USDA Natural Resources
Conservation Service

Ecological site AX001X01X200
Temperate Wet Meadow

Last updated: 5/15/2025
Accessed: 04/07/2026

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): 001X–Northern Pacific Coast Range, Foothills, and Valleys

This area consists of a long and narrow range of mountains with associated foothills and valleys that parallels the Pacific Ocean. This area is entirely within the Pacific Border Province of the Pacific Mountain System in Oregon and Washington. MLRA 1 is bounded on the north by the highest elevations of the Olympic Mountains and the strait of Juan de Fuca, and by the Klamath Mountains on the south. The Washington portion of this MLRA is primarily composed of young Tertiary sedimentary rocks (siltstone and sandstone) mixed with some volcanic rocks of the same age. Glacial till and outwash deposits are also found in the northern half of this area in Washington. Much of this area is accreted terrane formed by tectonic processes. The average annual precipitation ranges from 60 to 200 inches (1,525 to 5,580 millimeters), increasing with elevation. Most of the precipitation in this area occurs during low-intensity, Pacific frontal storms and is evenly distributed throughout fall, winter, and spring.

The dominant soil orders in this MLRA are Andisols, Inceptisols, and Ultisols. Soil depths broadly range from shallow to very deep. Soils are primarily well drained, however poorly drained soils may be found in depressional areas and on alluvial floodplains. Surface textures are typically medial and loamy or clayey. Soils in this area dominantly have a mesic or frigid temperature regime and a udic moisture regime. Soils with aquic moisture regimes and cryic temperature regimes also occur.

Ecological site concept

Temperate Wet Meadow sites occur on stable, depressional areas on debris aprons,

cirques, and bench basins in the isomesic, mesic, and frigid temperature zones. Temperate Wet Meadows receive a significant amount of run-on water from adjacent forest sites. Temperate Wet Meadow sites occur on poorly drained soils that are frequently ponded. These sites are indicated by abundant wetland species. Devilsclub (*Oplopanax horridus*) is the dominant shrub on this site. Common forbs include American skunkcabbage (*Lysichiton americanus*), threeleaf foamflower (*Tiarella trifoliata*), pioneer violet (*Viola glabella*), small enchanter's nightshade (*Circaea alpina*), threeleaf bedstraw (*Galium trifidum*), and claspleaf twistedstalk (*Streptopus amplexifolius*). Common ladyfern (*Athyrium filix-femina*), western oakfern (*Gymnocarpium dryopteris*), deer fern (*Blechnum spicant*), horsetail (Equisetum spp.), and water sedge (*Carex aquatilis*) are also frequently found on this site.

Associated sites

AX004A01X005	**Isomesic Udic Alluvial Terrace Forest** Isomesic Udic Alluvial Terrace Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Isomesic Udic Alluvial Terrace Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X402	**Mesic Udic Moist Forest** Mesic Udic Moist Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Mesic Udic Moist Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X401	**Mesic Udic Forest** Mesic Udic Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Mesic Udic Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X403	**Mesic Udic Dry Forest** Mesic Udic Dry Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Mesic Udic Dry Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X002	**Mesic Udic Flood Plain Forest** Mesic Udic Flood Plain Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Mesic Udic Flood Plain Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.

AX001X01X003	**Mesic Udic Alluvial Terrace Forest** Mesic Udic Alluvial Terrace Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Mesic Udic Alluvial Terrace Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X108	**Frigid Aquic Forest** Frigid Aquic Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Frigid Aquic Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X407	**Frigid Udic Moist Forest** Frigid Udic Moist Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Frigid Udic Moist Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X406	**Frigid Udic Forest** Frigid Udic Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Frigid Udic Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X408	**Frigid Udic Dry Forest** Frigid Udic Dry Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Frigid Udic Dry Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X107	**Frigid Udic Alluvial Terrace Forest** Frigid Udic Alluvial Terrace Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Frigid Udic Alluvial Terrace Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX001X01X406	**Frigid Udic Forest** Frigid Udic Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Frigid Udic Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.

AX004A01X404	**Isomesic Aquic Forest** Isomesic Aquic Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Isomesic Aquic Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX004A01X403	**Udic Moist Forest** Mesic Udic Dry Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Mesic Udic Dry Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
AX004A01X401	**Isomesic Udic Forest** Isomesic Udic Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Isomesic Udic Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.
F004AA001WA	**Udic Flood Plain Forest** Udic Flood Plain Forest sites are forested sites typically located on topographic highs and run-off positions associated with Temperate Wet Meadows. Temperate Wet Meadow sites may exist on seeps adjacent to or surrounded by Udic Flood Plain Forests. Temperate Wet Meadows are easily distinguished by the hydrophilic vegetation and lack of tree cover.

