Ecological site R237XY222AK
Western Alaska Maritime Scrubland Loamy Hummocks

Last updated: 7/23/2020
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): 237X–Ahklun Mountains

The Ahklun Mountains Major Land Resource Area (MLRA 237) is in western Alaska (fig. 1). This MLRA covers approximately 14,555 square miles, and it includes the mountains, hills, and valleys of the Kilbuck Mountains in the north and the Ahklun Mountains in the south. Except for the Kilbuck Mountains and the highest ridges of the Ahklun Mountains, the MLRA was extensively glaciated during the Pleistocene (Kautz et al., 2004). Today, a few small glaciers persist in mountainous cirques (Gallant et al., 1995). The present-day landscape and landforms reflect this glacial history; glacial moraines and glacial drift cover much of the area (USDA-NRCS, 2006). The landscape of the MLRA is primarily defined by low, steep, rugged mountains cut by narrow-to-broad valleys. Flood plains and terraces of varying sizes are common at the lower elevations in the valley bottoms. Glacially carved valleys host many lakes. Togiak Lake is one of the largest lakes in the region. It is 13 miles long and about 9,500 acres in size. Major rivers include the Goodnews, Togiak, Kanektok, Osviak, Eek, and Arolik Rivers. Where the Goodnews and Togiak Rivers reach the coast, the nearly level to rolling deltas support numerous small lakes.

This MLRA has two distinct climatic zones: subarctic continental and maritime continental (fig. 2). The high-elevation areas are in the subarctic continental zone. The mean annual precipitation is more than 75 inches, and the mean annual air temperature is below about 27 degrees F (-3 degrees C) in extreme locations. The warmer, drier areas at the lower elevations are in the maritime continental zone. The mean annual precipitation is 20 to 50 inches, and the mean annual air temperature is about 30 to 32 degrees F (-0.2 to 1.2 degrees C) (PRISM). This climatic zone is influenced by both maritime and continental factors. The temperatures in summer are moderated by the open waters of the Bering Sea, and the temperatures in winter are more continental due to the presence of ice in the sea (Western Regional Climate Center, 2017). The seasonal ice reaches its southernmost extent off the coast of Alaska in Bristol Bay (Alaska Climate Research Center, 2017). The western coast of Alaska is also influenced by high winds from strong storms and airmasses in the Interior Region of Alaska (Hartmann, 2002).

The Ahklun Mountains MLRA is principally undeveloped wilderness. Federally managed lands include the Togiak and Alaska Maritime National Wildlife Refuges. The MLRA is sparsely populated, but it has several communities, including Togiak, Manokotak, Twin Hills, and Goodnews Bay. Togiak is the largest village. It has a population of approximately 855, most of which are Yup'ik Alaska Natives (U.S. Census Bureau, 2016). Major land uses include subsistence activities (fishing, hunting, and gathering) and wildlife recreation (USDA-NRCS, 2006; Kautz et al., 2004).

Ecological site concept

Ecological site R237XY222AK is on linear outwash terraces and glaciated plains. It is associated with earth hummocks of well drained soils. This site is throughout the Ahklun Mountains area. The formation of earth hummocks via frost heave is the major disturbance. This site does not support an alternate state.

This ecological site is on small, rolling earth hummocks. The vegetation is not in a mosaic pattern based on micro-topographical features. The reference plant community supports many shrub species, mixed lichens, and sporadic

graminoids. Common species include dwarf birch (*Betula nana*), black crowberry (*Empetrum nigrum*), marsh Labrador tea (Ledum palustre ssp. decumbens), bog blueberry (Vaccinium uliginosum), greyleaf willow (Salix glauca), and smallawned sedge (*Carex microchaeta*).

