Ecological site R220XY358AK
Subalpine Scrub Gravelly Dry Slopes

Last updated: 3/10/2025
Accessed: 05/11/2025

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

The Alexander Archipelago-Gulf of Alaska Coast area consists of a narrow arc of islands and lower elevation coastal mountains in the Southern Alaska Region. This area spans from the Alexander Archipelago in southeastern Alaska, north and west along the coast of the Gulf of Alaska and Prince William Sound, and further west to the southern tip of the Kenai Peninsula and the northeastern islands of the Kodiak Archipelago. The area makes up about 27,435 square miles (USDA 2006). The terrain primarily consists of low to moderate relief mountains that are deeply incised. Throughout the area glaciers, rivers, and streams have cut deep, narrow to broad valleys. The broader valleys have nearly level to strongly sloping flood plains and stream terraces. Alluvial and colluvial fans and short footslopes are common in the valleys along the base of the mountains. Rocky headlands, sea cliffs, estuaries, and beaches are common along the coast.

During the late Pleistocene epoch, the entire area was covered with glacial ice. The numerous fjords of the Alexander Archipelago and Prince William Sound were formed chiefly as a result of glacial scouring and deepening of preglacial river valleys. Most glacial deposits have been eroded away or buried by mountain colluvium and alluvium, which cover about 90 percent of the present landscape. The remaining glacial and glaciofluvial deposits are generally restricted to coastal areas. During the Holocene epoch, volcanic activity within and adjacent to this area deposited a layer of volcanic ash of varying thickness on much of the landscape in the southeastern and northwestern parts of the area. Paleozoic, Mesozoic, and Lower Tertiary stratified sedimentary rocks and Cretaceous and Tertiary intrusive rocks underlie much of the area and are exposed on steep mountain slopes and ridges (USDA 2006).

The dominant soil orders in this MLRA are Spodosols, Histosols, and Entisols. Soils in the area typically have a cryic soil temperature regime, an udic moisture regime, and have mixed minerology. Spodosols are common on mountains and hills having been formed in gravelly or cobbly colluvium, glacial till, and varying amounts of silty volcanic ash. These Spodosols commonly range from shallow to deep, are well to somewhat poorly drained, and typically classify as Humicryods or Haplocryods. Histosols that are poorly to very poorly drained occur on footslopes, discharge slopes, and valley floors. These wet histosols commonly classify as Cryosaprists, Cryohemists, and Cryofibrists. Histosols that are well drained occur on steep mountainsides. These dry Histosols commonly classify as Cryofolists. Entisols are common on flood plains, stream terraces, and outwash plains having been formed in silty, sandy, and gravelly to cobbly alluvium. These Entisols are generally deep, range from well to somewhat poorly drained, and commonly classify as Cryaquents and Cryofluvents. Miscellaneous (nonsoil) areas make up about 23 percent of this MLRA. The most common miscellaneous areas are chutes, rock outcrop, rubble land, beaches, riverwash, and water.

This area represents the Northern extent of the Pacific temperature rainforest and is characterized by productive stands of conifers. Western hemlock and Sitka spruce are the dominant trees on mountains and hills at lower elevations. Due to warmer temperatures, western red cedar and Alaska cedar are more prevalent in the southern portion of this area. Black cottonwood and mixed forest types occur on flood plains. Areas of peat and other sites that are too wet for forest growth support sedge-grass meadows and low scrub. As elevation increases, mountain

hemlock becomes the dominant tree in forested stands, which marks the transition to subalpine vegetation. The subalpine life zone typically occurs at elevations between 1500 to 3000 feet (Boggs et al. 2010, Carstensen 2007, Martin et al. 1995). Other common subalpine plant communities include tall alder scrub and bluejoint-forb meadows. Alpine vegetation occurs at even higher elevations, which marks the transition to the Southern Alaska Coastal Mountains Area (MLRA 222).

This area includes the Municipality of Juneau, Alaska's capital, and a number of smaller coastal towns and villages. Federally administered lands within this MLRA include Admiralty Island National Monument and part of Misty Fjords National Monument, Tongass National Forest, Chugach National Forest, and Glacier Bay, Wrangell-St. Elias, and Kenai Fjords National Parks and Preserves. The southern terminus of the Trans-Alaska Pipeline is in Valdez.

