

# Ecological site RX143X00Y503

## Loamy Flat

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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 5 (Loamy Forests) 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 relatively flat (0 to 5 percent slopes) till plains and ground moraines at elevations between 120 and 2,500 feet. It has a seasonally-high water table from November through May that is within 12 inches (30 centimeters) of the soil surface. From June through October the water table often drops below 12 inches (30 centimeters) except following large rain events. This site may exhibit pit and mound topography from a history of blowdowns that excavated pits as tree roots tip up and deposit mounds of soil next to the pit. Soils of this site are poorly- and somewhat-poorly-drained complexes of lodgment till characterized by a densely-compacted layer within 40 inches (100 centimeters) below the surface. This dense layer is hard to dig through and often has about 15 percent rock fragments by volume. Importantly, it perches water in the upper soil layers, resulting in redoximorphic features near the soil surface. These are mineral soils, but they may have a thin layer of mucky peat material on the surface, particularly in poorly-drained components. This site is dominated by red spruce, often with balsam fir occurring in younger patches. The understory is typically sparse, though wild raspberries and other early seral species may occupy large areas when trees are removed by logging, blowdowns, insects, or disease. This site is often managed for spruce-pine-fir (SPF) timber products, and as such may produce more fir than spruce in a managed state. However, historically these sites were likely dominated by red spruce with a limited understory.

## Associated sites

|                     |                                                                                                                                                                                                                                                                                                                                   |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RX143X00Y302</b> | <b>Mucky Swamp</b><br><br>The Loamy Till Swamp site can be found downslope of the Loamy Flat site as soil moisture increases farther down the watershed. The Loamy Till Swamp site will generally receive more subsurface water flow (seepage) that promotes the dominance of northern white cedar rather than spruce.            |
| <b>RX143X00Y304</b> | <b>Wet Flat</b><br><br>The Wet Flat site can be found downslope of the Loamy Flat site as soil moisture increases farther down the watershed. The Wet Flat site will generally be absent of very poorly- or somewhat-poorly drained components that is more typical of wetter sites (Acidic Swamps) and drier sites (Loamy Flat). |
| <b>RX143X00Y502</b> | <b>Loamy Till Toeslope</b><br><br>The Loamy Till Toeslope site can be found upslope of the Loamy Flat site as slope ranges increase, promoting the growth of hardwood species intermixed with spruce.                                                                                                                             |

## Similar sites

|                     |                                                                                                                                                                                                                                                                                                                                        |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RX143X00Y304</b> | <b>Wet Flat</b><br><br>The Wet Flat site is wetter than the Loamy Flat site, with all components being poorly-drained rather than a mix of poorly- and somewhat poorly-drained soils. Both sites will support the growth of red spruce with Wet Flat supporting more black spruce and / or red/black spruce hybrids.                   |
| <b>RX143X00Y502</b> | <b>Loamy Till Toeslope</b><br><br>The Loamy Till Toeslope site is found on slopes greater than 5 percent and is typically more hardwood-dominated, whereas the Loamy Flat site is found on slopes less than 5 percent and is typically softwood-dominated.                                                                             |
| <b>RX143X00Y303</b> | <b>Acidic Swamp</b><br><br>The Acidic Swamp site is wetter than the Loamy Flat site, with all components being very poorly- and poorly-drained rather than a mix of poorly- and somewhat poorly-drained soils. Both sites will support the growth of spruce with the Acidic Swamp supporting more black spruce rather than red spruce. |

Table 1. Dominant plant species

|            |                                                      |
|------------|------------------------------------------------------|
| Tree       | (1) <i>Picea rubens</i><br>(2) <i>Abies balsamea</i> |
| Shrub      | Not specified                                        |
| Herbaceous | Not specified                                        |

## Legacy ID

F143XY503ME

## Physiographic features

This site occurs on relatively flat (0 to 5 percent slopes) till plains and ground moraines at elevations between 120 and 2,500 feet. It has a seasonally-high water table from November through May that is within 12 inches (30 centimeters) of the soil surface. From June through October the water table often drops below 12 inches (30 centimeters) except following large rain events. This site may exhibit pit and mound topography from a history of blowdowns that excavated pits as tree roots tip up and deposit mounds of soil next to the pit.