Associated sites

R237XY201AK	**Western Alaska Maritime Scrubland Gravelly Slopes** Ecological site R237XY222AK is on outwash terraces and outwash plains. Several other ecological sites are associated with this site, including R237XY201AK, R237XY205AK, R237XY208AK, and R237XY220AK. These sites typically are differentiated by one or more criteria, including landform, landform position, associated soils, associated disturbance regimes, and the type and amount of plants. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut.
R237XY205AK	**Western Alaska Maritime Scrubland Loamy Swales** Ecological site R237XY222AK is on outwash terraces and outwash plains. Several other ecological sites are associated with this site, including R237XY201AK, R237XY205AK, R237XY208AK, and R237XY220AK. These sites typically are differentiated by one or more criteria, including landform, landform position, associated soils, associated disturbance regimes, and the type and amount of plants. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut.
R237XY208AK	**Western Alaska Maritime Scrubland Peat Depressions** Ecological site R237XY222AK is on outwash terraces and outwash plains. Several other ecological sites are associated with this site, including R237XY201AK, R237XY205AK, R237XY208AK, and R237XY220AK. These sites typically are differentiated by one or more criteria, including landform, landform position, associated soils, associated disturbance regimes, and the type and amount of plants. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut.
R237XY220AK	**Western Alaska Maritime Mosaic Loamy Hummocks** Ecological site R237XY222AK is on outwash terraces and outwash plains. Several other ecological sites are associated with this site, including R237XY201AK, R237XY205AK, R237XY208AK, and R237XY220AK. These sites typically are differentiated by one or more criteria, including landform, landform position, associated soils, associated disturbance regimes, and the type and amount of plants. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut.

Similar sites

R237XY220AK	**Western Alaska Maritime Mosaic Loamy Hummocks** Ecological site R237XY220AK is on earth hummocks. Site R237XY222AK is throughout the Ahklun Mountains area, and site R237XY220AK is in the southern part of the area. The large earth hummocks associated with site R237XY220AK are in areas of wet soils. A mosaic of vegetative communities is in the micro-topographic high and low areas of site R237XY220AK. Site R237XY222AK does not support a mosaic pattern of vegetation.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Betula nana* (2) *Empetrum nigrum*
Herbaceous	(1) *Carex microchaeta*

Physiographic features

Site characteristics specifically relate to the reference plant community phase. Each ecological site has a specific set of site characteristics and disturbance dynamics that results in a unique plant community composition, structure, and function. Site characteristics (climate, geology, topography, and soil characteristics) are dynamic across a landscape. Subtle changes in site characteristics can result in a different plant community phase or ecological site. Definitions of site characteristics are provided in the United States Department of Agriculture Handbook 296 (USDA-NRCS, 2006), Geomorphic Description System (Schoeneberger and Wysocki, 2012), Field Book for

Describing and Sampling Soils (Schoeneberger et al., 2012), and Soil Survey Manual (Soil Science Division Staff, 2017).

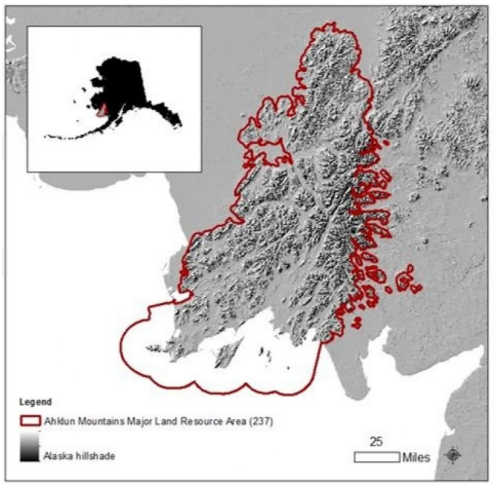

Figure 1. The Ahklun Mountains area (MLRA 237) is in western Alaska.

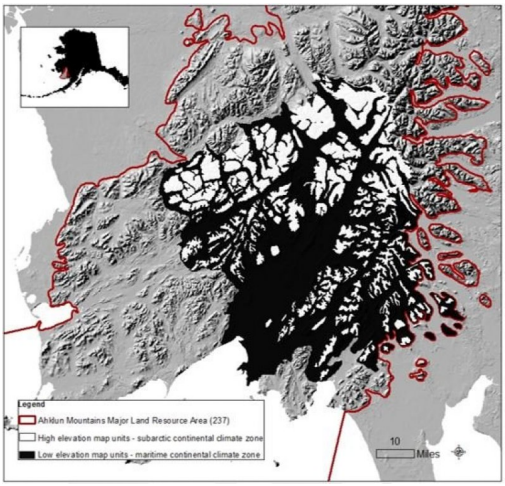

Figure 2. High-elevation and low-elevation map units in the area, which illustrate the primary climatic influence.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear (2) Convex
Landforms	(1) Outwash plain > Outwash plain > Earth hummock (2) Outwash plain > Outwash terrace > Earth hummock
Flooding frequency	None
Ponding frequency	None
Elevation	0–2,400 ft
Slope	0–5%
Water table depth	4–20 in
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Climate of land resource region (LLR): Maritime continental (Western Regional Climate Center, 2017); short, warm summers and long, cold winters (USDA-NRCS, 2006)

Climate of major land resource area (MLRA): Maritime continental in the lowlands and subarctic continental at

higher elevations. The mean annual precipitation is 20 to 30 inches in the lowlands, and it increases to more than 45 inches at the higher elevations. The mean annual air temperature along the coast is about 34 degrees F (1 degree C) (PRISM, 2014). Strong winds are common throughout the year.