Similar sites

AX001X01X305	**Cryic Udic Wet Subalpine Meadow** Cryic Aquic Subalpine Wet Meadows are found at higher elevations, above 900 meters.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Oplopanax horridus*
Herbaceous	(1) *Lysichiton americanus* (2) *Athyrium filix-femina*

Legacy ID

R001XA200WA

Physiographic features

This site primarily occurs on glacial valley walls and colluvial aprons on mountains.

Temperate Wet Meadows are typically located in topographical depressions or on groundwater seeps. The depressional topography of these sites lead to water collecting on these sites from upslope areas. This additional moisture becomes restricted by the poorly drained soil and creates ponded conditions during much of the growing season. The positioning of these sites in depressions and seeps is a significant driver of plant dynamics on this site; the topographic position of Temperate Wet Meadows contributes more of the site character than the climatic variations across the elevation range of the site.

Table 2. Representative physiographic features

Landforms	(1) Mountains (2) Outwash plain (3) Colluvial apron (4) Drainageway (5) Depression
Flooding duration	Long (7 to 30 days)
Flooding frequency	Frequent
Ponding frequency	None
Elevation	30–900 m
Slope	0–8%
Water table depth	0–25 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

This site occurs in isomesic, mesic, and frigid temperature regimes, and in the aquic moisture regime. This site is found across a large gradient of climatic conditions, since surface ponding is the driving factor for plant community dynamics. Precipitation arrives mostly via low-intensity, Pacific frontal storms. Precipitation is unevenly distributed, with the lowest amounts on the leeward side of the Coast Range mountains. Precipitation falls largely as snow in higher elevations. Precipitation is evenly distributed throughout the fall, winter, and spring, while summers are dry. Air temperatures vary significantly along the elevation gradient.

Table 3. Representative climatic features

Frost-free period (characteristic range)	90-240 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	991-2,997 mm

Influencing water features

This site is frequently ponded for long periods during the growing season, creating anaerobic soil conditions for much of the growing season. Plants must be adapted to growing in low-oxygen substrate and must be resistant to root-rot.

Soil features

The soils are very deep, have very high or high Ksat throughout, and are poorly drained. The soils are formed in mixed alluvium or colluvium derived from metasedimentary rock. The soil surface texture is gravelly silt loam or loam. Clay content is eight to 17 percent throughout. The soil component for this ecological site is Typic Humaquepts. Although representative of this site, these soils may exist across multiple ecological sites because of naturally variable slope, texture, rock fragments, and pH. An on-site soil pit and the most current ecological site key are necessary to classify a site.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Colluvium–metasedimentary rock
Surface texture	(1) Gravelly silt loam (2) Loam
Drainage class	Poorly drained
Soil depth	203 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	10.16–15.24 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5–5.5
Subsurface fragment volume <=3" (0-50.8cm)	15–50%
Subsurface fragment volume >3" (0-50.8cm)	0–10%

Ecological dynamics

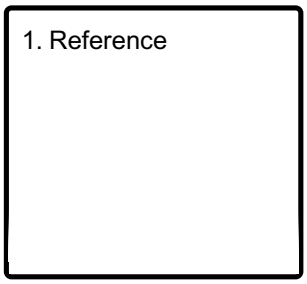
Temperate Wet Meadow sites are found on poorly drained soils in lowland positions and depressions where additional moisture is received via run-on from upslope sites. Saturated soil conditions preclude the establishment of mature forest on these sites, although few scattered trees may be found on these sites depending on conditions. High moisture conditions favor wetland species on these sites. Devilsclub (*Oplopanax horridus*)

is the dominant shrub on this site. Common forbs include American skunkcabbage (*Lysichiton americanus*), threeleaf foamflower (*Tiarella trifoliata*), pioneer violet (*Viola glabella*), small enchanter's nightshade (*Circaea alpina*), threeleaf bedstraw (*Galium trifidum*), and claspleaf twistedstalk (*Streptopus amplexifolius*). Common ladyfern (*Athyrium filix-femina*), western oakfern (*Gymnocarpium dryopteris*), deer fern (*Blechnum spicant*), horsetail (Equisetum spp.), and water sedge (*Carex aquatilis*) are also frequently found on this site.

