USDA Natural Resources Conservation Service

Ecological site R010XA675OR
Juniper Hills 8-11 PZ

Last updated: 2/14/2025
Accessed: 05/12/2025

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): 010X–Central Rocky and Blue Mountain Foothills

This MLRA is characterized by gently rolling to steep hills, plateaus, and low mountains at the foothills of the Blue Mountains in Oregon and the Central Rocky Mountains in Idaho. The geology of this area is highly varied and ranges from Holocene volcanics to Cretaceous sedimentary rocks. Mollisols are the dominant soil order and the soil climate is typified by mesic or frigid soil temperature regimes, and xeric or aridic soil moisture regimes. Elevation ranges from 1,300 to 6,600 feet (395 to 2,010 meters), increasing from west to east. The climate is characterized by dry summers and snow dominated winters with precipitation averaging 8 to 16 inches (205 to 405 millimeters) and increasing from west to east. These factors support plant communities with shrub-grass associations with considerable acreage of sagebrush grassland. Big sagebrush, bluebunch wheatgrass, and Idaho fescue are the dominant species. Stiff sagebrush, low sagebrush, and Sandberg bluegrass are often dominant on sites with shallow restrictive layers. Western juniper is one of the few common tree species and since European settlement has greatly expanded its extent in Oregon. Nearly half of the MLRA is federally owned and managed by the Bureau of Land Management. Most of the area is used for livestock grazing with areas accessible by irrigation often used for irrigated agriculture.

Ecological site concept

In reference condition, this site supports a plant community dominated by scattered old growth western juniper (*Juniperus occidentalis*) in the overstory, mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana) in the shrub layer and both needleandthread (*Hesperostipa comata*) and bluebunch wheatgrass (*Pseudoroegneria spicata* ssp. spicata) in the herbaceous layer. Abiotically, this site is characterized by shallow to moderately deep, somewhat excessively drained soils formed in volcanic ash. The high ash content of these soils increases available water content and effective precipitation thereby facilitating the presence of species such as mountain big sagebrush. Historically, plant community dynamics were driven by disturbances such as fire, drought and insect/disease. Presently, reference conditions are less common and current dynamics are influenced by the spread of invasive species, infill of western juniper, livestock grazing pressures and fire suppression.

Associated sites

R010XA659OR	**Juniper Pumice Plains 8-11 PZ** occupying adjacent plains

Similar sites

R010XA027OR	**Juniper Pumice Flat 8-10 PZ** mesic rather than frigid soil temperature regime
R010XA009OR	**Juniper Shrubby Pumice Flat 10-12 PZ** mesic rather than frigid soil temperature regime, higher precipitation

Table 1. Dominant plant species

Tree	(1) *Juniperus occidentalis*
Shrub	(1) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Hesperostipa comata*

Physiographic features

This site is located on toeslopes of hills of volcanic tablelands. This site occurs on all aspects. No water table is present and the site is not subject to ponding or flooding.

Table 2. Representative physiographic features

Landforms	(1) Hills > Toe (2) Tableland > Toe
Flooding frequency	None
Ponding frequency	None
Elevation	1,326–1,372 m
Slope	2–20%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

This site has an aridic soil moisture regime and a frigid soil temperature regime characterized by hot dry summers and cold wet winters. Mean annual precipitation ranges from 8 to 11 inches (200 to 275 mm). Precipitation falls primarily as rain and snow from November through April. The frost-free period ranges from 85 to 95 days. Localized convection storms occasionally occur during the summer. Climate graphs are based on the nearest available climate stations to modal site locations and are provided to indicate general climate patterns.

Table 3. Representative climatic features

Frost-free period (characteristic range)	85-95 days
Freeze-free period (characteristic range)	120-135 days
Precipitation total (characteristic range)	203-279 mm
Frost-free period (average)	90 days
Freeze-free period (average)	125 days
Precipitation total (average)	254 mm