For many decades, logging, commercial fishing, and mining have been the primary industrial land uses throughout much of the area. In recent years, changes in public interests, land use policies, and timber economics have contributed to a significant decline in the timber industry. Commercial fishing continues to be an important industry and most communities support a fleet of boats and fishing related facilities. A number of mines operate in the area and others have been prospected and proposed. Tourism and wildland recreation are becoming increasingly important within the area. Subsistence hunting, fishing, and gathering provide food and a variety of other resources to local residents and remain the principal economy for residents of remote villages.

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 Mesic Herbaceous Meadow (CES204.163), Alaskan Pacific Maritime Alder-Salmonberry Shrubland (CES204.152) (NatureServe 2015)

Biophysical Settings: Alaskan Pacific Maritime Mesic Herbaceous Meadow (BpS 7816530), Alaskan Pacific Maritime Subalpine Alder-Salmonberry Shrubland (BpS 7816520) (LANDFIRE 2009)

Alaska Natural Heritage Program Landcover Class: Herbaceous (Mesic): Alpine and Subalpine Mesic Herbaceous, Low-Tall Shrub: Alder-Salmonberry (Boggs et al. 2016)

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

Ecological site concept

This subalpine site has soils prone to creep. This site occurs on mountain slopes at the highest subalpine bands of elevation before the true alpine life zone. This site occurs at a band of elevation with a harsh climate where trees are often stunted and grow in patches. The soils are dry for much of the growing season and are considered well to moderately well drained. The soils are gravelly and are typically formed in colluvium that is shallow to very deep. Since these soils are associated with creep, soils commonly have buried, mixed, and/or broken horizons. This site has a unique mosaic of tall scrub and meadow vegetation.

The reference plant community is a closed tall scrubland dominated by sitka alder and salmonberry (Landfire 2009). The understory vegetation is dominated by ferns species like common ladyfern and spreading woodfern. The meadow community is typically a mixture of grass and forb species like bluejoint, longawn sedge, fireweed, green false hellebore, and common cowparsnip (Boggs et al. 2008, Landfire 2009). The primary disturbance processes thought to maintain these plant communities are exposure to cold temperatures, soil creep that hinders tree growth and establishment, thick creeping snowpack that crushes woody vegetation, and avalanches (Carstensen 2007, NatureServe 2018).

Associated sites

F220XY205AK	**Subalpine Woodlands Gravelly Moist Slopes** Occurs on similar bands of elevation on wetter soils.
F220XY350AK	**Subalpine Woodland Gravelly Dry Slopes** Occurs on similar bands of elevation on drier soils not prone to soil creep.
F220XY202AK	**Subalpine Woodlands Gravelly Dry Slopes, Limestone** Occurs on similar bands of elevation on calcareous limestone bedrock.

Similar sites

F220XY205AK	**Subalpine Woodlands Gravelly Moist Slopes** Both sites occur in a similar band of elevation. However, F220XY205AK typically has a woodland dominated by mountain hemlock and an understory dominated by copperbush and wetland indicators species.
F220XY350AK	**Subalpine Woodland Gravelly Dry Slopes** Both sites occur in a similar band of elevation. However, F220XY350AK typically has a woodland dominated by mountain hemlock and an understory dominated by ericaceous dwarf shrubs.
R220XY349AK	**Subalpine Scrub Gravelly Dry Chutes** Both sites have tall scrub plant communities. R220XY349AK is restricted to subalpine avalanche chutes.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Alnus viridis ssp. sinuata* (2) *Rubus spectabilis*
Herbaceous	(1) *Dryopteris expansa* (2) *Athyrium filix-femina*

Physiographic features

This site occurs on mountain backslopes and shoulders at elevations approaching treeline, which typically occurs between 1350 and 3000 feet depending on slope and aspect. This site likely occurs at much higher elevations on warm southerly slopes and at much lower elevations on cold northernly slopes. Slopes are very steep ranging from 65 to 90 percent. This site does not experience flooding or ponding, but rather generates runoff to adjacent, downslope ecological sites.

