

## **Ecological site R220XY329AK Estuarine Herbaceous Tidal Marsh**

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

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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): 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.

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. 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 (non-soil) areas make up about 23 percent of the MLRA. The most common miscellaneous areas are avalanche chutes, rock outcrop, rubble land, beaches, river wash, 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 the lower elevations. Due to warmer temperatures, western red cedar and Alaska cedar are more prevalent in the southern part of the 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. The transition to subalpine and alpine communities typically occurs at elevations between 1500 to 3000 feet (Boggs et al. 2010, Carstensen 2007, Martin et al. 1995), which characterize the vegetation of the Southern Alaska Coastal Mountains area.

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. 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.

## Ecological site concept

This site occurs in tidal areas associated with coastal rivers and flats that are frequently flooded by high ocean tides. Seawater mixes with freshwater on this site, resulting in brackish conditions that favor salt-tolerant plant species. Soil formed in marine deposits, and textures are typically silt loams or silty clay loams at the surface, and often increase in rock fragments and sand content in deeper soil horizons. These soils are poorly- to very poorly-drained, and occupy the space between barren mudflats downslope and drier terraces and dunes upslope.

The reference community phase is a wet graminoid herbaceous community is dominated by salt-tolerant Lyngbye's sedge (*Carex lyngbyei*). Other common species are sea milkwort, alkali buttercup, seaside arrowgrass, saltmarsh starwort, silverweed cinquefoil, and tufted hairgrass.

## Associated sites

R220XY422AK	<b>Estuarine Herbaceous Dry Sand</b> Site R220XY422AK occurs on sandy dunes and marine terraces in estuarine settings that rarely flood or pond, just upslope from this site.
R220XY424AK	<b>Estuarine Herbaceous Sandy Beach Plain</b> Site R220XY424AK occurs on marine terraces in estuarine settings that no longer flood or pond due to natural uplift of the land mass caused by isostatic rebound following glacial retreat.
R220XY450AK	<b>Estuarine Herbaceous Loamy Floodplain</b> Site R220XY450AK occurs in similar estuarine settings on soils with coarser textures and better drainage than this site.

## Similar sites

R220XY450AK	<b>Estuarine Herbaceous Loamy Floodplain</b> Site R220XY450AK occurs in similar estuarine settings, but in coarser alluvium soils rather than silty marine soils. As a result, site R220XY450AK is better drained and supports American dunegrass instead of Lyngbye's sedge.
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**Table 1. Dominant plant species**

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Carex lyngbyei</i> (2) <i>Glaux maritima</i>

## Physiographic features

This site occurs in tidal areas along the coast that are frequently flooded by high ocean tides. Flooding is very brief, but may result in long duration ponding in low depressions. The water table is typically within 24 inches of the soil

surface at high tide. Slopes range from 0-5% and elevations are typically less than 20 feet above sea level.

**Table 2. Representative physiographic features**

Landforms	(1) Shore complex > Tidal marsh (2) Shore complex > Fluvio-marine bottom (3)
Runoff class	Medium
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Frequent to very frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	0–20 ft
Slope	0–3%
Water table depth	0–24 in
Aspect	W, NW, N, NE, E, SE, S, SW

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

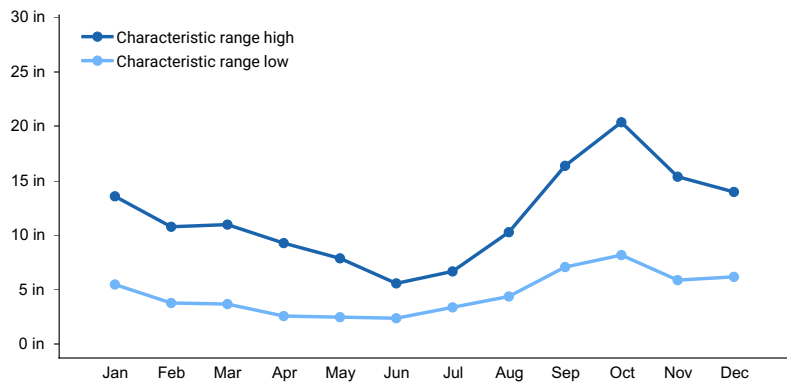
Runoff class	Medium
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Frequent to very frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	0–100 ft
Slope	0–5%
Water table depth	0–24 in

