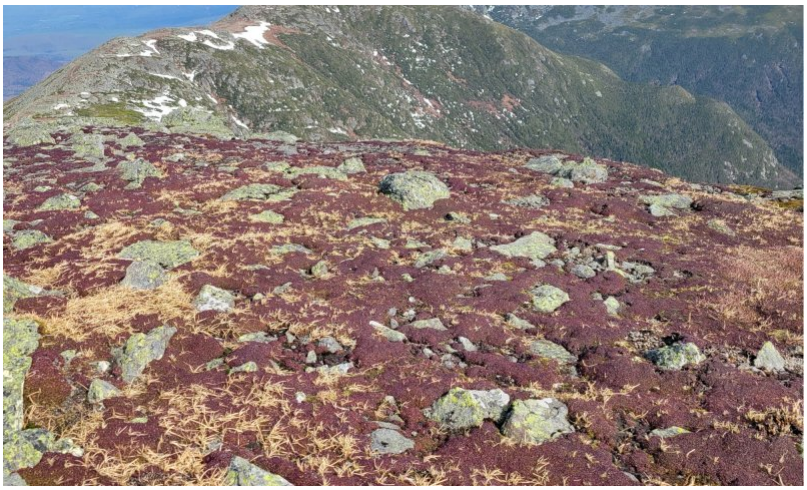


Figure 10. Pincushion Plant Dwarf Shrubland on Mount Washington, New Hampshire, overlooking the Presidential Range. Diapensia loses their green coloration over the winter and turns red. Photo taken May 17th, 2024.

These alpine habitats are charactered by dwarf shrub cushion plants, which are often less than 4 inches (10 centimeters) in height. The dominant shrub is *Diapensia lapponica*, with compacted mats of *Vaccinium uliginosum*, *Empetrum nigrum*, *Rhododendron lapponicum*, *Loiseleuria procumbens*, and *Arctostaphylos alpina*. Herbs, graminoids, and lichens are sparse, but may include *Juncus trifidus*, *Carex bigelowii*, *Solidago multiradiata*, *Minuartia groenlandica*, and *Agrostis mertensii*. These will often occur on extremely exposed areas above treeline on relatively flat, windswept areas where snow cover is slight or absent. Soils are minimally developed, well drained gravels where frost heaving and winter freezing is characteristic. Within the Northeast US, this community typically correlates with Maine’s “Diapensia alpine ridge” concept (Gawler and Cutko 2010), New Hampshire’s “Diapensia shrubland” concept (Sperduto and Nichols 2012), New York’s “Open alpine community” concept (Edinger et al. 2014), and Vermont’s “Alpine Meadow” concept (Thompson, Sorenson, and Zaino 2019). This correlates with NatureServes '*Diapensia lapponica* Dwarf-shrubland' Association (CEGL006322).

Dominant plant species

- pincushion plant (*Diapensia lapponica*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- Lapland rosebay (*Rhododendron lapponicum*), shrub
- highland rush (*Juncus trifidus*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- northern bentgrass (*Agrostis mertensii*), grass
- alpine bearberry (*Arctostaphylos alpina*), other herbaceous
- alpine azalea (*Loiseleuria procumbens*), other herbaceous
- Rocky Mountain goldenrod (*Solidago multiradiata*), other herbaceous
- Greenland stitchwort (*Minuartia groenlandica*), other herbaceous

Community 1.5
Alpine and Subalpine Rock Balds

These alpine habitats are sparsely vegetated rocky balds with vascular vegetation less than 25% cover overall but may have patches covering up to 70%. Dominant plants include *Vaccinium uliginosum*, *V. vitis-idaea*, *Empetrum nigrum*, *Empetrum eamesii* ssp. atropurpureum, Sibbaldiopsis (=Potentilla) tridentata, *Juncus trifidus*, and *Carex bigelowii* in lesser amounts at higher elevations. This community is related to Phases 2 and 3 but occurs at lower elevations and lacks characteristic alpine plants such as *Diapensia lapponica*, *Agrostis mertensii*, *Rhododendron lapponicum*, etc. It differs from lower elevation open summits in the presence of subalpine *Vaccinium uliginosum* (and sometimes *Juncus trifidus* or *Carex bigelowii*). These will often occur on dry acidic rocky summits, ridges, and outcrops composed of resistant granitic bedrock with minimal soil development confined to crevices. Within the Northeast US, this community typically correlates with Maine's "Crowberry – bilberry summit bald" concept (Gawler and Cutko 2010), New Hampshire's "Subalpine dwarf shrubland" and "Subalpine rocky bald" concepts (Sperduto and Nichols 2012), New York's "Open alpine community" concept (Edinger et al. 2014), and Vermont's "Alpine Meadow" concept (Thompson, Sorenson, and Zaino 2019). This correlates with NatureServes '*Vaccinium uliginosum* / *Sibbaldiopsis tridentata* Sparse Vegetation' Association (CEGL006533).

Dominant plant species

- bog blueberry (*Vaccinium uliginosum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- purple crowberry (*Empetrum eamesii*), shrub
- shrubby fivefingers (*Sibbaldiopsis tridentata*), shrub
- highland rush (*Juncus trifidus*), grass
- Bigelow's sedge (*Carex bigelowii*), grass

State 2
Exposed / Degraded Land

This state consists of exposed areas within alpine communities in which the native vegetation is absent, displaced, or destroyed by soil degradation and erosion and will lack dominant vegetation cover.

Dominant resource concerns

- Sheet and rill erosion
- Wind erosion
- Ephemeral gully erosion

Community 2.1
Bare / Exposed Soil Surface

This community phase consists of little to no existing vegetation, often a result of the absence of a soil medium or the result of disturbance. Bare soil or previously unexposed bedrock may be present.