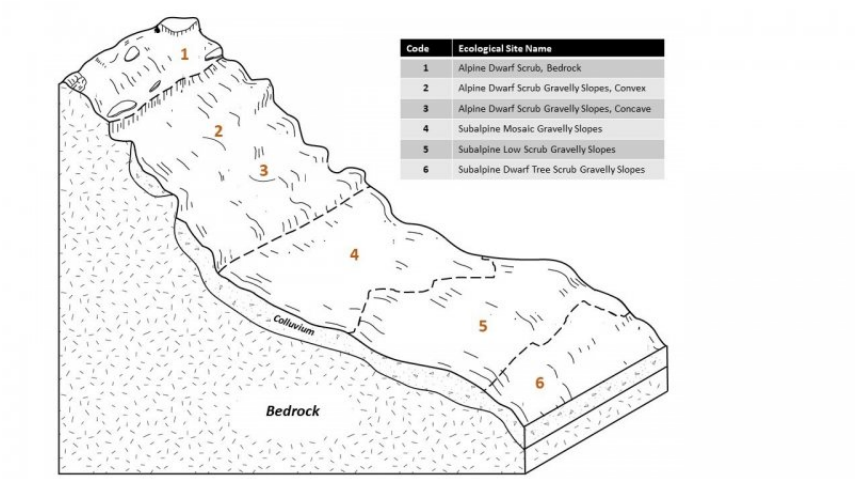


Figure 1. Representative block diagram of Subalpine Mosaic Gravelly Slopes and associated ecological sites.

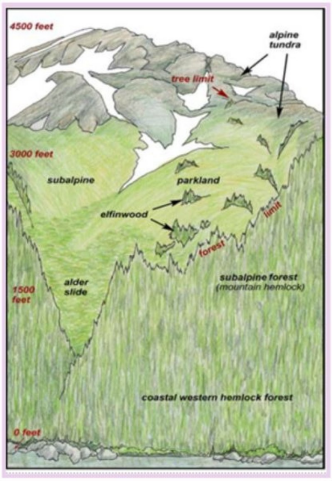


Figure 2.

Table 2. Representative physiographic features

Geomorphic position, mountains	(1) Mountainflank
Hillslope profile	(1) Backslope (2) Shoulder
Landforms	(1) Mountains > Mountain (2) Mountains > Mountain slope
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,350–3,000 ft
Slope	65–90%
Water table depth	0 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	None to frequent
Ponding frequency	Not specified
Elevation	1,000–4,500 ft
Slope	25–100%
Water table depth	12–0 in