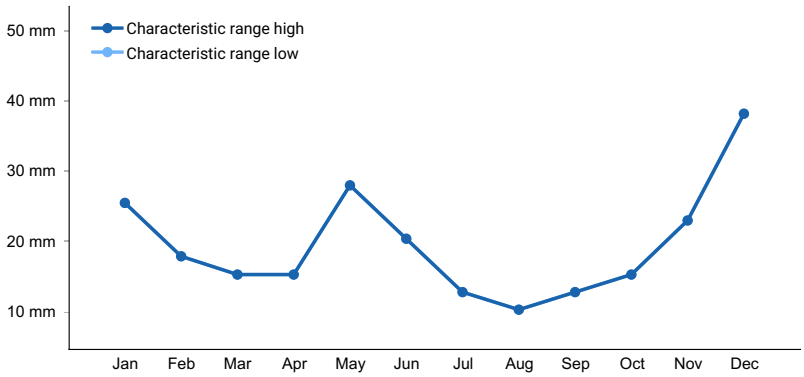


Figure 1. Monthly precipitation range

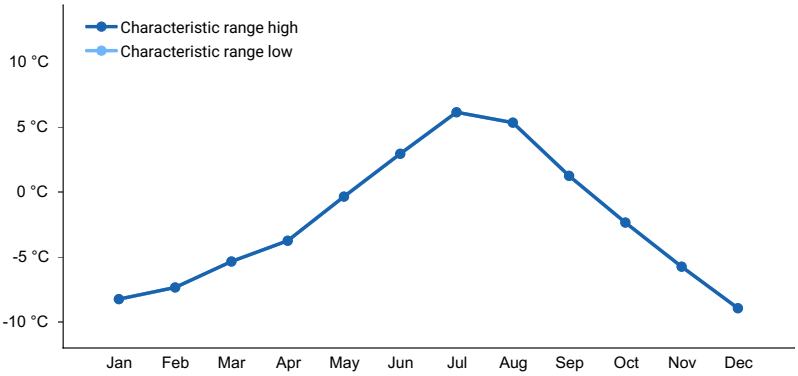


Figure 2. Monthly minimum temperature range

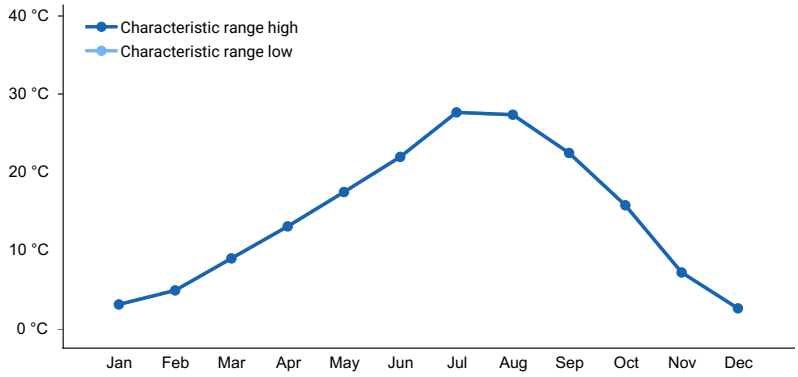


Figure 3. Monthly maximum temperature range

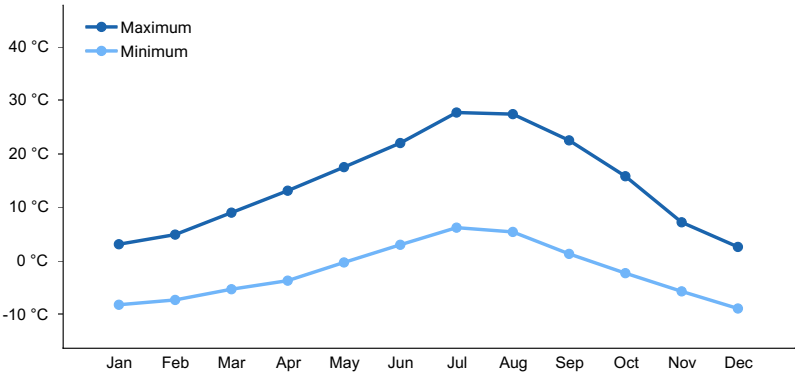


Figure 4. Monthly average minimum and maximum temperature

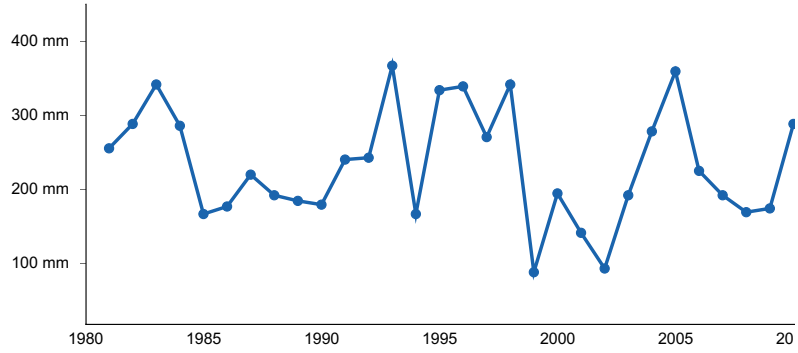


Figure 5. Annual precipitation pattern

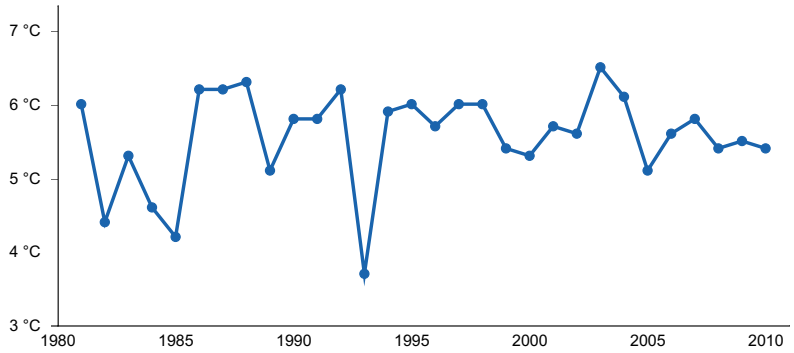


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BROTHERS [USC00351067], Brothers, OR

Influencing water features

This site is not influenced by or associated with water features.

Wetland description

N/A

Soil features

Soils on this site are shallow to moderately deep with small channers. These are well drained soils formed in volcanic ash over residuum and colluvium from volcanic rock.

Table 4. Representative soil features

Parent material	(1) Colluvium–basalt (2) Tuff (3) Lacustrine deposits (4) Volcanic ash–volcanic rock
Surface texture	(1) Ashy loamy fine sand
Family particle size	(1) Ashy-skeletal
Drainage class	Somewhat excessively drained
Permeability class	Moderately rapid
Depth to restrictive layer	25–102 cm
Soil depth	25–102 cm
Surface fragment cover <=3"	0–90%
Surface fragment cover >3"	0–90%
Available water capacity (0-101.6cm)	1.52–10.92 cm
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (10.2-101.6cm)	10–50%
Subsurface fragment volume >3" (10.2-101.6cm)	15–50%

Ecological dynamics

In its reference phase, this site is dominated by scattered old growth western juniper (*Juniperus occidentalis*) in the overstory, mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana) in the shrub layer and both needleandthread (*Hesperostipa comata*) and bluebunch wheatgrass (*Pseudoroegneria spicata* ssp. spicata) in the herbaceous layer.

