USDA Natural Resources Conservation Service

Ecological site R220XY361AK
Subalpine Shrub Dry Flood Plain

Last updated: 3/10/2025
Accessed: 05/12/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 220X–Alexander Archipelago-Gulf of Alaska Coast

This area is in the Southern Alaska Region and includes the higher elevations of the Coast, St. Elias, Chugach, and Kenai Mountains. The area makes up about 26,335 square miles. The terrain consists of steep, rugged, high-relief mountains. Glaciers and ice fields make up about 54 percent of the area. Unglaciated portions of the area are deeply incised with narrow to broad valleys. Flood plains and stream terraces on valley floors rapidly give rise to steep alluvial fans and mountain footslopes. Elevation ranges from sea level at the base of tidewater glaciers and ice fields to 18,008 feet at the summit of Mt. St. Elias (USDA 2006).

During the Pleistocene epoch, the area was covered with glacial ice. As the glacial ice melted, sediments were deposited by the melting ice. However, most of the original glacial deposits have eroded away or have been buried by colluvium and slope alluvium, which covers more than 90 percent of the present unglaciated landscape. The remaining glacial and glaciofluvial deposits and recent fluvial deposits are generally restricted to the bottoms of the larger valleys. Paleozoic, Mesozoic, and Lower Tertiary stratified sedimentary rocks, and occasionally Paleozoic intrusive rocks, underlie much of the area and are exposed on steep mountain slopes and ridges (USDA 2006).

Miscellaneous (non-soil) areas make up more than 90 percent of this MLRA. The most common miscellaneous areas are rock outcrop, rubble land, chutes, and glaciers. The dominant soil orders in this area are Spodosols and Histosols. The soils in the area have a cryic soil temperature regime or a subgelic soil temperature class, a udic or aquic soil moisture regime, and mixed or amorphic mineralogy (USDA 2006).

While both alpine and subalpine plant communities characterize the vegetation in this area, most of the unglaciated terrain in this region is in the true alpine zone. Alpine vegetation consists of a variety of dwarf scrub and herbaceous communities. Low willow scrub is common in drainages. Lichens, scattered herbs, and dwarf shrubs dominate bedrock exposures and very shallow soils. In general, there is little or no plant growth at elevations above about 7,500 feet (USDA 2006). At lower elevations, subalpine vegetation consists of a variety of mountain hemlock and tall scrub communities. These subalpine plant communities typically occur at elevations between 1500 to 3000 feet (Boggs et al. 2010, Carstensen 2007, Jaques 1983; Martin et al. 1995).

The area is almost entirely undeveloped wild land. Remote wild-land recreation is the principal land use in this area. The rugged, high mountains, extensive glaciers and ice fields, and wilderness qualities of the area attract visitors from around the world. Small rural communities along the road system are the only permanent settlements. Part of the Wrangell-St. Elias Bay National Park and Preserve, the Glacier Bay National Park and Preserve, the Misty Fjords National Monument, the Chugach National Forest, and the Tongass National Forest are in this MLRA.

Classification relationships

USFS Ecoregion Province: Marine Mountains (M240), Forest-Meadow High (M242b) (Bailey 2007)

U.S. EPA Level III Ecoregion: Pacific Coastal Mountains (119) (Gallant et al. 2010)

National Vegetation Classification – Ecological Systems: Alaskan Pacific Maritime Alpine Floodplain (CES204.161) (NatureServe 2015)

Biophysical Settings: Alaskan Pacific Maritime Alpine Floodplain (BpS 7716760) (LANDFIRE 2009)

Alaska Natural Heritage Program Landcover Class: Low-Tall Shrub: Willow Shrubland (Boggs et al. 2016)

Alaskan Vegetation Classification: Tall Alder-Willow Shrub, Mesic Sedge-Grass Meadow Tundra, Sedge-Willow Tundra (Viereck et al. 1992)

Ecological site concept

This site occurs on the flood plain of low-order, glacially fed streams at high elevations. Unvegetated gravel bars are common directly adjacent to the active stream channel. As distance from the stream channel increases, the flood plain becomes more vegetated. This site floods frequently (greater than 50 times in 100 years) to occasionally (5 to 50 times in 100 years). When flooded, soils are saturated. However, as flooding subsides, these soils drain and are dry for much of the growing season. As a result, the soils are considered somewhat poorly to moderately well drained. Flooding results in a patchwork of highly diverse vegetation that includes forb meadow, low shrub, and tall shrub communities.

