Ecological site R220XY443AK
Maritime Scrub Loamy Steep Slopes

Last updated: 3/10/2025
Accessed: 05/13/2025

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.

Ecological site concept

This site occurs in avalanche chutes characterized by linear/concave features of steep mountain slopes. Avalanche chutes typically occur on the center third of mountain flanks on slopes ranging from 40-100%. The soils of this site are very cobbly sandy loams that formed in colluvium. Rock fragments may or may not be present on the soil surface, but typically compose about 80% of the soil volume below the surface. Bedrock is sometimes present at depths of 20 inches or greater.
This site supports two distinctive plant communities driven by avalanche activity. The most common community phase is an open tall scrub community dominated by Sitka alder, and the other is an early seral mesic forb herbaceous community that establishes following an avalanche. Trees may establish in this site given sufficient time without avalanches.

Associated sites

R220XY446AK	**Maritime Scrub Loamy Escarpments** Ecological site R220XY446AK supports a similar plant community but occurs on escarpments on steep, shallow to moderately-deep soils.

Similar sites

R220XY446AK	**Maritime Scrub Loamy Escarpments** Site R220XY446AK occurs on steep mountain slopes dominated by alder, but lacks avalanches as a disturbance driver.
R220XY465AK	**Maritime Scrub Loamy Slopes** Site R220XY465AK is also dominated by alder, but occurs on mountain slopes with less than 50% slope, and lacking avalanches as a disturbance driver.

Table 1. Dominant plant species

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

Physiographic features

This site occurs in avalanche chutes characterized by linear/concave features of steep mountain slopes. Avalanche chutes typically occur on the center third of mountain flanks on slopes ranging from 40-100%. Elevations range from 70-1000 feet above sea level.

Figure 1. Avalanche chutes in Glacier Bay National Park and Preserve. These avalanche chutes are common throughout this MLRA.

Table 2. Representative physiographic features

Geomorphic position, mountains	(1) Center third of mountainflank
Slope shape across	(1) Concave
Slope shape up-down	(1) Linear
Landforms	(1) Mountains > Avalanche chute
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	21–305 m
Slope	40–100%
Water table depth	152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	21–305 m
Slope	40–100%
Water table depth	Not specified

Climatic features

Cloudy skies, moderate temperatures, and abundant rainfall characterize the temperate maritime climate of this site. Frequent winter storms may consist of snow or heavy rainfall. Moderate to strong winds from the south and southeast are common before and during storms throughout the year. Annual precipitation ranges from 44-94 inches, and annual snowfall ranges from 30-70 inches along the coast and up to 200 inches at higher elevations (USDA 2006). The average annual temperature at lower elevations ranges from about 38-43 degrees F (3-6 degrees C). The frost-free period ranges from about 90-140 days, and the freeze-free period ranges from about 125-180 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)	1,397-3,683 mm
Frost-free period (actual range)	84-170 days
Freeze-free period (actual range)	119-218 days
Precipitation total (actual range)	889-4,369 mm
Frost-free period (average)	120 days
Freeze-free period (average)	168 days
Precipitation total (average)	2,464 mm