Table 3. Representative climatic features

Frost-free period (characteristic range)	75-140 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	

Influencing water features

Soil features

The well drained Rocky soil is correlated to this ecological site. The saturated hydraulic conductivity of the soil is moderately high or high in the upper part and high or very high in the sandy and gravelly glacial material in the lower part.

Table 4. Representative soil features

Drainage class	Well drained

Ecological dynamics

Outwash plains and outwash terraces are throughout the Ahklun Mountains area. Two ecological sites are on earth hummocks in these positions, and they are differentiated by location, soil characteristics, and vegetation. Site R237XY220AK is on moderately well drained soils in the southern half of the Ahklun Mountains area, and site R237XY222AK is on well drained soils throughout the area. Differences in climate, slope length, and soil characteristics create unique vegetative communities in these ecological sites.

Site R237XY222AK is correlated to well drained soils. It is on earth hummocks of linear and convex outwash terraces and outwash plains throughout the Ahklun Mountains area. The earth hummocks of this site support a single community, but those of site R237XY220AK support a mosaic of communities differentiated by the micro-high and micro-low areas. The soil texture and natural drainage class due to the parent material and slope length appear to be the primary reasons for the undifferentiated community of site R237XY222AK. Soil moisture likely plays a role in the formation of earth hummocks (Grab, 2005; Kade et al., 2005; Beskow, 1930). The natural drainage class of the soils, linear to convex slope shape, and short slope length minimize the amount of soil moisture available to freeze and cause cryoturbation. The resulting small earth hummocks are unlikely to cause the differences in micro-habitat necessary for a mosaic plant community.

Disturbance Dynamics

No known disturbance creates a community phase distinctly different from the reference plant community. Anthropogenic disturbances that remove vegetation, such as construction of trails, may disrupt natural disturbances, alter the reference plant community, and result in a separate plant community. This was not documented in situ. Natural variations in plant richness and cover may be evident in areas of this ecological site.

Frost heave

Several factors and processes may contribute to the formation of earth hummocks, including soil moisture and texture, seasonal frost or permafrost, air temperature, and existing vegetation (Kade et al., 2005; Grab, 2005; Kokelj et al., 2007). Frost heave (cryoturbation) possibly is the most widely accepted model for the development of earth hummocks (Grab, 2005), including for those in this area. This model proposes that the unevenness in the surface of the ground and the vegetation cover lead to corresponding variations in soil temperature and moisture. As frost results in frozen ground that progresses to unfrozen pockets, the upward movement of the soil creates earth hummocks (Beskow, 1930). This model is compatible with these open tundra communities. The soil is susceptible

to cryoturbation and frost heave because of the patchy growth of ericaceous scrubs, and the insulating effect of the thicker vegetation results in variable frost depths, which likely contributes to the formation of earth hummocks.

The earth hummocks of site R237XY222AK are smaller than those of site R237XY220AK, likely due to differences in the natural drainage class and texture of the soil. The difference in soil moisture is the major factor in the intensity of frost heave and formation of earth hummocks (Matsuoka, 1996; Grab, 2005). As compared to the sandy and gravelly soils of site R237XY222AK, fine textured soils are more susceptible to frost heave (Grab, 2005). The soils associated with site R237XY222AK contain enough silt and moisture in the upper part of the profile for frost action and cryoturbation to form small earth hummocks. These hummocks are underlain by sandy and gravelly glacial material that does not have the particle size and moisture necessary to create earth hummocks large enough for different plant communities to occur in a mosaic pattern.

Hydrological Influences

Small, low areas of this ecological site may be subject to very brief periods of ponding. A water table is present in May as the snowpack melts and the ground thaws; however, the soils are well drained and the lower part of the profile has high or very high saturated hydraulic conductivity. Ponding does not create distinguishable vegetative differences in the high and low areas because of its short duration at the beginning of the growing season.