Table 2. Representative physiographic features

|                               |                                      |
|-------------------------------|--------------------------------------|
| Hillslope profile             | (1) Footslope<br>(2) Toeslope        |
| Geomorphic position, flats    | (1) Talf                             |
| Geomorphic position, terraces | (1) Tread                            |
| Slope shape across            | (1) Linear                           |
| Slope shape up-down           | (1) Linear                           |
| Landforms                     | (1) Ground moraine<br>(2) Till plain |
| Runoff class                  | Low to medium                        |
| Flooding frequency            | None                                 |
| Ponding frequency             | None                                 |
| Elevation                     | 40 – 760 m                           |

|                   |                                    |
|-------------------|------------------------------------|
| Slope             | 0 – 10 %                           |
| Ponding depth     | 0 cm                               |
| Water table depth | 0 – 30 cm                          |
| Aspect            | Aspect is not a significant factor |

**Table 3. Representative physiographic features (actual ranges)**

|                    |             |
|--------------------|-------------|
| Runoff class       | Low to high |
| Flooding frequency | None        |
| Ponding frequency  | None        |
| Elevation          | 40 – 760 m  |
| Slope              | 0 – 10 %    |
| Ponding depth      | 0 cm        |
| Water table depth  | 0 – 60 cm   |

### **Climatic features**

The climate of this site is typical of MLRA 143, with very cold snowy winters, warm rainy summers, and a relatively short growing season. Precipitation is fairly constant from month to month and averages about 44 inches (112 centimeters) annually. Growing degree days ranges from 106 -130 days from June to September.

**Table 4 Representative climatic features**

|                                            |                |
|--------------------------------------------|----------------|
| Frost-free period (characteristic range)   | 80-100 days    |
| Freeze-free period (characteristic range)  | 120-130 days   |
| Precipitation total (characteristic range) | 1,090-1,170 mm |
| Frost-free period (actual range)           | 80-100 days    |
| Freeze-free period (actual range)          | 110-140 days   |

|                                    |              |
|------------------------------------|--------------|
| Precipitation total (actual range) | 990-1,220 mm |
| Frost-free period (average)        | 90 days      |
| Freeze-free period (average)       | 120 days     |
| Precipitation total (average)      | 1,120 mm     |

- (1) RANGELEY 2 NW [USC00177039], Rangeley, ME
- (2) SPRINGFIELD [USC00178353], Springfield, ME
- (3) DANFORTH [USC00171833], Danforth, ME
- (4) WOODLAND [USC00179891], Baileyville, ME
- (5) BLANCHARD [USC00170655], Abbot, ME
- (6) BRASSUA DAM [USC00170814], Rockwood, ME
- (7) ISLAND POND [USC00434120], Island Pond, VT
- (8) YORK POND [USC00279966], Berlin, NH
- (9) CLAYTON LAKE [USC00171472], Northwest Aroostook, ME
- (10) PITTSTON FARM [USC00176721], North Somerset County, ME
- (11) NEWCOMB [USC00305714], Newcomb, NY
- (12) TUPPER LAKE SUNMOUNT [USC00308631], Tupper Lake, NY

**Influencing water features**

Though soils are poorly drained with a seasonally high-water table ranging close to the soil surface, this site does not regularly experience ponding water on the soil surface. During dry periods from June to September the water table may drop below 18 inches (45 centimeters) below the soil surface.

**Wetland description**

NA

**Soil features**

Soils of this site are poorly- and somewhat-poorly-drained complexes of lodgment till characterized by a densely-compacted layer within 40 inches (100 centimeters) below the surface. This dense layer is hard to dig through and often has about 15 percent rock fragments by volume. Importantly, it perches water in the upper soil layers, resulting in redoximorphic features near the soil surface. These are mineral soils, but they may have a thin layer of mucky peat material on the surface, particularly in poorly-drained components.

Representative soils include the Adirondack (Typic Endoaquods), Aurelie (Aeric Endoaquepts), Brayton (Aeric Endoaquepts), Colonel (Aquic Haplorthods), Cabot (Typic Humaquepts), Daigle (Aquic Haplorthods), and Wilmington (Typic Endoaquods). Other series may be locally representative in some cases, a result of local physiography compared to solely soil characteristics.

Figure 7. Wilmington series present in the Nullhegan Basin of Silvio O. Conte National Wildlife Refuge, Vermont. NASIS Pedon ID 2017VT009001.