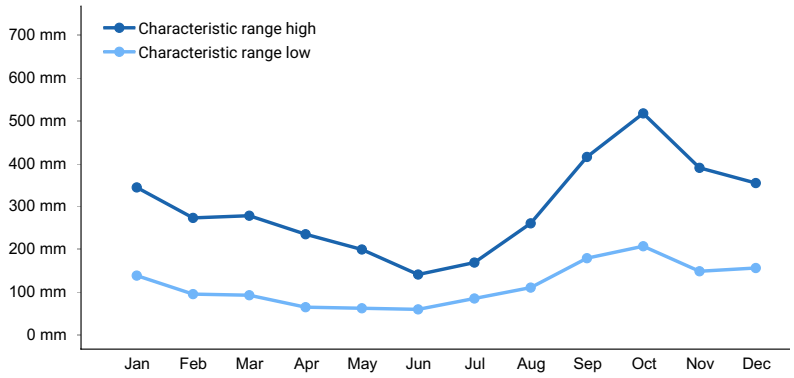


Figure 2. Monthly precipitation range

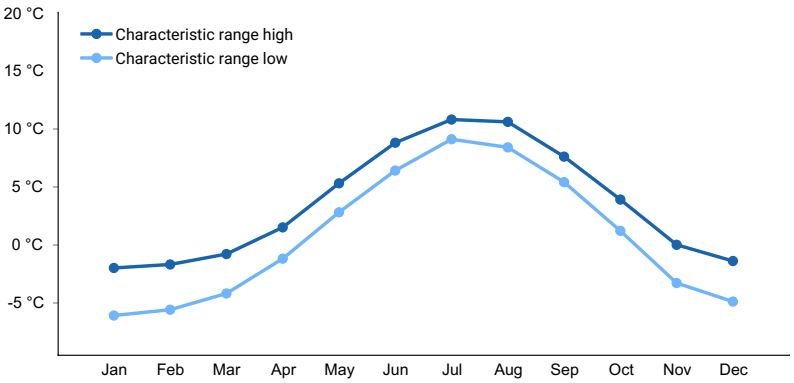


Figure 3. Monthly minimum temperature range

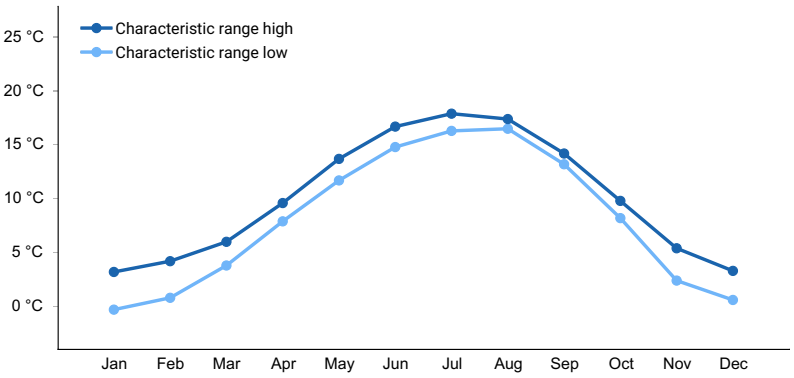


Figure 4. Monthly maximum temperature range

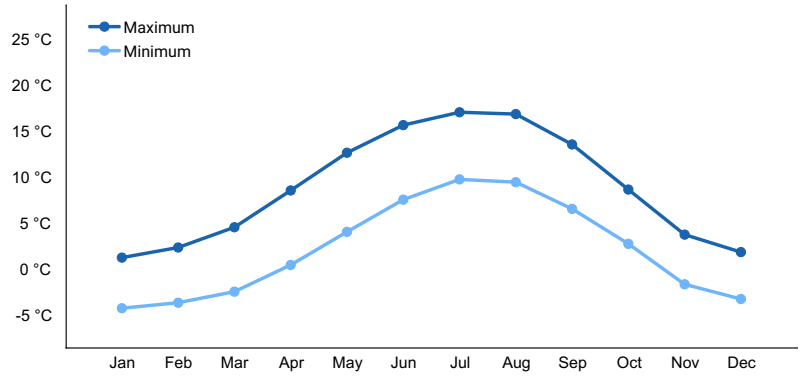


Figure 5. Monthly average minimum and maximum temperature

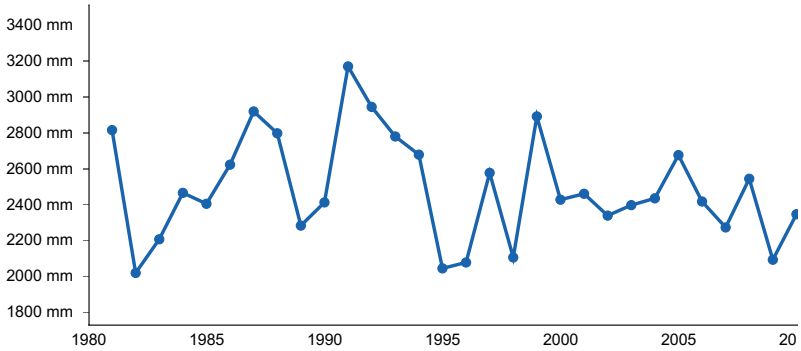


Figure 6. Annual precipitation pattern

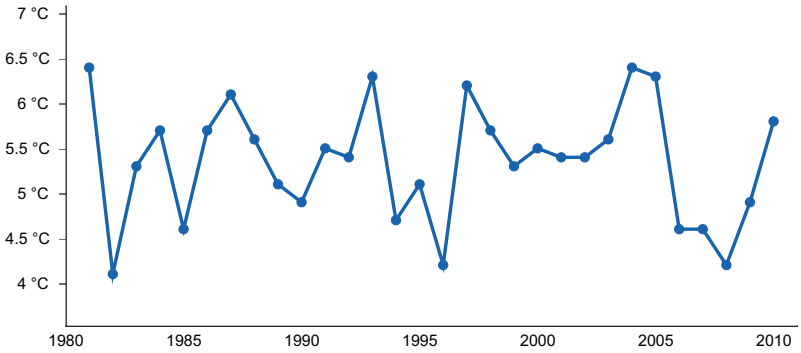


Figure 7. Annual average temperature pattern

Climate stations used

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

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands. This site readily sheds water to lower portions of the landscape.

Soil features

The soils of this site are very cobbly sandy loams that formed in colluvium. Rock fragments may or may not be present on the soil surface, but typically compose about 80% of the soil volume below the surface. Bedrock is sometimes present at depths of 20 inches or greater. These soils are well-drained with a low water-holding capacity. The soil moisture regime is Udic and the soil temperature regime is cryic.

Figure 8. Typical soil profile for Abdallah soils in the Glacier Bay National Park and Preserve-Gustavus Area, Alaska (AK692): Abdallah and Enigma.

Figure 9. Typical soil profile for Enigma soils in the Glacier Bay National Park and Preserve-Gustavus Area, Alaska (AK692): Abdallah and Enigma.

Table 5. Representative soil features

Parent material	(1) Colluvium
