USDA Natural Resources
Conservation Service

Ecological site R010XC035OR
SR Shallow 9-12 PZ

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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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Associated sites

R010XC020OR	**SR Loamy 9-12 PZ** SR Loamy 9-12 PZ
R010XC021OR	**SR Clayey 9-12 PZ** SR Clayey 9-12 PZ
R010XC043OR	**SR South 9-12 PZ** SR South 9-12 PZ
R010XC063OR	**SR Droughty North 9-12 PZ** SR Droughty North 9-12 PZ
R010XC064OR	**SR North 9-12 PZ** SR North 9-12 PZ

Similar sites

R010XC020OR	**SR Loamy 9-12 PZ** SR Loamy 9-12 PZ (greater soil depth, higher production)
R010XC021OR	**SR Clayey 9-12 PZ** SR Clayey 0-12 PZ (greater soil depth, higher production)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis*
Herbaceous	(1) *Pseudoroegneria spicata ssp. spicata* (2) *Poa secunda*

Physiographic features

This site occurs on mid elevation terraces, tablelands and rolling uplands. Slopes typically range from 2 to 12%. Elevations vary from 2,000 to 3,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	2,000–3,500 ft
Slope	2–12%
Aspect	Aspect is not a significant factor

Climatic features

The annual precipitation ranges from 9 to 12 inches, most of which occurs in the form of snow and rain during the months of November through April. Localized convection storms occasionally occur during the summer. The soil temperature regime is mesic with a mean air temperature of 52 degrees F. Temperature extremes range from 100 to -10 degrees F. The frost free period ranges from 110 to 140 days. The optimum growth period for plant growth is April through June.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	160 days
Precipitation total (average)	12 in

Influencing water features

Soil features

The soils of this site are typically shallow and well drained. Typically the surface layer is a gravelly silt loam to clay loam about 6 inches thick. The subsoil is a silty clay to stony clay about 10 inches thick. Depth to bedrock or an indurated pan is 10 to 20 inches. Permeability is slow. The available water holding capacity (AWC) is about 2 to 4 inches for the profile. The erosion potential is moderate to severe.

Table 4. Representative soil features

Parent material	(1) Eolian deposits–rhyolite
Surface texture	(1) Gravelly silt loam (2) Stony clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to moderately slow

Soil depth	10–20 in
Available water capacity (0-40in)	2–4 in

Ecological dynamics

The potential native plant community is dominated by Wyoming big sagebrush, bluebunch wheatgrass and Thurber's needlegrass. Sandberg bluegrass is the dominant shallow rooted perennial grass. A variety of forbs are common. Vegetative composition of the community is approximately 80 percent grasses, 10 percent forbs and 10 percent shrubs. The approximate ground cover is 40 to 60 percent (basal and crown).

Range in Characteristics:
Bluebunch wheatgrass increases on clayey surfaces. Thurber's needlegrass increases on loamy surfaces and on droughtier sites. Wyoming big sagebrush is clearly dominant throughout the precipitation zone. Basin big sagebrush increases slightly on deeper soils at higher precipitations. Crab apple increases over fractured bedrock and sediments. Production increases at the upper end of the precipitation zone.

Response to Disturbance:
When the condition of the site deteriorates as a result of over grazing bluebunch wheatgrass and Thurber's needlegrass rapidly decrease. Wyoming big sagebrush and Sandberg bluegrass increase. Cheatgrass, medusahead, other annuals, biennial weeds and bulbous bluegrass are strong invaders. With fire and continued disturbance sagebrush is severely impacted, rabbitbrush increases slightly and annuals and noxious biennial forbs continue to invade. Bare ground increases and excessive erosion contributes to downstream sedimentation.

States: ARTRW/POSE-BRTE; POSE-POBU/biennial forbs or BRTE-TACA8/biennial forbs (following fire on degraded range)

Treatment Response:

The repair pathways located between State 1 and States 2 and 3 indicates potential for rehabilitation. It will require mechanical or chemical treatment of sagebrush and annual grasses along with seeding of native or adapted introduced species in either of these two plant communities. If annual grasses are present in either of them it will require long term treatment. Since the risk of a seeding failure is high, it would be advisable to implement assisted succession by planting an aggressive perennial such as crested wheatgrass and then following up years later with a reintroduction of native species. Every effort should be made to prevent establishment of annual grasses on this site.
Reference Plant Community

State 1 – Reference State

Three plant community phases occur in the Reference State. They are phase 1.1, the Reference Plant Community Phase (RPCP) which is the perennial grass and forb phase, phase 1.2, the sagebrush grass phase and phase 1.3, the sagebrush dominant phase.