Table 5. Representative soil features

|                 |                                      |
|-----------------|--------------------------------------|
| Parent material | (1) Lodgment till                    |
| Surface texture | (1) Fine sandy loam<br>(2) Silt loam |

|                                                |                                           |
|------------------------------------------------|-------------------------------------------|
| Family particle size                           | (1) Loamy                                 |
| Drainage class                                 | Poorly drained to somewhat poorly drained |
| Depth to restrictive layer                     | 0 – 100 cm                                |
| Soil depth                                     | 200 cm                                    |
| Surface fragment cover <=3"                    | Not specified                             |
| Surface fragment cover >3"                     | Not specified                             |
| Available water capacity<br>(0-101.6cm)        | 10.16 – 33.02 cm                          |
| Calcium carbonate equivalent<br>(0-101.6cm)    | Not specified                             |
| Electrical conductivity<br>(0-101.6cm)         | Not specified                             |
| Sodium adsorption ratio<br>(0-101.6cm)         | Not specified                             |
| Soil reaction (1:1 water)<br>(0-101.6cm)       | 3.6 – 6.5                                 |
| Subsurface fragment volume <=3"<br>(0-101.6cm) | 0 – 10 %                                  |
| Subsurface fragment volume >3"<br>(0-101.6cm)  | 0 – 10 %                                  |

Table 6. Representative soil features (actual values)

|                |                                           |
|----------------|-------------------------------------------|
| Drainage class | Poorly drained to somewhat poorly drained |
|----------------|-------------------------------------------|

|                                                |              |
|------------------------------------------------|--------------|
| Depth to restrictive layer                     | 0 – 100 cm   |
| Soil depth                                     | 150 – 200 cm |
| Surface fragment cover <=3"                    | 0 %          |
| Surface fragment cover >3"                     | 0 %          |
| Available water capacity<br>(0-101.6cm)        | 0 – 38.1 cm  |
| Calcium carbonate equivalent<br>(0-101.6cm)    | 0 %          |
| Electrical conductivity<br>(0-101.6cm)         | 0 mmhos/cm   |
| Sodium adsorption ratio<br>(0-101.6cm)         | 0            |
| Soil reaction (1:1 water)<br>(0-101.6cm)       | 0 – 10       |
| Subsurface fragment volume <=3"<br>(0-101.6cm) | 0 – 30 %     |
| Subsurface fragment volume >3"<br>(0-101.6cm)  | 0 – 20 %     |

## Ecological dynamics

The vegetation groupings described in this section are based on the terrestrial ecological system classification and vegetation associations developed by NatureServe (Comer et al., 2003) and localized associations provided by the New York Natural Heritage Program (Edinger et al., 2014), Maine Natural Areas Program (Gawler and Cutko, 2010), New Hampshire Natural Heritage Program (Sperduto and Nichols, 2011), and Vermont Fish and Wildlife Department Natural Heritage Inventory (Sorenson and Zaino, 2019).

Relationships to other classification systems include:

- *Picea mariana* – *Picea rubens* / *Pleurozium schreberi* Forest (CEGL006361)
- *Picea rubens* – *Abies balsamea* – *Betula papyrifera* Forest (CEGL006273)
- *Picea rubens* – *Abies balsamea* – *Betula* spp. – *Acer rubrum* Forest (CEGL006505)
- [ME] Lower-elevation Spruce-Fir Forest (Gawler and Cutko, 2010)

- [NH] Lowland spruce – fir forest (Sperduto and Nichols, 2011)
- [NY] Spruce flats, Balsam flats (Edinger et al., 2014)
- [VT] Lowland Spruce – Fir Forest (Thompson and Sorrenson, 2010)

This community matrix is described as a closed canopy forest dominated by red spruce (*Picea rubens*) and / or balsam fir (*Abies balsamea*) with northern hardwood species such as red maple (*Acer rubra*), yellow birch (*Betula alleghaniensis*), and paper birch (*B. papyrifera*) in smaller amounts. The shrub layer is often sparse to absent and will typically have variable amounts of softwood regeneration. Herbaceous and bryophyte plant cover is closely correlated with light availability; canopy gaps tend to have greater understory plant cover, whereas dense, closed canopies tend to reduce it. The ground surface cover of mosses and liverworts appears to be closely correlated with high moisture availability and moderate light levels (e.g., a more open canopy may produce drier conditions that impede bryophyte growth) (Sperduto 2000). These communities are often found in cold pockets where cool air settles and creates cold microclimates, keeping the soil moist for extended periods of time.