## Climatic features

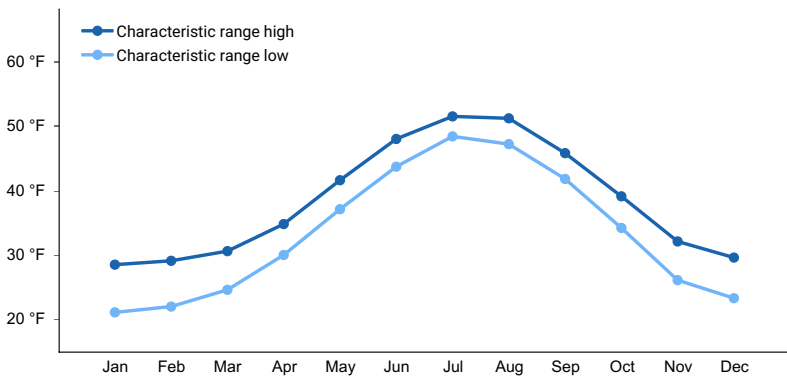
Cloudy skies, moderate temperatures, and abundant rainfall characterize the temperate maritime climate of this site. Frequent winter storms may consist of snow or heavy rainfall. Moderate to strong winds from the south and southeast are common before and during storms throughout the year. Annual precipitation 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**

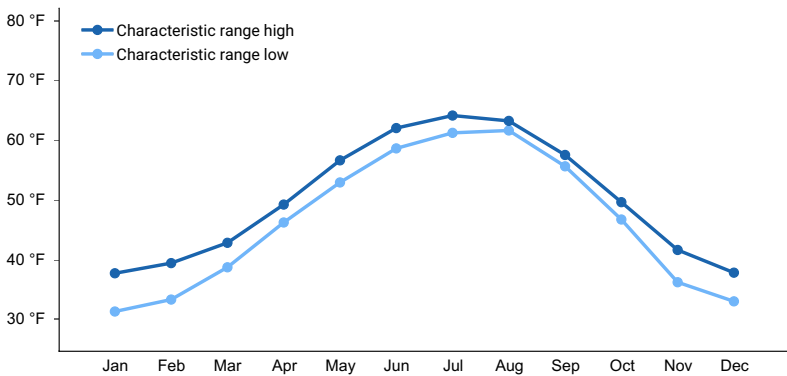
Frost-free period (characteristic range)	95-142 days
Freeze-free period (characteristic range)	147-183 days
Precipitation total (characteristic range)	55-145 in
Frost-free period (actual range)	84-170 days
Freeze-free period (actual range)	119-218 days
Precipitation total (actual range)	35-172 in
Frost-free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



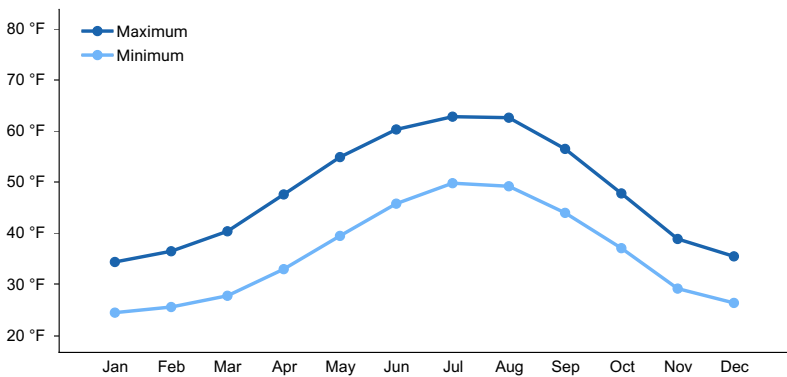
**Figure 1. Monthly precipitation range**