The reference community is open tall scrub. Sitka alder and feltleaf willow are the dominant tall shrub species. Common understory species include netleaf willow, sprouting leaf willow, dwarf fireweed, and Nootka lupine (Landfire 2009).

Associated sites

R220XY362AK	**Subalpine Sedge Wet Flood Plain** Occurs on similar flood plains but on wetter, organic-rich soils.

Similar sites

R220XY362AK	**Subalpine Sedge Wet Flood Plain** Both sites occur on high elevation flood plain, however R220XY362AK occurs on wetter soils that have more wetland indicator species and fewer shrubs.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Alnus viridis ssp. sinuata* (2) *Salix alaxensis*
Herbaceous	(1) *Chamerion latifolium* (2) *Lupinus nootkatensis*

Physiographic features

This site occurs on mountain flood plains and alluvial fan flood plains at elevations most commonly between 1500 to 3000 feet. Alluvial fan flood plains are much steeper (6-25 percent) than mountain flood plains (0-15 percent). This site does not pond. Flooding frequency ranges from frequent to occasional and flood duration is brief.

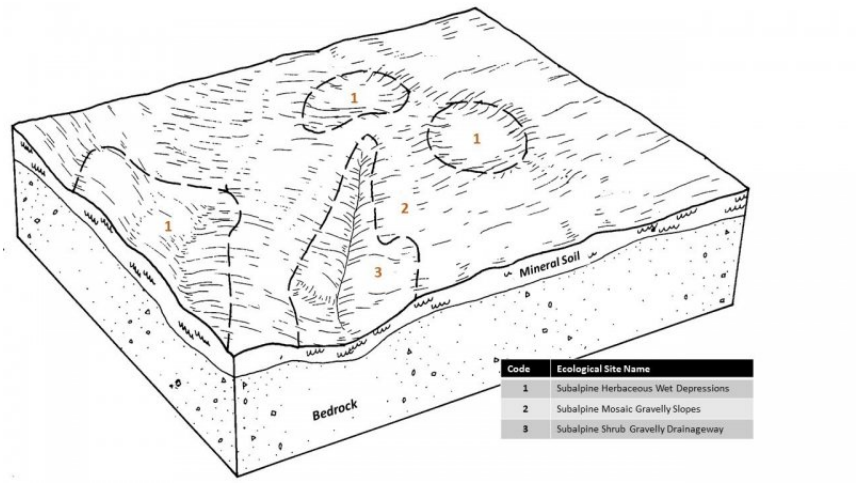


Figure 1. Representative block diagram of Subalpine Scrub Gravelly Drainageway

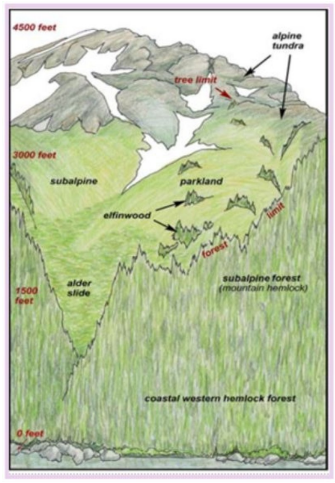


Figure 2.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Flood plain (2) Alluvial plain > Flood plain (3) Mountains > Terrace
Runoff class	High to very high
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	1,500–3,000 ft
Slope	0–25%
Ponding depth	0 in
Water table depth	66–72 in

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding duration	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	1,000–4,500 ft