Phase 1.1. The Reference Plant Community Phase (RPCP) is the perennial grass and forb phase. This plant community is strongly dominated by bluebunch wheatgrass with Thurber's needlegrass, basin wildrye and Sandberg bluegrass being common. Lesser amounts of other perennial grasses and a small amount of forbs are also present. Wyoming big sagebrush and basin big sagebrush are both common. Grasses compose 78 % of the community, forbs 12% and shrubs 10%. Energy capture, nutrient cycling and water use are controlled by the perennial grasses.

Phase 1.2. Sagebrush grass phase. The sagebrush grass phase results with prescribed grazing and a normal fire frequency of 40-60 years (1.1A). The composition of sagebrush within the plant community will increase as the length of time between fires gets longer. A period of improper grazing can accelerate the increase in sagebrush even if the bunchgrass plant community is maintained. Under prescribed grazing and fire the plant community pathway (1.2A) moves back toward Phase 1.1, the perennial grass and forb phase. With the continued absence of fire and improper grazing management or drought (1.2B), the plant community will move towards phase 1.3,

sagebrush dominant phase. The ecological processes in this phase are still controlled by the perennial grasses.

Phase 1.3. The sagebrush dominant phase is dominated by Wyoming or basin big sagebrush, and lesser amounts of bluebunch wheatgrass, Thurber's needlegrass, basin wildrye and Idaho fescue. Sandberg bluegrass has increased in the stand as well as cheatgrass. Big sagebrush controls the ecological processes in this plant community. This phase is a result of the absence of fire with improper grazing or drought and can occur through community pathways 1.1B or 1.2B. This phase is the "at risk" plant community within State 1. As the site deteriorates the potential for cheatgrass invasion increases. With prescribed grazing and fire this phase can be returned to Phase 1.1 by community pathway 1.3A. Since this phase is "at risk" it can transition to State 2 (IRT1A) with the continued lack of fire and improper grazing or drought. With fire, improper grazing and drought this plant community can transition to State 3 (IRT1B).

State 2. This State is dominated by big sagebrush which controls all of the ecological processes. Initially, Phase 2.1, the sagebrush dominant phase is occupied by Wyoming and basin big sagebrush, with minor amounts of bluebunch wheatgrass and Thurber's needlegrass. Sandberg bluegrass has increased along with cheatgrass. If fire continues to be suppressed and severe improper grazing continues, the sagebrush will become decadent and the cheatgrass will replace the bunchgrass understory. The potential for soil erosion increases as this transition in the plant community occurs. The risk of an irreversible transition (IRT2A) over an abiotic threshold to the Erosional State, State 4, increases with fire, improper grazing or drought.

State 3. This state is dominated by annual grasses with few other shallow-rooted grasses in the understory but may have some rabbitbrush (3.1) in the overstory. This state is recognized as the annual grass phase and is a result of fire, improper grazing and drought. Continued improper grazing and fire will transition this state to the eroded state 4. The ecological processes in this state are controlled by the annual grasses.

State 4. This is the eroded state and is recognized by the soil erosion that is occurring or has occurred on the site in the past. Since this state has occurred through widespread erosion as a result of severe improper grazing in combination with fire all of the other states can transition to this State. The increase in bare ground facilitates the increase in wind and/or water erosion. Abiotic factors control site resources and ecological functions. Rehabilitation of this state may not be practical or possible due to extreme soil loss.