Disturbance and ecological dynamics:

While historical disturbances were most likely driven by climate, current disturbances include continued infill of western juniper, invasion of exotic annual grasses, and livestock grazing pressures. This site is considered a persistent juniper woodland, where at least some old growth juniper would be present even in the absence of altered disturbance regimes that have led to the encroachment of juniper throughout much of the Great Basin. Still, in its present state, this site is likely to have a much higher proportion of juniper than historically due to infill into these woodlands because of wildfire suppression, historic livestock grazing, and climate change (Bunting 1994). Persistent juniper woodlands often occur on sites with low productivity, coarse soils or protected rock outcrops and as such experience low fuel loading and discontinuous fuels. These conditions lead to very long fire return intervals that may range into the hundreds of years (Miller 2019). Grazing disturbance may increase the plant community composition of squirreltail (*Elymus elymoides*) at the expense of bluebunch wheatgrass. This site may also be susceptible to invasion by exotic annual grasses. The invasion of sagebrush communities by cheatgrass (*Bromus tectorum*) has been linked to disturbances (fire, abusive grazing) that have resulted in fluctuations in resources (Chambers et al. 2007).

The state and transition model below represents a partial understanding of ecological dynamics on this site as they relate to grazing pressure. Future field work will further refine and expand this model to include other disturbance dynamics such as invasion by annual grasses and encroachment of juniper.