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

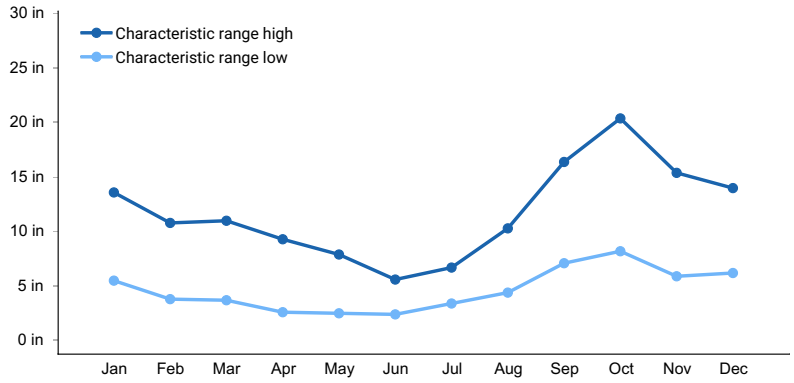


Figure 3. Monthly precipitation range

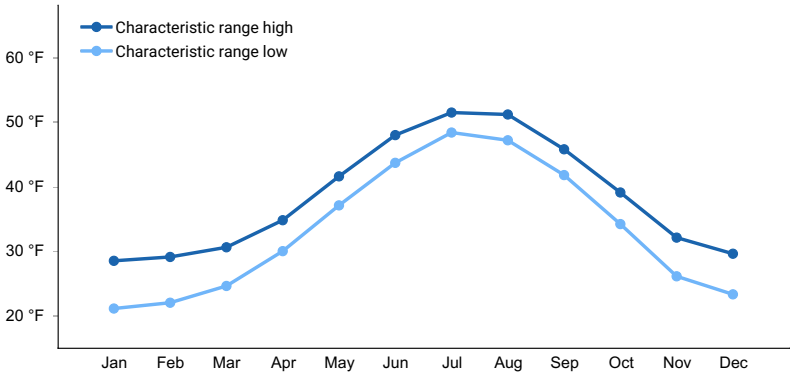


Figure 4. Monthly minimum temperature range

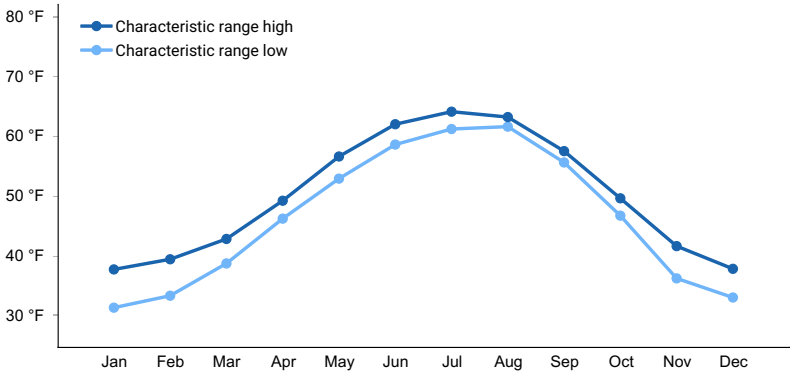


Figure 5. Monthly maximum temperature range

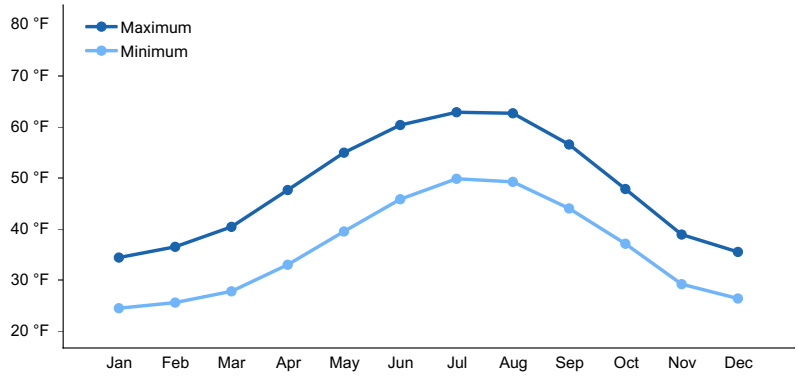


Figure 6. Monthly average minimum and maximum temperature

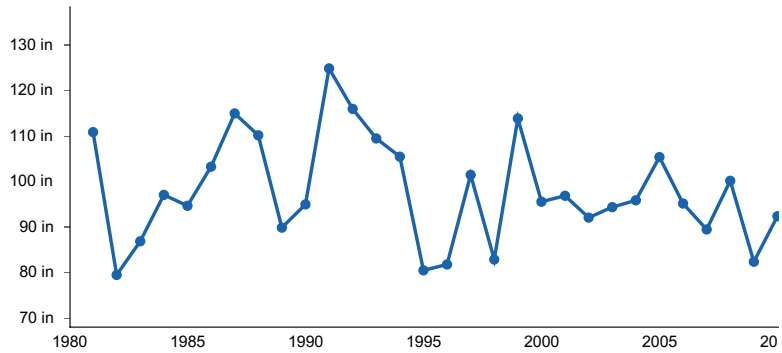


Figure 7. Annual precipitation pattern

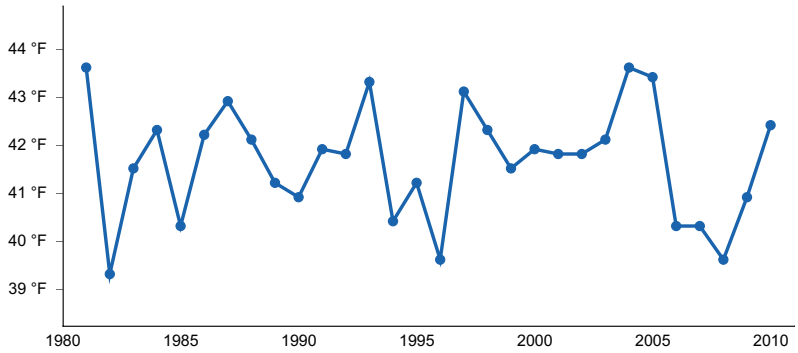


Figure 8. Annual average temperature pattern

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) GLACIER BAY [USC00503294], Gustavus, AK
- (8) GUSTAVUS [USW00025322], Gustavus, AK
- (9) HAINES AP [USW00025323], Haines, AK
- (10) SKAGWAY AP [USW00025335], Skagway, AK
- (11) YAKUTAT STATE AP [USW00025339], Yakutat, AK
- (12) CORDOVA M K SMITH AP [USW00026410], Cordova, AK
- (13) MAIN BAY [USC00505604], Valdez, AK
- (14) SELDOVIA AP [USW00025516], Homer, AK