Due to the presence of a restrictive layer close to the soil surface and increased soil moisture as a result, small tree throw gaps are one of the most common disturbances in these communities. Shallow rooting contributes to individual tip ups, leaving a microtopography of hummocks and hollows. Other small-scale disturbances may occur during localized windstorms, from ice shearing, snow loading, selective harvest, insect disease, from old age or any number of small disturbance events. This site is resilient following these small disturbances and will often succeed through a localized herbaceous and shrubby phase prior to tree establishment and return to the reference condition. Rarer large-scale disturbances such as severe windstorm damage may occur naturally, whereas human influenced large scale disturbances such as large scale logging are more common. Fire is uncommon in these communities with an average return interval of 556 to 1,111 years but have been known to occur during periods of extended drought. Replacement-severity fires (causing >75% kill or top kill of the upper canopy) occurs as 18 to 100 percent of fires and mixed-severity fires (26-75% kill or top kill of the upper canopy) occur as 0 to 64 percent of fires and low-severity fires (

## State and transition model

### Additional community tables

Table 7. Community 1.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 8. Community 1.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 9. Community 1.3 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 10. Community 1.4 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 11. Community 1.5 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 12. Community 2.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 13. Community 2.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 14. Community 3.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 15. Community 3.2 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

Table 16. Community 4.1 plant community composition

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

## Animal community

**\*\*DRAFT\*\*** The following information is provided from University of New Hampshire's "Dirt to Trees to Wildlife". Asterisks denotes Species of Greatest Conservation Need and hyperlinks will take you to recommendations specific to those species. Common animals found in Spruce-Fir Forest Types at ANY elevation may include: Snowshoe hare (*Lepus americanus*), Red squirrel (*Sciurus vulgaris*), Southern red-backed vole (*Myodes gapperi*), Long-tailed shrew (*Sorex dispar*)\*, American marten (*Martes americana*)\*, Boreal chickadee (*Poecile hudsonicus*), Dark-eyed junco (*Junco hyemalis*), Pine siskin (*Spinus pinus*), Spruce grouse (*Canachites canadensis*)\*, and Red-breasted nuthatch (*Sitta canadensis*). Common animals found in Spruce-Fir Forest Types at low-elevation (generally below 2,500 feet) only may include Northern flying squirrel (*Glaucomys sabrinus*), Deer mouse (*Peromyscus maniculatus*), Hoary bat (*Lasiurus cinereus*)\*, Tri-colored bat (*Perimyotis subflavus*)\*, Little brown bat (*Myotis lucifugus*)\*, Silver-haired bat (*Lasionycteris noctivagans*)\*, Northern long-eared bat (*Myotis septentrionalis*)\*, Indiana bat (*Myotis sodalis*)\*, Red bat (*Lasiurus borealis*)\*, Red fox (*Vulpes vulpes*), Bobcat (*Lynx rufus*)\*, Moose (*Alces alces*)\*, Bay-breasted warbler (*Setophaga castanea*)\*, Blackburnian warbler (*Setophaga fusca*), Cape May warbler (*Setophaga tigrina*)\*, Common goldeneye (*Bucephala clangula*), Magnolia warbler (*Setophaga magnolia*), Olive-sided flycatcher (*Contopus cooperi*)\*, Purple finch (*Haemorhous purpureus*)\*, Rusty blackbird (*Euphagus carolinus*)\*, Sharp-shinned hawk (*Accipiter striatus*)\*, Swainsons thrush (*Catharus ustulatus*), Three-toed woodpecker (*Picoides dorsalis*)\*, Yellow-bellied flycatcher (*Empidonax flaviventris*), Blackpoll warbler (*Setophaga striata*), Blue-headed vireo (*Vireo solitarius*), Northern parula (*Setophaga americana*), evening grosbeak (*Coccothraustes vespertinus*), Northern saw-whet owl (*Aegolius acadicus*), Hermit thrush (*Catharus guttatus*), Merlin (*Falco columbarius*), and the Nashville warbler (*Leiothlypis ruficapilla*). Silvicultural recommendations for managing wildlife habitat: -Use uneven-aged management - group selection with group sizes of less than 1 acre. -Rotation age - 120 years -Entry cycle every 15 to 20 years - Avoid entry during nesting season (April to June) -Whole-tree harvest or cut-to-length is preferred.

## Wood products

This ecological site is included in the Spruce-Pine-Fir (SPFs) commercial lumber category [eastern species of SPF group produced from logs harvested in the USA]. These species share similar characteristics, making them suitable for the same construction purposes and are often popular choices for framing, trusses, and other structural components in residential and commercial buildings.

## 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.

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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                                        | 04/28/2025        |
| Approved by                                 |                   |
| Approval date                               |                   |
| Composition (Indicators 10 and 12) based on | Annual Production |

Indicators

1. Number and extent of rills:  

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2. Presence of water flow patterns:  

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3. Number and height of erosional pedestals or terracettes:  

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

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5. Number of gullies and erosion associated with gullies:

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

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

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

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

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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:

---

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):

---

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:
- 

17. Perennial plant reproductive capability:
-