Slope	Not specified
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

Cloudy skies, moderate temperatures, and abundant rainfall characterize the temperate maritime climate of this area. Winter storms, accompanied by heavy rainfall at lower elevations and snow at higher elevations, are frequent. Moderate to strong, south and southeast winds are common before and during storms. The average annual precipitation is approximately 60 to 140 inches. The average annual snowfall ranges from about 30 to 70 inches along the coast, to as much as 200 inches at higher elevations (USDA 2006). Average annual temperatures are considerably warmer in the Southern portion of this area. The average annual temperature at lower elevations ranges from about 37 degrees F (2.7 degrees C) in the northwest, to 46 degrees F (7.7 degrees C) in the southeast (USDA 2006). The average annual temperatures associated with lower elevation maritime vegetation is considerably warmer compared to higher elevation subalpine vegetation. The average frost-free period is about 105 to 140 days.

Table 4. Representative climatic features

Frost-free period (characteristic range)	95-142 days
Freeze-free period (characteristic range)	147-183 days
Precipitation total (characteristic range)	55-145 in
Frost-free period (actual range)	84-170 days
Freeze-free period (actual range)	119-218 days
Precipitation total (actual range)	35-172 in
Frost-free period (average)	120 days
Freeze-free period (average)	168 days
Precipitation total (average)	97 in