State and transition model

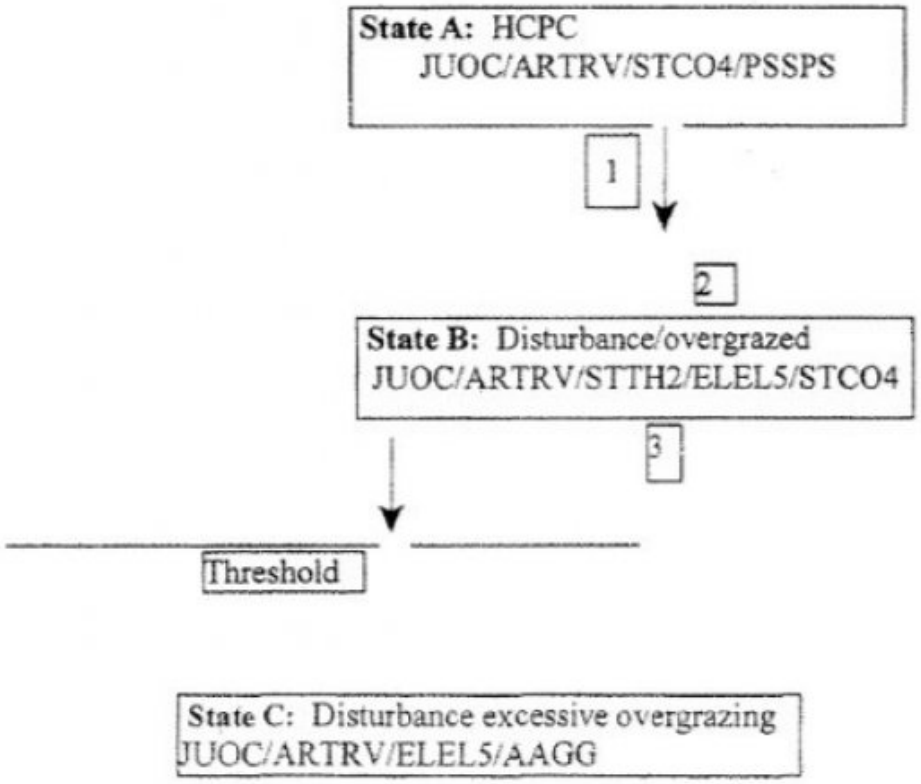
Ecological and Plant Community Dynamics:

State A: (HCPC) Dominated by western juniper, mountain big sagebrush, needleandthread, and bluebunch wheatgrass.

State B: Disturbance/overgrazed: Dominated by western juniper, mountain big sagebrush, Thurber needlegrass, bottlebrush squirreltail, and needleandthread

State C: Disturbance/continued overgrazed: Dominated by western juniper, mountain big sagebrush, and bottlebrush squirreltail

State and Transition Model:



?? The possibility of an irreversible threshold exists, but has not been exactly determined.

Transition Pathways

Number	Reason:
1	Overgrazing leads to a decrease in bluebunch wheatgrass, needleandthread, and an increase in squirreltail.
2	Sufficient rest allows the community to recover to HCPC
3	Continued overgrazing moves community past the recovery threshold. Idaho fescue, bluebunch wheatgrass, needleandthread, and Thurber needlegrass removed.

State 1
Historical Reference

This is the Historical Reference State, with the absence of an altered disturbance regime.

Dominant plant species

- western juniper (*Juniperus occidentalis*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub

- bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass

Community 1.1
Reference Plant Community

Dominant plant species

- western juniper (*Juniperus occidentalis*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- needle and thread (*Hesperostipa comata*), grass

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	207	314	471
Shrub/Vine	146	213	325
Tree	62	90	135
Forb	34	56	78
Total	**449**	**673**	**1009**

Community 1.2
Altered Plant Community

In this state perennial grass composition has been significantly altered.

Dominant plant species

- western juniper (*Juniperus occidentalis*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- Thurber's needlegrass (*Achnatherum thurberianum*), grass
- squirreltail (*Elymus elymoides*), grass
- needle and thread (*Hesperostipa comata ssp. comata*), grass

Pathway 1.1A
Community 1.1 to 1.2

Prolonged inappropriate grazing management leading to a change in perennial grass composition, marked by decreases in sensitive species such as needle and thread and bluebunch wheatgrass, and an increase in disturbance adapted species such as bottlebrush squirreltail.

Pathway 1.2A
Community 1.2 to 1.1

Extended rest from grazing allowing sensitive native grasses to increase in cover.