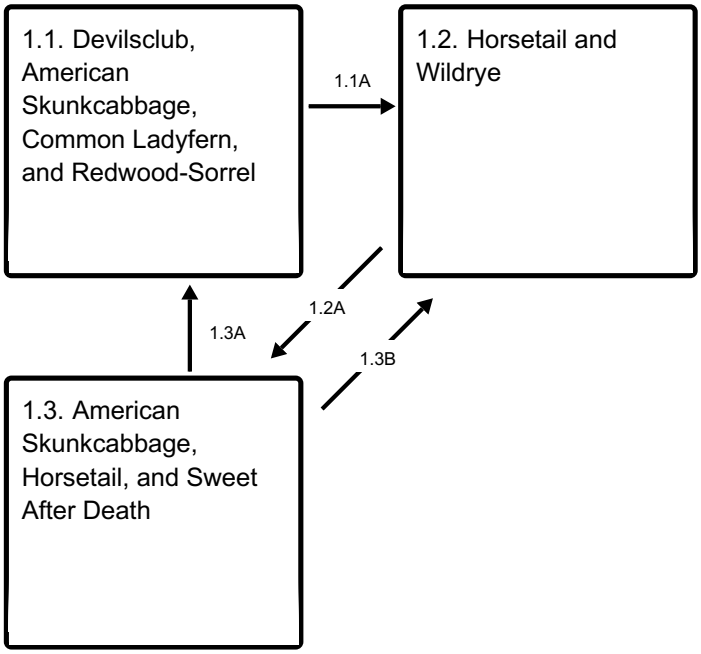
Temperate Wet Meadow sites may be subject to occasional disturbance from fire and mass-movement events. Wildfires are rare on this site, but burns are likely severe when they do occur. Fires are likely to be ignited in adjacent upland or terrace forests and spread to Temperate Wet Meadows. If a fire can spread through the moist site conditions, high fuel loads allow for severe burning. Mass-movement may occur on less stable slopes and can result in the rapid deposition of colluvium or slope alluvium on site. The rapid deposition of mineral soil can kill existing vegetation and favor early pioneer species on site.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - High-intensity disturbance

1.2A - Time without disturbance
1.3A - Time without disturbance

1.3B - High-intensity disturbance

State 1
Reference

The Reference state of this site is comprised of three communities in varying conditions of regeneration from disturbance.

Dominant plant species

- devilsclub (*Oplopanax horridus*), shrub
- wildrye (*Elymus*), grass
- American skunkcabbage (*Lysichiton americanus*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- redwood-sorrel (*Oxalis oregana*), other herbaceous
- horsetail (*Equisetum*), other herbaceous
- sweet after death (*Achlys triphylla*), other herbaceous
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous
- pioneer violet (*Viola glabella*), other herbaceous
- threeleaf foamflower (*Tiarella trifoliata*), other herbaceous
- water sedge (*Carex aquatilis*), other herbaceous
- deer fern (*Blechnum spicant*), other herbaceous

Community 1.1
Devilsclub, American Skunkcabbage, Common Ladyfern, and Redwood-Sorrel

Structure: Multistory with small gap dynamics The reference community of this site is codominated by shrubs, forbs, and graminoids. Common species in this community are devilsclub (*Oplopanax horridus*), American skunkcabbage (*Lysichiton americanus*), common ladyfern (*Athyrium filix-femina*), western oakfern (*Gymnocarpium dryopteris*), redwood-sorrel (*Oxalis oregana*), threeleaf foamflower (*Tiarella trifoliata*), pioneer violet (*Viola glabella*), water sedge (*Carex aquatilis*), horsetail (Equisetum spp.), and deer fern (*Blechnum spicant*).

Community 1.2
Horsetail and Wildrye

Structure: disturbed site with early regeneration This community is initiated in the wake of a severe disturbance that has removed most or all vegetation from the site. Horsetails (Equisetum spp.) and wildrye (Elymus spp.) are often the first species to establish after disturbance, but species composition of this community may be highly variable depending on the immediate disturbance impact on site hydrology.

Community 1.3
American Skunkcabbage, Horsetail, and Sweet After Death

Structure: forb and graminoid meadow This community is an intermediate seral stage where additional forbs and graminoids have become established on site, but shrubs have not yet established.

Pathway 1.1A
Community 1.1 to 1.2

Severe disturbance such as wildfire or mass-movement event.

Pathway 1.2A
Community 1.2 to 1.3

Time without disturbance allows regeneration, growth, and progression to a later seral stage.

Pathway 1.3A
Community 1.3 to 1.1

Time without disturbance allows regeneration, growth, and progression to a later seral stage.

Pathway 1.3B
Community 1.3 to 1.2

Severe disturbance such as wildfire or mass-movement event.

Additional community tables

Other references

Breemen, Nico van. “How Sphagnum Bogs down Other Plants.” Trends in Ecology & Evolution 10, no. 7 (July 1, 1995): 270–75. 90007-1.

Dwire, K. and Kauffman, J. 2003. Fire and Riparian Ecosystems in Landscapes in the Western United States. Forest Ecology and Management, Vol. 178 pg. 61-74.