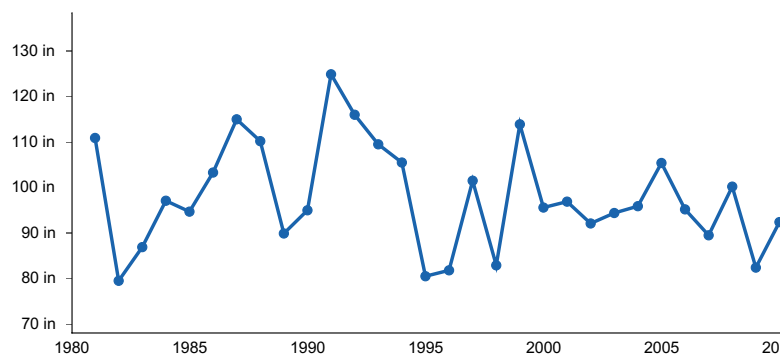
**Figure 2. Monthly minimum temperature range**



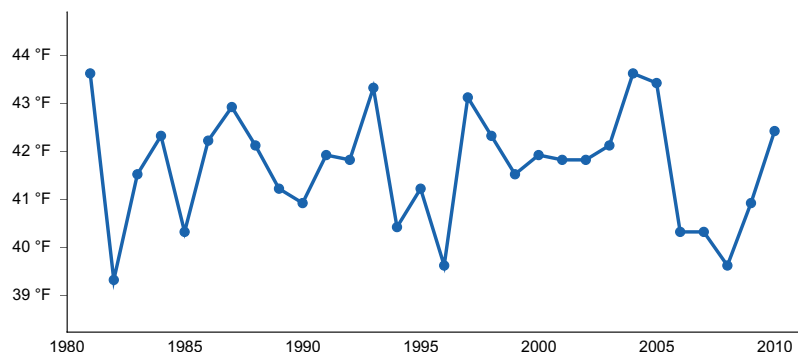
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. 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

The hydrology of this site is characterized by ocean tides that rise and recede twice each day. The water table fluctuates with the tides, but typically occurs within 24 inches of the soil surface at high tide. High tides frequently flood the site with saltwater, though flood frequency and duration decrease with increasing elevation. Low depressions within the tidal marsh landform are frequently ponded with saltwater for long durations. Evaporation of ocean water can result in salt concentrations near the soil surface, especially in areas where flooding or ponding duration are greatest. However, the high precipitation this region limits the cumulative salt concentration on this site compared to tidal marshes in drier climates.

## Soil features

The soils of this site formed in deep marine deposits in tidal landscape positions. Soil textures are typically silt loams or silty clay loams at the surface, and often increase in rock fragments and sand content in deeper soil horizons. A thin layer of peat may cap the soil surface. Electrical conductivity ranges from 0-5, and is highest in

portions of the site where ponding or flooding duration are longest, particularly depressions. The soils of this site are poorly- to very poorly-drained throughout and have an aquic soil moisture regime.



**Figure 7. Typical soil profile of Beartrack soil component. This soil is wetter when compared to Astrolable soils.**



**Figure 8. Typical soil profile of Astrolable soil component. This soil is drier when compared to Beartrack soils.**

**Table 5. Representative soil features**

Parent material	(1) Marine deposits (2) Estuarine deposits
Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Coarse-silty (2) Sandy-skeletal
Drainage class	Very poorly drained to poorly drained
Permeability class	Moderately slow to moderately rapid
Depth to restrictive layer	60 in
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	0.5–2.3 in
Calcium carbonate equivalent (0-40in)	0%