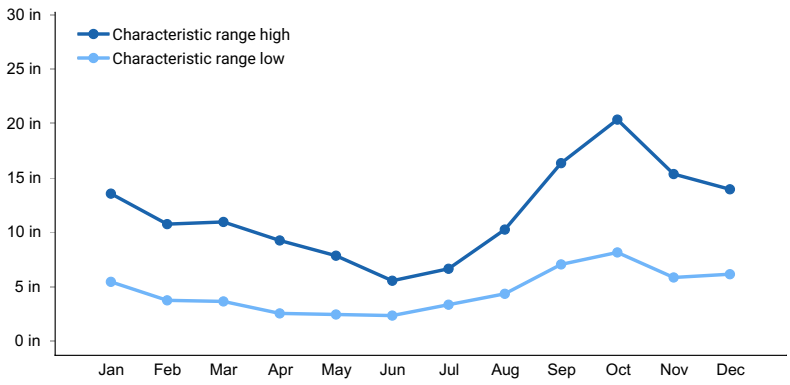


Figure 3. Monthly precipitation range

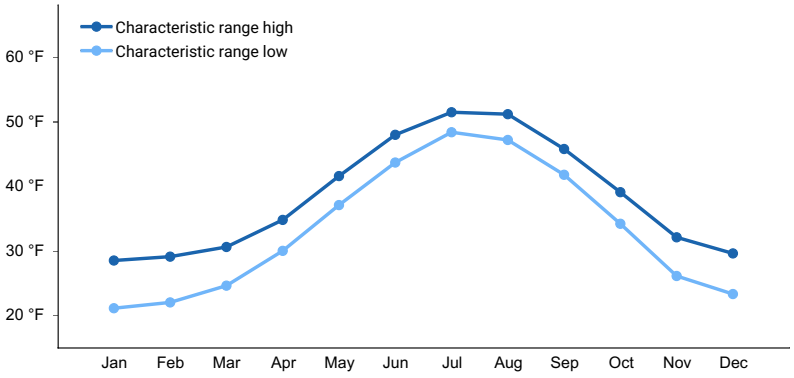


Figure 4. Monthly minimum temperature range

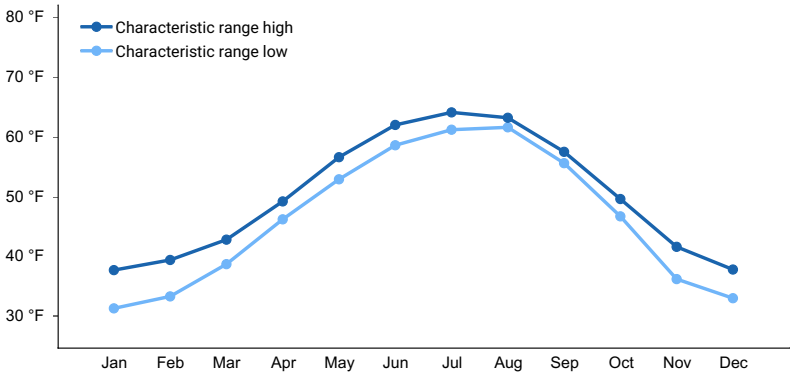


Figure 5. Monthly maximum temperature range

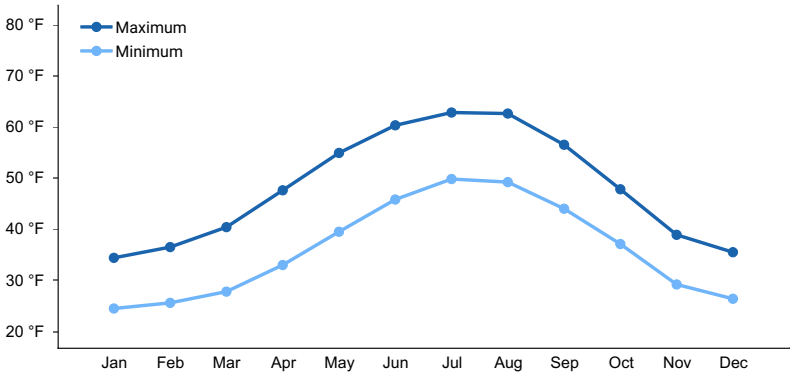


Figure 6. Monthly average minimum and maximum temperature

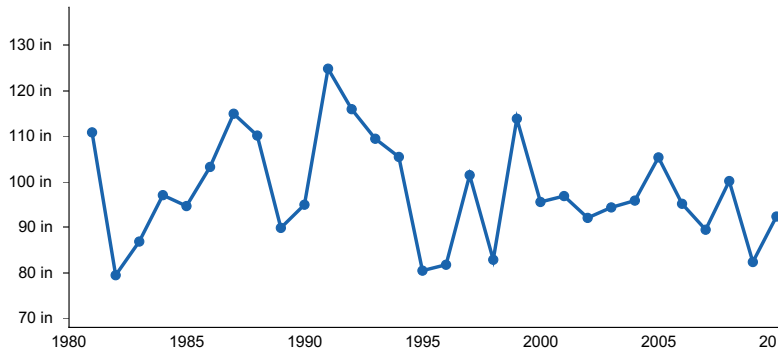


Figure 7. Annual precipitation pattern

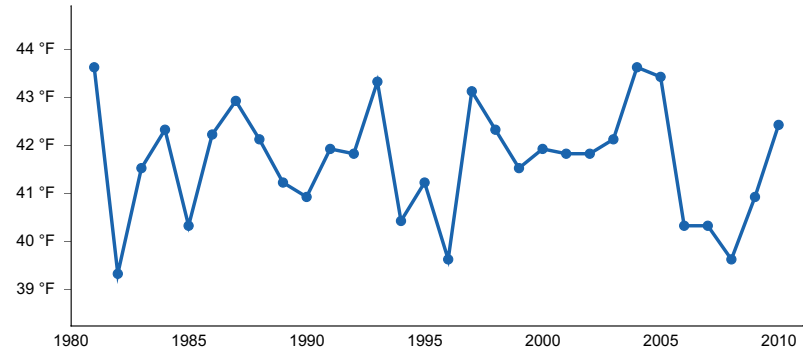


Figure 8. Annual average temperature pattern

Climate stations used

- (1) ANNETTE ISLAND AP [USW00025308], Metlakatla, AK
- (2) KETCHIKAN INTL AP [USW00025325], Ketchikan, AK
- (3) PETERSBURG 1 [USW00025329], Petersburg, AK
- (4) SITKA AIRPORT [USW00025333], Sitka, AK
- (5) JUNEAU INTL AP [USW00025309], Juneau, AK
- (6) PELICAN [USC00507141], Hoonah, AK
- (7) GUSTAVUS [USW00025322], Gustavus, AK
- (8) GLACIER BAY [USC00503294], Gustavus, AK
- (9) HAINES AP [USW00025323], Haines, AK
- (10) YAKUTAT STATE AP [USW00025339], Yakutat, AK
- (11) CORDOVA M K SMITH AP [USW00026410], Cordova, AK
- (12) MAIN BAY [USC00505604], Valdez, AK
- (13) SELDOVIA AP [USW00025516], Homer, AK
- (14) SKAGWAY AP [USW00025335], Skagway, AK