State and transition model

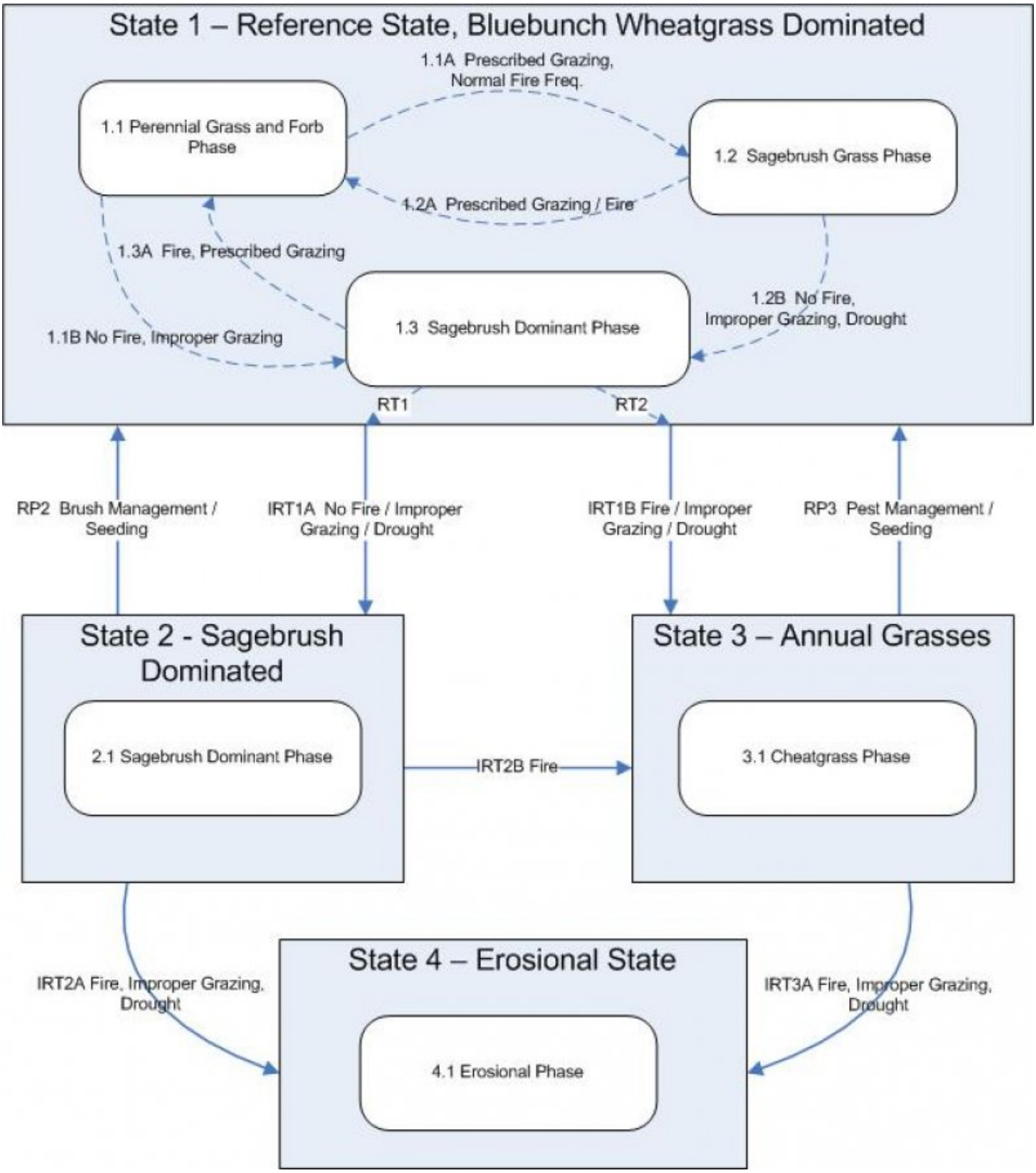

Figure 4. SR CLAYEY 9-12 PZ - R010XC021OR

State 1
Reference Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by Wyoming big sagebrush, bluebunch wheatgrass and Thurber's needlegrass. Sandberg bluegrass is the dominant shallow rooted perennial grass. A variety of forbs are common. Vegetative composition of the community is approximately 80 percent grasses, 10 percent forbs and 10 percent

shrubs. The approximate ground cover is 40 to 60 percent (basal and crown).

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	240	480	800
Shrub/Vine	30	60	100
Forb	30	60	100
Total	**300**	**600**	**1000**

Figure 6. Plant community growth curve (percent production by month). OR4461, B10 SR Lmy Clayey & No. 9-12pz. SR Lmy Clayey & No. 9-12pz RPC Growth Curve.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	35	25	10	0	10	0	0	0

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant, perennial, deep-rooted bunchgrasses**			360–540	
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	240–360	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	120–180	–
3	**Sub-dominant, perennial, shallow-rooted grass**			12–30	
	Sandberg bluegrass	POSE	*Poa secunda*	12–30	–
4	**Other perennial grasses**			6–48	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–12	–
	squirreltail	ELEL5	*Elymus elymoides*	6–12	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–12	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	0–12	–
Forb					
7	**Dominant, perennial forb**			12–18	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	12–18	–
8	**Sub-dominant, perenial, forbs**			36–66	
	desertparsley	LOMAT	*Lomatium*	10–20	–
	buckwheat	ERIOG	*Eriogonum*	6–12	–
	desertparsley	LOMAT	*Lomatium*	6–12	–
	lupine	LUPIN	*Lupinus*	6–12	–
	phlox	PHLOX	*Phlox*	6–10	–
	common yarrow	ACMI2	*Achillea millefolium*	6–10	–
	fleabane	ERIGE2	*Erigeron*	6–10	–
9	**Other perennial forbs**			10–50	
	milkvetch	ASTRA	*Astragalus*	2–6	–
	bastard toadflax	COMAN	*Comandra*	0–6	–
	hawksbeard	CREPI	*Crepis*	2–6	–