Clay content (0-20in)	10–25%
Electrical conductivity (0-10in)	0–6 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (0-60in)	0–40%
Subsurface fragment volume >3" (0-60in)	0–10%

**Table 6. Representative soil features (actual values)**

Drainage class	Very poorly drained to poorly drained
Permeability class	Moderately slow to moderately rapid
Depth to restrictive layer	60 in
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	0–2.3 in
Calcium carbonate equivalent (0-40in)	0–5%
Clay content (0-20in)	10–25%
Electrical conductivity (0-10in)	0–6 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (0-60in)	0–55%
Subsurface fragment volume >3" (0-60in)	0–10%

## Ecological dynamics

This site is associated with estuaries along the Gulf of Alaska. Until about 10,000 years ago, this area had many continental-scale ice sheets that advanced and retreated many times over millennia (Chapin 1994). The final advance of these glaciers occurred during the Little Ice Age, which peaked about 1750 AD. Since then, many glaciers have thinned and retreated inland, while numerous tidewater glaciers still exist in the area (Lawson 2015). The 250-year glacial retreat is attributed to less regional snowfall in the mountains, rising winter temperatures, and decreased cloud cover and lower precipitation during the growing season in summer (Hall et al. 2003).

During the past 250 years of glacial retreat, meltwater transported and deposited a large amount of silt and sediment via numerous short, high-gradient rivers. Alluvial and colluvial fans and long footslopes are common in the valleys along the base of the mountains. Drainageways dissect these fans and flats, which ultimately feed into the streams, rivers, and estuaries along the coastal plain.

This site is associated with these estuarine coastal plains. Estuaries are subject to tidal flooding and ponding as seawater mixes with fresh water to create brackish conditions. During high tides, brackish water extends upriver into tidal flood plains and marshes several miles inland from the coast. As elevation and distance from the tidal influence increase, the proportion of salt-tolerant species decrease.

Ocean tides are the primary drivers of species composition and diversity on this site because of their impact on hydrology and soil salinity . Estuarine plant species are salt-tolerant, and they also slow and redirect tidal energy, collect sediment, and stabilize soils (Bromberg-Gedan et al. 2009). The diversity of plant species is commonly low on this site, since the flora must be adapted to soils with high salinity and periods of inundation (Bertness et al. 2002).

## State and transition model

# R220XY329AK - Estuarine Herbaceous Tidal Marsh

## 1. Reference State

**Community Phase 1.1**  
**Lyngbye's sedge / sea milkwort-alkali buttercup**  
*Alaska vegetation classification: Wet graminoid herbaceous*

## State 1 Reference State



Figure 9. Phase 1.1 dominated by *Carex lyngbyei*

The reference state has one documented plant community dominated by Lyngbye's sedge. Other common species are sea milkwort, alkali buttercup, seaside arrowgrass, saltmarsh starwort, silverweed cinquefoil, and tufted hairgrass.

**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

- Lyngbye's sedge (*Carex lyngbyei*), grass

### Community 1.1

#### Lyngbye's sedge / sea milkwort-alkali buttercup



Figure 10. Typical plant community associated with community 1.1

This wet graminoid herbaceous community is dominated by salt-tolerant Lyngbye's sedge (*Carex lyngbyei*). Other common species are sea milkwort, alkali buttercup, seaside arrowgrass, saltmarsh starwort, silverweed cinquefoil, and tufted hairgrass. Silverweed cinquefoil may be more abundant following flood events that scour the soil substrate. The vegetative stratum for this community is mostly medium graminoids (4 to 24 inches in height).

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

### Dominant plant species

- Lyngbye's sedge (*Carex lyngbyei*), grass

Table 7. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	70-100%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0-30%
Bare ground	0-5%

### Additional community tables

Table 8. Community 1.1 forest understory composition

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

## Inventory data references

All data currently reside in NASIS under the User Site IDs in the following table:

## Other references

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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:**

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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:**

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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:**

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