Influencing water features

Due to its landscape position, this site has dry soil. This site is neither associated with or influenced by streams or wetlands. Precipitation is the main source of water for this ecological site. Infiltration is very slow, and surface runoff is high. Surface runoff contributes some water to downslope ecological sites.

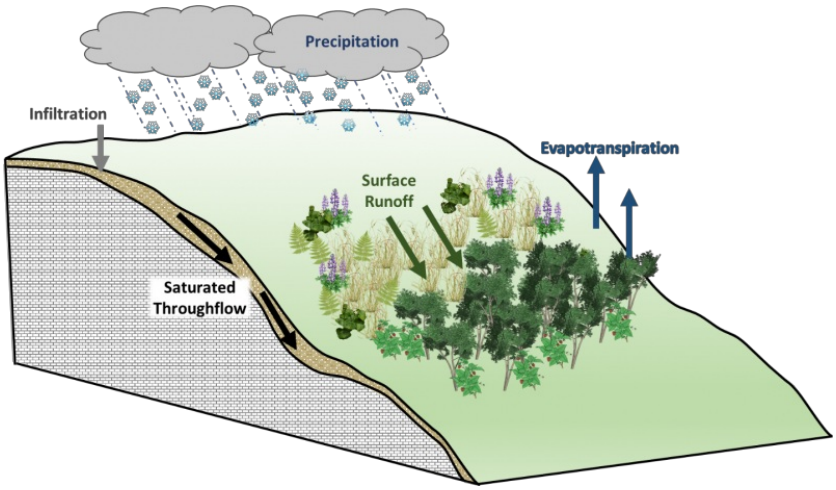


Figure 9. Hydrologic cycling in Subalpine Mosaic Gravelly Slopes ecological site.

Soil features

This site occurs on shallow to very deep soils. Bedrock-controlled soils typically formed in gravelly colluvium. The bedrock most commonly occurs between 15 and 40 inches. Deeper soils typically formed in gravelly colluvium and occasionally volcanic ash over till. Rock fragments do not usually occur on the soil surface. Rock fragments in the soil subsurface are variable and most commonly range between 30 and 40 percent of the soil profile by volume.

Soils are dry and are classified as moderately well to well drained. The soil moisture regime 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 ecological site are most commonly Inceptisols and occasionally Spodosols and Andisols.

Table 5. Representative soil features

Parent material	(1) Colluvium (2) Volcanic ash (3) Till
Surface texture	(1) Gravelly sandy loam (2) Gravelly loam (3) Sandy loam (4) Loam (5) Very fine sandy loam (6) Silt loam
Family particle size	(1) Loamy-skeletal
Drainage class	Moderately well drained to well drained
Permeability class	Moderately rapid to rapid
Depth to restrictive layer	15–0 in
Soil depth	15–0 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	0.2–4.1 in
Soil reaction (1:1 water) (0-10in)	3.5–6.5

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	Not specified
Permeability class	Not specified
Depth to restrictive layer	6–0 in
Soil depth	6–0 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	0.2–6.8 in
Soil reaction (1:1 water) (0-10in)	3.5–6.5
Subsurface fragment volume <=3" (0-60in)	10–40%
Subsurface fragment volume >3" (0-60in)	0–20%

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 mountain slopes with creeping soils at the highest bands of subalpine vegetation. While the subalpine life zone typically occurs between 1500 and 3000 feet of elevation, subalpine vegetation in this area can be split into various subzones. Located in the subalpine parkland subzone (Carstensen 2007) just below treeline and the true alpine life zone, this site is exposed to a variety of harsh environmental conditions that drive and maintain the reference state plant communities.

A mosaic of tall shrubs and herbaceous meadows is the characteristic vegetation of this ecological site. Cold temperatures and high winds prevent the trees from growing tall. Soil creep, creeping snowpack that crushes woody vegetation, and avalanche are disturbances believed to impact reference state plant communities (Carstensen 2007; NatureServe 2018).