Surface texture	(1) Very cobbly sandy loam (2) Extremely cobbly sandy loam (3) Extremely gravelly sandy loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Rapid
Depth to restrictive layer	51 cm
Soil depth	51 cm
Surface fragment cover <=3"	0%

Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	1.27–4.06 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Clay content (0-50.8cm)	5–8%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.3–8.4
Subsurface fragment volume <=3" (0-152.4cm)	5–28%
Subsurface fragment volume >3" (0-152.4cm)	53–79%

Table 6. Representative soil features (actual values)

Drainage class	Well drained
Permeability class	Rapid
Depth to restrictive layer	51 cm
Soil depth	51 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	1.27–4.06 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Clay content (0-50.8cm)	5–8%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.3–8.4
Subsurface fragment volume <=3" (0-152.4cm)	5–65%
Subsurface fragment volume >3" (0-152.4cm)	20–79%

Ecological dynamics

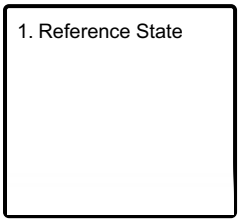
Avalanches are common on mountains in this area. These events generally occur during or following periods of high precipitation during winter into early summer. Avalanches take the path of least resistance as they travel downslope, commonly coalescing from small drainageways in the alpine and subalpine areas to broader, deeper drainageways and finally spreading out in runout zones on the mountain toeslopes and coastal plains.