Context dependence. Excessive grazing leading to a loss of species diversity or reproductive output or altering abiotic conditions by significantly compacting or eroding soil, for example, will not recover by rest alone and will require additional inputs.

State 2
Disturbed

In this state, perennial grass composition has significantly shifted in structure and composition, and abiotic factors have crossed a threshold due to erosion.

Dominant plant species

- western juniper (*Juniperus occidentalis*), tree
- mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*), shrub
- squirreltail (*Elymus elymoides*), grass

Community 2.1
Disturbed Plant Community

This community has lost a significant number of perennial grass species from the community, disturbance/early seral adapted species dominate.

Resilience management. Community is susceptible to invasion by invasive and noxious plant species.

Transition T1A
State 1 to 2

Continued prolonged inappropriate grazing management leading to a change in perennial grass composition and the loss of several species including Idaho fescue, bluebunch wheatgrass, needleandthread and Thurber's needlegrass.

Constraints to recovery. Site has crossed an abiotic threshold that may only be rehabilitated by intensive restoration measures if at all.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Perennial Grasses**			128–309	
	needle and thread	HECO26	*Hesperostipa comata*	67–135	–
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	34–101	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	7–34	–
	Idaho fescue	FEID	*Festuca idahoensis*	7–13	–
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	7–13	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	7–13	–
2	**Other Perennial Grasses**			7–34	
	squirreltail	ELEL5	*Elymus elymoides*	0–7	–
	beardless wildrye	LETR5	*Leymus triticoides*	0–7	–
	basin wildrye	LECI4	*Leymus cinereus*	0–7	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–7	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–7	–
Forb					
4	**Forbs**			20–40	
	lupine	LUPIN	*Lupinus*	7–13	–
	granite prickly phlox	LIPU11	*Linanthus pungens*	7–13	–
	curvepod milkvetch	ASCU4	*Astragalus curvicarpus*	7–13	–
5	**Other Forbs**			7–13	
	common yarrow	ACMI2	*Achillea millefolium*	0–7	–
	fleabane	ERIGE2	*Erigeron*	0–7	–
Shrub/Vine					
7	**Shrubs**			81–202	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	67–135	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	13–34	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–34	–
8	**Other Shrubs**			13–34	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	0–13	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–13	–
Tree					
6	**Trees**			34–101	
	western juniper	JUOC	*Juniperus occidentalis*	34–101	–

Animal community

GRAZING:
This site is suited to use under a planned grazing system by cattle. Care should be taken to avoid use until soils are sufficiently dry and stable as to reduce the impacts of trampling and root reserves have been established.

WILDLIFE:

This site provides nesting, feeding, and security cover to a variety of wildlife species. Use should be managed in such a manner as to maintain or improve conditions for wildlife populations.

This site is seasonally utilized by native ungulates (mule deer, elk, and antelope). Other animals that use this site are: coyotes, bobcats, and rabbits.

Type locality

Location 1: Lake County, OR	
Township/Range/Section	T26S R14E S23
General legal description	Fort Rock quad in northern Lake County in the foothills of the Connley Hills, T26S., RI4E. Sec. 23

References

. Fire Effects Information System. http://www.fs.fed.us/database/feis/.

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Other references

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Chambers, J.C., B.A. Bradley, C.S. Brown, C. D'Antonio, M.J. Germino, J.B. Grace, S.P. Hardegree, R.F. Miller, and D.A. Pyke. 2013. Resilience to Stress and Disturbance, and Resistance to *Bromus tectorum* L. Invasion in Cold Desert Shrublands of Western North America. Ecosystems 17:360–375.

Miller, Richard F.; Chambers, Jeanne C.; Evers, Louisa; Williams, C. Jason; Snyder, Keirith A.; Roundy, Bruce A.; Pierson, Fred B. 2019. The ecology, history, ecohydrology, and management of pinyon and juniper woodlands in the Great Basin and Northern Colorado Plateau of the western United States. Gen. Tech. Rep. RMRS-GTR-403. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 284 p.

Contributors

C Tackman
Cici Brooks
Jenni Moffitt, general edits and updates 2020
Andrew Neary - additional minor PES updates 2021

Approval

Kirt Walstad, 2/14/2025

Acknowledgments

Original Authors: ESI Team, Burns, Oregon 2000

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	02/14/2025
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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:**

17. **Perennial plant reproductive capability:**