	hawksbeard	CREPI	*Crepis*	2–6	
	stoneseed	LITHO3	*Lithospermum*	3–6	–
	beardtongue	PENST	*Penstemon*	0–3	–
	deathcamas	ZIGAD	*Zigadenus*	1–3	–
	common woolly sunflower	ERLA6	*Eriophyllum lanatum*	0–3	–
	haplopappus	HAPLO11	*Haplopappus*	0–3	–
	woodland-star	LITHO2	*Lithophragma*	1–3	–
	mariposa lily	CALOC	*Calochortus*	0–3	–
	Indian paintbrush	CASTI2	*Castilleja*	0–3	–
	agoseris	AGOSE	*Agoseris*	0–3	–
	onion	ALLIU	*Allium*	1–3	–
	pussytoes	ANTEN	*Antennaria*	1–3	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0–2	–
Shrub/Vine					
11	**Dominant, evergreen shrub**			30–48	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	18–48	–
12	**Sub-dominant shrubs**			6–66	
	wild crab apple	PERA4	*Peraphyllum ramosissimum*	0–30	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0–18	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	6–18	–
13	**Other shrubs**			12–24	
	threetip sagebrush	ARTR4	*Artemisia tripartita*	3–7	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	3–7	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	3–7	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	3–7	–

Animal community

Livestock Grazing:
This site is suitable for livestock grazing use in the spring, and fall under a planned grazing system. Use should be postponed until the soils are firm enough to prevent trampling damage and soil compaction. Grazing management should be keyed for bluebunch wheatgrass and Thurber’s needlegrass. Deferred grazing or rest is recommended at least once every three years.

Native Wildlife Associated with the Potential Climax Community:
This site is commonly used by pronghorn antelope, mule deer, rabbits, rodents, upland birds and various predators. It is a referred site for sage grouse nesting, rearing and wintering. Antelope and mule deer make excellent use of the site for winter and spring forage.

Hydrological functions

The soils of this site are typically in an upland topographic position. They have moderate runoff potential and medium infiltration rates when the hydrologic cover is high. Hydrologic cover is high when bluebunch wheatgrass and other deep rooted bunchgrass components are greater than70 percent of potential. The soils are in hydrologic group D.

Other references

Stringham, Tamzen, 2007. Final Report for USDA Ecological Site Description. Oregon State University, Corvallis, Oregon.

USDI Bureau of Land Management, US Geological Survey; USDA Natural Resources Conservation Service, Agricultural Research Service; Interpreting Indicators of Rangeland Health. Technical Reference 1734-6; Version 4-2005.

Contributors

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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.

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Contact for lead author	State Rangeland Management Specialist for NRCS in Oregon.
Date	09/10/2009
Approved by	Bob Gillaspy
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None. Moderate sheet and rill erosion hazard.

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2. **Presence of water flow patterns:** None.

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3. **Number and height of erosional pedestals or terracettes:** None.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 30-40%.

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5. **Number of gullies and erosion associated with gullies:** None.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

7. **Amount of litter movement (describe size and distance expected to travel):** Fine. Limited movement, typically < two feet.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Moderately resistant to erosion. Aggregate stability 3-5.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Structure ranges from weak to strong very thin platy and platy structure. SOM is 0.5 to 2.0 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Significant ground cover and gentle slopes (2-20%) limit rainfall impact and overland flow.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Deeper soils on this site have a duripan or cemented hardpan between 20-30 inches.

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: Deep-rooted, perennial, cool-season bunchgrasses >>

    Sub-dominant: Shallow-rooted, perennial, cool-season bunchgrasses >

    Other: Tall shrubs > Forbs

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Big sagebrush will become decadent in the absence of normal fire frequency and ungulate grazing. Grass and forb mortality will occur as tall shrubs increase. Normal decadence would be expected in the bluebunch wheatgrass. This would be evidenced by the dead centers in the plants.

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):** Favorable: 1400; Normal: 1000; Unfavorable: 600 lbs/ac/yr

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: cheatgrass, medusahead, dalmation toadflax, Russian, diffuse and spotted knapweed

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17. **Perennial plant reproductive capability:** All species should be capable of reproducing annually.