Dominant resource concerns

- Sheet and rill erosion
- Wind erosion
- Compaction

Transition T1A
State 1 to 2

Soil degradation and erosion may lead to loss of habitat, resulting in exposed soil or bedrock. This often occurs in localized zones of trampled vegetation, soil erosion, and unofficial trail development. Extreme loss of soils materials may create localized channels which can funnel snowmelt and increase habitat loss.

Restoration pathway R2A
State 2 to 1

Habitat protection is needed to restore alpine communities, allowing the soil and seedbank to recover without disturbance from human traffic. This is often a very slow and sensitive process and requires more detailed study.

Additional community tables

Inventory data references

Information presented was derived from NRCS clipping data, current and historical literature, field observations, and personals contacts with local, state and federal partners. This is a provisional level ESD and is subject to change as more information becomes available, for any questions please contact your local NRCS office.

Other references

Aiken, S.G., Dallwitz, M.J., Consaul, L.L., McJannet, C.L., Boles, R.L., Argus, G.W., Gillett, J.M., Scott, P.J., Elven, R., LeBlanc, M.C., Gillespie, L.J., Brysting, A.K., Solstad, H., and Harris, J.G. 2007. Flora of the Canadian Arctic Archipelago: Descriptions, Illustrations, Identification, and Information Retrieval. NRC Research Press, National Research Council of Canada, Ottawa.

Barton, A. M., A. S. White, and C. V. Cogbill. 2012. The Changing Nature of the Maine Woods. University Press of New England, Lebanon, NH.

Bliss, L. C. 1963. Alpine plant communities of the Presidential Range, New Hampshire. Ecology 44:678-697.

Doyle, K. M., T. J. Fahey, and R. D. Paratley. 1987. Subalpine heathlands of the Mahoosuc Range, Maine. Bulletin of the Torrey Botanical Club 114:429-436.

Faber-Langendoen, D., J. Drake, S. Gawler, M. Hall, C. Josse, G. Kittel, S. Menard, C. Nordman, M. Pyne, M. Reid, L. Sneddon, K. Schulz, J. Teague, M. Russo, K. Snow, and P. Comer, editors. 2010-2019a. Divisions, Macrogroups and Groups for the Revised U.S. National Vegetation Classification. NatureServe, Arlington, VA. plus appendices. [in preparation]

Faber-Langendoen, D., G. Edinger, J. Lundgren, B. Nichols, K. Puryear, J. Schlawin, L. Shappell, L. Sneddon, E. Sorenson, K. Walz, B. Zaino, E. Zimmerman. 2021a. Revisions to the vegetation types in the Northeastern states: An expert review of USNVC groups and alliances and their relation to state natural community types. Proceedings of the U.S. National Vegetation Classification. USNVC-Proc-XX. 2021. Ecological Society of America, Washington, D.C., USA. xx pp.

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, Maine.

Gilliam, F. S., D. A. Burns, C. T. Driscoll, S. D. Frey, G. M. Lovett, and S. A. Watmough. 2019. Decreased atmospheric nitrogen deposition in eastern North America: Predicted responses of forest ecosystems. Environmental Pollution 244:560-574.

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

Jones, M., L. Willey, and M. Anions. 2012a. Vegetation. Pages 49-78 in: M. Jones and L. Willey, editors. Eastern alpine guide: Natural history and conservation of mountain tundra east of the Rockies. Beyond Ktaadn, Inc., and Boghaunter Books, New Salem, MA.

Kimball, K. D., and D. M. Weihrauch. 2000. Alpine vegetation communities and the alpine-treeline ecotone boundary in New England as biomonitors for climate change. USDA Forest Service, Proceedings RMRS-P-15 3:93-101.

Morelli, T. L., Barrows, C. W., Ramirez, A. R., Cartwright, J. M., Ackerly, D. D., Eaves, T. D., ... and Thorne, J. H. 2020. Climate-change refugia: Biodiversity in the slow lane. Frontiers in Ecology and the Environment, 18(5), 228-234.

Nelson, S., MacKenzie, C. M., Morelli, T. L., Wason, J., Wentzell, B., Hovel, R., ... and Pounch, M. 2022. Introduction: climate change in the mountains of Maine and the northeast. Northeastern Naturalist, 28(sp11), ii-ix.

New Hampshire Department of Fish and Game. 2015. New Hampshire Wildlife Action Plan 2015. Appendix B: Habitat Profiles. Concord, New Hampshire. Online. Available: https://www.wildlife.state.nh.us/wildlife/wap.html (Accessed 2023).

New York Natural Heritage Program. 2023. Online Conservation Guide for Alpine krummholz. Online. Available: https://guides.nynhp.org/alpine-krummholz/ (Accessed 2023).

Smetzer, J., and Morelli, T. L. 2019. Incorporating climate change refugia into climate adaptation in the Acadia National Park region.

Sperduto, D. and B. Kimball. 2011. The Nature of New Hampshire: Natural Communities of the Granite State. The Nature Conservancy and The New Hampshire Heritage Bureau. University Press of New England, Lebanon, NH.

Sperduto, D. D., and C. V. Cogbill. 1999. Alpine and subalpine vegetation of the White Mountains, New Hampshire. New Hampshire Natural Heritage Inventory, Concord, NH. 25 pp. plus figures.

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.

USDA 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.

Whitney, G. G., and R. E. Moeller. 1982. An analysis of the vegetation of Mt. Cardigan, New Hampshire: A rocky, subalpine New England summit. Bulletin of the Torrey Botanical Club 109:177-188.

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Approval

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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	02/03/2025
Approved by	Nels Barrett
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be**

mistaken for compaction on this site):

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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:**