This ecological site is specifically associated with the avalanche chutes of these mountains, where avalanches

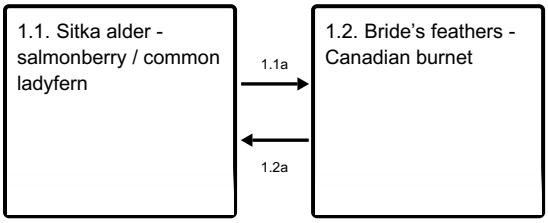
commonly occur and are very destructive. Depending on the intensity and severity of the avalanches, complete removal of trees, shrubs, and most vegetation can occur (Walsh et al.1994). The frequency and intensity of avalanches is influenced by a myriad of factors, including terrain, climate, snowpack, slope, aspect, elevation, and vegetation. In areas that are subject to frequent avalanches, associated vegetation is largely herbaceous. In areas that are subject to less frequent avalanches, shrubs develop and trees may become established.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1a - Avalanche

1.2a - Natural colonization and succession

State 1
Reference State

The reference state supports two distinctive plant communities. The most common community phase is an open tall scrub community dominated by Sitka alder, and the other is an early seral mesic forb herbaceous community that establishes following an avalanche.

Resilience management. This state has been observed to be resilient and/or resistant to current disturbance drivers, lacking alternative states and at-risk communities.

Dominant plant species

- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- bride's feathers (*Aruncus dioicus*), other herbaceous

Community 1.1
Sitka alder - salmonberry / common ladyfern

This community is characterized as open tall scrub dominated by Sitka alder. Other common species include salmonberry, bride’s feathers, spreading woodfern, and common ladyfern. Mountain hemlock, western hemlock, and Sitka spruce are capable of establishing on this site in small amounts given enough time without an avalanche. The soil surface is a mixture of herbaceous debris, rock fragments, and moss.

Dominant plant species

- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- common ladyfern (*Athyrium filix-femina*), other herbaceous

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	0%
Forb basal cover	0%
Non-vascular plants	0-15%
Biological crusts	0%
Litter	20-95%
Surface fragments >0.25" and <=3"	0-20%
Surface fragments >3"	0-70%
Bedrock	0%
Water	0%
Bare ground	0%

Community 1.2
Bride’s feathers - Canadian burnet

This community is characterized as mesic forb herbaceous, not dominated by any particluar species. Common species include bride’s feathers, Canadian burnet, Hornemann’s willowherb, alpine heuchera, and fringed grass of Parnassus.

Dominant plant species

- bride's feathers (*Aruncus dioicus*), other herbaceous
- Canadian burnet (*Sanguisorba canadensis*), other herbaceous

Table 8. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	0%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	0-20%
Surface fragments >0.25" and <=3"	5-20%
Surface fragments >3"	30-60%
Bedrock	0%
Water	0%
Bare ground	30-50%

Pathway 1.1a
Community 1.1 to 1.2

Sitka alder - salmonberry / common ladyfern

Bride’s feathers - Canadian burnet

Avalanche of sufficient energy to shear the roots of woody species.

Pathway 1.2a
Community 1.2 to 1.1

Bride's feathers - Canadian burnet

Sitka alder - salmonberry / common ladyfern

Time since avalanche, sufficient for establishment of woody species.

Additional community tables

Table 9. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
western hemlock	TSHE	*Tsuga heterophylla*	Native	–	0–15	–	–
Sitka spruce	PISI	*Picea sitchensis*	Native	–	0–5	–	–

Table 10. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)

Table 11. Community 1.2 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)

Inventory data references

All data currently reside in NASIS under the User Site IDs in the following table:
NASIS ID Plant Community
13TD03702 Community 1.1
13TD02503 Community 1.1
13TD00303 Community 1.1
13NP01302 Community 1.1
13NP00701 Community 1.1
13TD02502 Community 1.2

Other references

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Soil Survey Division Staff. 2017. Soil survey manual. U.S. Department of Agriculture Handbook 18.

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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	05/13/2025
Approved by	Marji Patz
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:**

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:**