Other Observations

Grazing and browsing by caribou and moose on lichens, willow, and shrubs was recorded, but it is not considered severe enough to result in a separate community phase or an alternative state.

No alternative states were observed in this ecological site.

State and transition model

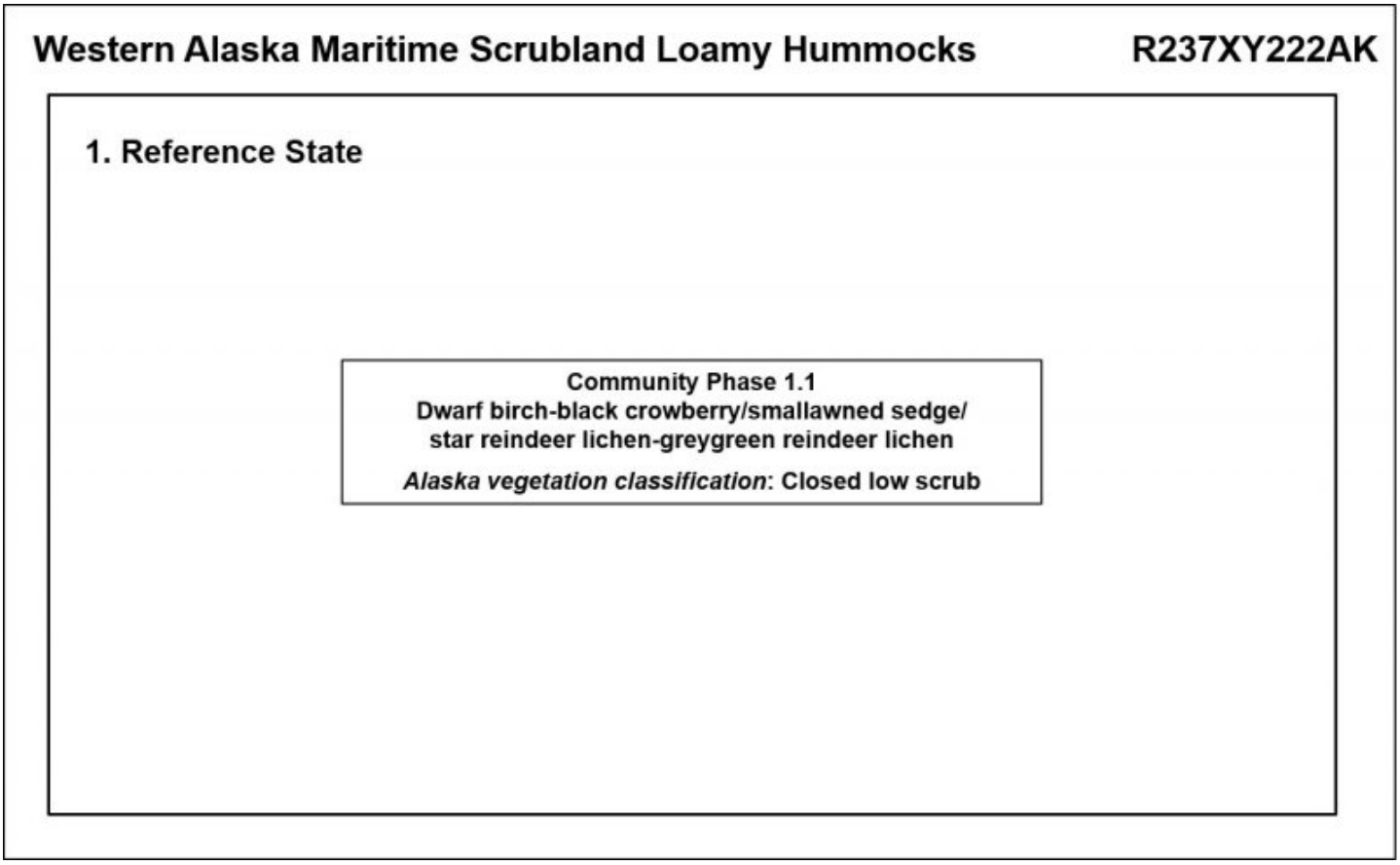

Figure 3. State-and-transition model.