Influencing water features

Channel overbank flow and subsurface hydraulic connections are the main sources of water for this ecological site (Smith et al. 1995).

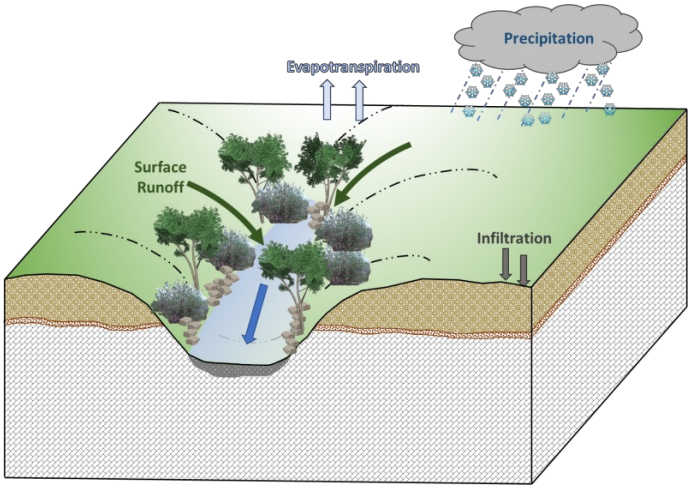


Figure 9. Hydrologic cycling in Subalpine Scrub Gravelly Drainageway ecological site.

Soil features

The soils are formed in alluvium and are a mixture of silt, sand, gravel, and cobbles.
Soil textures range from silt loam to sandy loam, often with lenses of coarser material in the soil profile. Rock fragments on the soil surface can be abundant following intense flooding events but are not always present on this

site. Rock fragments in the soil subsurface are highly variable, ranging between 10 and 50 percent of the soil profile by volume. Soils are deep with no restrictive layers. When flooded, these soils are saturated. However, as flooding subsides, these soils drain and are dry for much of the growing season. As a result, the soils are considered somewhat poorly to moderately well drained.

The soil moisture regime for these dry soils is udic. The temperature regime for this site is cryic, where the mean annual soil temperature is between 32°F and 46°F (USDA-NRCS 2006). Soils of this site are Entisols, further classified as Typic Cryofluvents.

Table 5. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Very fine sandy loam (2) Sandy loam (3) Silt loam
Family particle size	(1) Sandy-skeletal (2) Coarse-loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately rapid to rapid
Soil depth	60–0 in
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	2.3–5.5 in
Soil reaction (1:1 water) (0-10in)	4.5–6
Subsurface fragment volume <=3" (0-60in)	10–40%
Subsurface fragment volume >3" (0-60in)	0–20%

Table 6. Representative soil features (actual values)

Drainage class	Somewhat poorly drained to somewhat excessively drained
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-40in)	1.9–5.9 in
Soil reaction (1:1 water) (0-10in)	Not specified
Subsurface fragment volume <=3" (0-60in)	Not specified
Subsurface fragment volume >3" (0-60in)	Not specified

Ecological dynamics

The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and

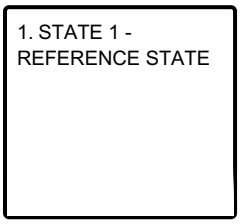
ecological processes are described to inform land management decisions.