Franklin, Jerry F.; Cromack, Kermit, Jr.; Denison, William; [and others]. 1981. Ecological characteristics of old-growth Douglas-fir forests. Gen. Tech. Rep. PNW-118. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 48 p. [7551]

Gavin, D., Brubaker, L. (2015). The Modern Landscape of the Olympic Peninsula. In: Late

Pleistocene and Holocene Environmental Change on the Olympic Peninsula, Washington. Ecological Studies, vol 222. Springer, Cham. https://doi.org/10.1007/978-3-319-11014-1_1

Geertsema, Marten & Pojar, James. (2007). Influence of landslides on biophysical diversity — A perspective from British Columbia. Geomorphology. 89. 55-69. 10.1016/j.geomorph.2006.07.019.

Goheen, E.M. and Willhite, E.A. 2006. Field Guide to Common Diseases and Inspect Pests of Oregon and Washington Conifers. Portland, Oregon: USDA Forest Service, Pacific Northwest Region R6-NR-FID-PR-01-06.

Hanley, D.P and D.M. Baumgartner. 2002. Forest Ecology in Washington. Washington State University Extension Publishing. Technical Report EB 1943.

Hanson, E.J., D.L. Azuma and B.A. Hiserote. 2002. Site Index Equations and Mean Annual Increment Equations for Pacific Northwest Research Station Forest Inventory and Analysis Inventories, 1985-2001. USDA Forest Service Pacific Northwest Research Station, Research Note PNW-RN-533.

Hemstrom, M., Franklin, J. 1982. Fire and Other Disturbances of the Forests in Mount Rainier National Park. Quaternary Research, Vol 18 pp 32-61.

James K. Agee and Mark H. Huff. 1987. Fuel succession in a western hemlock/Douglas-fir forest. Canadian Journal of Forest Research. 17(7): 697-704. https://doi.org/10.1139/x87-112

Nielsen, E. M., R. L. Brunner, C. Copass and L. K. Wise, 2021. Olympic National Park map class descriptions. National Park Service, Fort Collins.

Pojar J., and MacKinnon. 1994. Plants of the Pacific Northwest Coast. Lone Pine, Vancouver, British Columbia. 528 pages.

PRISM Climate Group, Oregon State University, http://prism.orgeonstate.edu, visited October 2023.

Reed Wendel, Darlene Zabowskl "Fire History within the Lower Elwha River Watershed, Olympic National Park, Washington," Northwest Science, 84(1), 88-97, (1 January 2010)

Rochefort, R.M. and Peterson, D.L. 1996. Temporal and Spatial Distribution of Trees in Subalpine Meadows of Mount Rainier National Park. Arctic and Alpine Research, Vol. 28, No. 1 pp 52-59.

Seastedt, T.R., Adams, G.A. 2001. Effects of Mobile Tree Islands on Alpine Tundra Soils. Ecology, Vol 82 pp 8-17.

Smith, K., G. Kuhn, and L. Townsend. 2008. Culmination of Mean Annual Increment for Indicator Tree Species in the State of Washington. USDA-NRCS Technical Note Forestry-9.

United States Department of Agriculture, Forest Service, 2015. Silvics Manual Vol 1. http://na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1/vol1_Table_of_contents.htm, visited December 2015.

United States Department of Agriculture, Natural Resources Conservation Service, and United States Department of the Interior, National Park Service. 2014. Ecological Site Descriptions for North Cascades National Park Complex, Washington.

United States Department of Agriculture, Natural Resources Conservation Service, and United States Department of the Interior, National Park Service. Ecological Site Descriptions for Mount Rainier National Park, Washington.

Van Pelt, R. 2007. Identifying Mature and Old Forests in Western Washington. Washington State Department of Natural Resources, Olympia, WA. 104 p

Washington Department of Natural Resources, Natural Heritage Program. 2015. Ecological Systems of Washington State. A Guide to Identification.

Wood, David, and Moral, Roger del. “Mechanisms of Early Primary Succession in Subalpine Habitats on Mount St. Helens.” Ecology 68, no. 4 (1987).

Zhao, Yunpeng, Chengzhu Liu, Simin Wang, Yiyun Wang, Xiaoqing Liu, Wanqing Luo, and Xiaojuan Feng. “‘Triple Locks’ on Soil Organic Carbon Exerted by Sphagnum Acid in Wetlands.” Geochimica et Cosmochimica Acta 315 (December 2021): 24–37. https://doi.org/10.1016/j.gca.2021.09.028.

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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	04/07/2026
Approved by	Grant Petersen
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):**

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:**