State 1
Reference State

The reference state supports one community phase that is distinguished by the developed structure and dominance of the vegetation and the ecological function and stability of the community (fig. 3). The earth hummocks in this ecological site support the same community in the micro-topographic high areas as in the low areas. This report provides baseline vegetation inventory data. Future data collection is needed to provide further information about existing plant communities and the disturbance regimes that would result in transitions from one community to another. Common and scientific names are from the USDA PLANTS database. All community phases are characterized by the Alaska Vegetation Classification System (Viereck et al., 1992).

Community 1.1
Dwarf birch-black crowberry/smallawned sedge/star reindeer lichen-greygreen reindeer lichen (Betula nana-Empetrum nigrum/Carex microchaeta/Cladina stellaris-Cladina rangiferina)

Figure 4. The small earth hummocks typically support dense shrubs and a variety of lichens.

Community Phase 1.1 Canopy Cover Table

Vegetation data are aggregated across modal sample plots for this community phase and are provided as a frequency (percent) and mean canopy cover (percent) of the dominant and most ecologically relevant species. Canopy cover is represented as a mean with the range in parentheses.

Plant group	Common name	Scientific name	USDA plant code	Frequency (percent)	Mean canopy cover (percent)
S	Dwarf birch	*Betula nana*	BENA	100	25 (5-50)
S	Black crowberry	*Empetrum nigrum*	EMNI	91	20 (0-60)
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	91	15 (0-30)
S	Lingonberry	*Vaccinium vitis-idaea*	VAVI	82	3 (0-6)
S	Beauverd spirea	*Spiraea stevenii*	SPST3	64	2 (0-10)
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	55	8 (0-20)
S	Greyleaf willow	*Salix glauca*	SAGL	55	2 (0-7)
S	Tealeaf willow	*Salix pulchra*	SAPU15	46	3 (0-25)
G	Smallawned sedge	*Carex microchaeta*	CAMI4	73	2 (0-10)
L	Reindeer lichen^	*Cladina* spp.	CLADI3	91	30 (0-65)
L	Cup lichens^^	*Cladonia* spp.	CLADO3	91	4 (0-15)
L	Star reindeer lichen	*Cladina stellaris*	CLST60	82	20 (0-60)
L	Greygreen reindeer lichen	*Cladina rangiferina*	CLRA60	73	15 (0-30)
L	Snow lichen	*Stereocaulon* spp.	STERE2	64	3 (0-10)
L	Flavocetraria cucullata	*Flavocetraria cucullata*	FLCU	46	2 (0-7)

^Reindeer lichen (*Cladina* spp.) includes all *Cladina* species, including star reindeer lichen and greygreen reindeer lichen.

^^Cup lichens (*Cladonia* spp.) includes all *Cladonia* species.

This dataset includes data from 11 sample plots. The plots are distributed across the Ahklun Mountains area and are independent of one another.

Plant functional group classifications—T = trees, S = shrubs, G = graminoids, F = forbs, B = bryophytes, L = lichens.

Canopy cover data are based on ocular estimates and rounded, except trace (0.1 percent) cover. Data ranging from 1 to 9 percent cover are rounded to the nearest integer. Data ranging from 10 to 100 percent cover are rounded to the nearest factor of 5.

Figure 5. Canopy cover and frequency of species in community 1.1.

The reference plant community is characterized as closed low scrub (fig. 4) (Viereck et al., 1992). Small differences in the vegetation in the micro-high areas as compared to the micro-low areas may be observed, but the pattern is variable. The major functional groups are lichens, dwarf shrubs (less than 8 inches in height), low shrubs (8 to 36 inches), and mosses (fig. 5). Common shrubs include dwarf birch, black crowberry, marsh Labrador tea, bog blueberry, and lingonberry (*Vaccinium vitis-idaea*). Other less abundant shrubs include greyleaf willow, beauverd spirea (*Spiraea stevenii*), and tealeaf willow (S. pulchra). Smallawned sedge and bluejoint (*Calamagrostis canadensis*) are the most common graminoids. Lichens make up a large component of the ground cover, and they generally include various reindeer lichens (Cladina spp.), cup lichens (Cladonia spp.), and snow lichens (Stereocaulon spp.). Other common ground cover includes mosses, herbaceous litter, and rock fragments. Some areas are bare soil.

Additional community tables

Other references

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Approval

Michael Margo, 7/23/2020

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	Michael Margo
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):

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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:**