This ecological site occurs on low order streams at high elevation. The primary disturbance for this site is flooding, which can either deposit sediment or erode surfaces within the flood plain. Flood plain positions closest to the active stream channel tend to get the most frequent and longest duration flood events. These proximal flood plain positions are commonly bare gravel bars and/or herbaceous communities. As height above and/or distance from the active stream channel increases, flood intensity and duration tend to decrease. These distal flood plain positions tend to be scrub dominant communities.

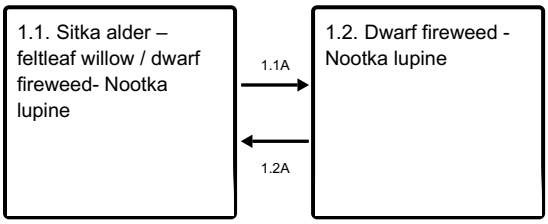
The state-and-transition model that follows provides a detailed description of each known state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - High-velocity flood

1.2A - Flood recovery

State 1
STATE 1 - REFERENCE STATE

The reference plant community is categorized as a shrubland community, dominated by tall shrubs. The two community phases within the reference state are maintained by flooding.

Community 1.1
Sitka alder – feltleaf willow / dwarf fireweed- Nootka lupine

Figure 10. Tall scrub community in Glacier Bay National Park and Preserve (Boggs et al. 2008).

This plant community is characterized as open tall scrub, which has 25 to 75 percent cover of shrubs 5 feet and taller. Dominant tall shrubs are Sitka alder and feltleaf willow. In areas that have more frequent and intense flooding, bare surface gravels are common with a diverse range of forbs with minimal cover. In areas that have less frequent and intense flooding, gravels become covered by a highly diverse range of shrubs and forbs species. Common understory species include netleaf willow, sprouting leaf willow, dwarf fireweed, and Nootka lupine.

Dominant plant species

- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- feltleaf willow (*Salix alaxensis*), shrub
- netleaf willow (*Salix reticulata*), shrub
- sprouting leaf willow (*Salix stolonifera*), shrub
- Aleutian mountainheath (*Phyllodoce aleutica*), shrub
- Alaska bellheather (*Harrimanella stelleriana*), shrub
- partridgefoot (*Luetkea pectinata*), shrub
- dwarf fireweed (*Chamerion latifolium*), other herbaceous
- Nootka lupine (*Lupinus nootkatensis*), other herbaceous
- arctic sweet coltsfoot (*Petasites frigidus*), other herbaceous
- Canadian burnet (*Sanguisorba canadensis*), other herbaceous

Community 1.2
Dwarf fireweed - Nootka lupine

This community phase occurs adjacent to active stream channel or after a high-intensity flood event removes woody vegetation. Exposed soil and bare rocks are the predominant ground cover. Vegetation is sparse and consists primarily of dwarf fireweed and Nootka lupine. New shoots of Sitka alder and feltleaf willow may begin to emerge.

Dominant plant species

- dwarf fireweed (*Chamerion latifolium*), other herbaceous
- Nootka lupine (*Lupinus nootkatensis*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

A flood events destroys and removes woody vegetation.

Pathway 1.2A
Community 1.2 to 1.1

Time and recovery after a flood.

Additional community tables

Animal community

The subalpine parkland zone of MLRA 222 provides desirable habitat opportunities for many wildlife species. The matrix of herbaceous meadows, low and tall shrubs, and small stands of stunted trees offer foraging opportunities and thermal and protective cover. Herbivores – such as Sitka deer (Odocoileus hemionus sitkensis), mountain goats (Oreamnos americanus), and hoary marmot (Marmota calligata) – readily graze the herbaceous meadows. Grouse (Dendragapus spp.) and ptarmigan (Lagopus spp.) utilize these meadows and low shrub communities for hunting insects. A small portion of bears (Ursus sp.), mostly sows with cubs, forage in this zone throughout the summer. Lastly, various songbirds will utilize the tall shrubs and stunted trees for nesting cover (Carsten 2007).

Inventory data references

No field plots were available for this site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in ecological site description.

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Contributors

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Approval

Marji Patz, 3/10/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/12/2025
Approved by	Marji Patz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