Creep is the very slow mass movement of unconsolidated earthy materials down slope due to free-thaw action. During spring melt, saturated unfrozen soils slowly slip downslope over frozen soils. This free-thaw action can cause displacement and/or incorporation of materials from one soil horizon to another (Poulenard and Podwojewski 2004). Creep is believed to hinder the establishment and growth of tree seedlings and promote a tall scrub community dominated by alder and salmonberry. Meadows can occur within these tall scrub communities.

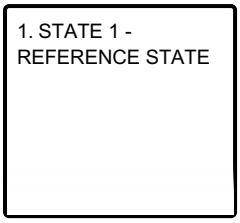
Creeping snowpack and avalanche are additional disturbances that can remove and kill tall scrub and tree species (Carstensen 2007). Forbs and graminoids, which have stems that senesce in the fall, are not impacted to the same degree by either disturbance. In fact, the removal of woody species creates favorable growing conditions, like increased sunlight, that likely promote the establishment and growth of a diverse range of herbaceous species. These herbaceous meadows can be recolonized by tall scrub species (Carstensen 2007).

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

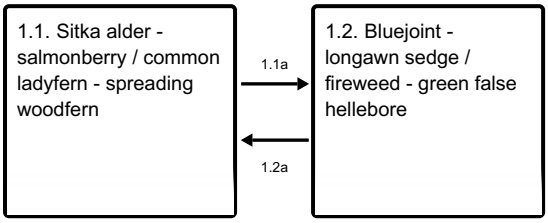
reviews, professional consensus, and interpretations.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1a - Avalanche and snowpack creep

1.2a - Recolonization

State 1
STATE 1 - REFERENCE STATE

The reference state has two plant communities: tall scrub and herbaceous meadow. These plant communities are maintained by soil creep, snowpack creep, and avalanche.

Community 1.1
Sitka alder - salmonberry / common ladyfern - spreading woodfern

The plant community is characterized as closed tall scrub, which has 75 percent or greater cover of shrubs 5 feet and taller. At times, these tall shrubs are patchy and range down to 25 percent cover. Dominant shrubs are Sitka alder and salmonberry. Other common understory species include red elderberry, copperbush, devilsclub, common ladyfern, and spreading woodfern.

Dominant plant species

- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- red elderberry (*Sambucus racemosa*), shrub
- copperbush (*Elliottia pyroliflora*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- spreading woodfern (*Dryopteris expansa*), other herbaceous
- long beechfern (*Phegopteris connectilis*), other herbaceous
- field horsetail (*Equisetum arvense*), other herbaceous
- claspleaf twistedstalk (*Streptopus amplexifolius*), other herbaceous
- pioneer violet (*Viola glabella*), other herbaceous

Community 1.2
Bluejoint - longawn sedge / fireweed - green false hellebore

This community is characterized by an herbaceous meadow. Common species include bluejoint, fireweed, and cow parsnip. These herbaceous meadows can be diverse with additional common species including longawn sedge, nootka lupine, Sitka valerian, wooly geranium, larkspurleaf monkshood, broadpetal gentian, and narcissus

anemone.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- longawn sedge (*Carex macrochaeta*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous
- green false hellebore (*Veratrum viride*), other herbaceous
- common cowparsnip (*Heracleum maximum*), other herbaceous
- Nootka lupine (*Lupinus nootkatensis*), other herbaceous
- Sitka valerian (*Valeriana sitchensis*), other herbaceous
- woolly geranium (*Geranium erianthum*), other herbaceous
- larkspurleaf monkshood (*Aconitum delphiniifolium*), other herbaceous
- Alaska Indian paintbrush (*Castilleja unalaschcensis*), other herbaceous
- Canadian burnet (*Sanguisorba canadensis*), other herbaceous
- broadpetal gentian (*Gentiana platypetala*), other herbaceous
- fir clubmoss (*Huperzia selago*), other herbaceous
- narcissus anemone (*Anemone narcissiflora*), other herbaceous
- whorled lousewort (*Pedicularis verticillata*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.2

Avalanche and snowpack creep remove tall scrub vegetation.

Pathway 1.2a
Community 1.2 to 1.1

Recolonization and growth of tall scrub species.

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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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	05/11/2025
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):**

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

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17. **Perennial plant reproductive capability:**
