Ecological site R025XY010NV
STEEP NORTH SLOPE

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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): 025X–Owyhee High Plateau

MLRA Notes 25—Owyhee High Plateau
This area is in Nevada (56 percent), Idaho (30 percent), Oregon (12 percent), and Utah (2 percent). It makes up about 27,443 square miles. MLRA 25 is characteristically cooler and wetter than the neighboring MLRAs of the Great Basin. The western boundary is marked by a gradual transition to the lower and warmer basins of MLRA 24. The boundary to the south-southeast, with MLRA 28B, is marked by gradual changes in geology marked by an increased dominance of singleleaf pinyon and Utah juniper and a reduced presence of Idaho fescue. The boundary to the north, with MLRA 11, is a rapid transition from the lava plateau topography to the lower elevation Snake River Plain.
Physiography:
All of this area lies within the Intermontane Plateaus. The southern half is in the Great Basin section of the Basin and Range province. This part of the MLRA is characterized by isolated, uplifted fault-block mountain ranges separated by narrow, aggraded desert plains. This geologically older terrain has been dissected by numerous streams draining to the Humboldt River.
The northern half of the area lies within the Columbia Plateaus province. This part of the MLRA forms the southern boundary of the extensive Columbia Plateau basalt flows. Most of the northern half is in the Payette section, but the northeast corner is in the Snake River Plain section. Deep, narrow canyons draining into the Snake River have been incised into this broad basalt plain. Elevation ranges from 3,000 to 7,550 feet on rolling plateaus and in gently sloping basins. It is more than 9,840 feet on some steep mountains. The Humboldt River crosses the southern half of this area
Geology:
The dominant rock types in this MLRA are volcanic. They include andesite, basalt, tuff, and rhyolite. In the north and west parts of the area, Cretaceous granitic rocks are exposed among Miocene volcanic rocks in mountains. A Mesozoic igneous and metamorphic rock complex dominates the south and east parts of the area. Upper and Lower Paleozoic calcareous sediments, including oceanic deposits, are exposed with limited extent in the mountains. Alluvial fan and basin fill sediments occur in the valleys.
Climate:
The average annual precipitation in most of this area is typically 11 to 22 inches. It increases to as much as 49 inches at the higher elevations. Rainfall occurs in spring and sporadically in summer. Precipitation occurs mainly as snow in winter. The precipitation is distributed fairly evenly throughout fall, winter, and spring. The amount of precipitation is lowest from midsummer to early autumn. The average annual temperature is 33 to 51 degrees F. The freeze-free period averages 130 days and ranges from 65 to 190 days, decreasing in length with elevation. It is typically less than 70 days in the mountains.
Water:
The supply of water from precipitation and streamflow is small and unreliable, except along the Owyhee, Bruneau, and Humboldt Rivers. Streamflow depends largely on accumulated snow in the mountains. Surface water from mountain runoff is generally of excellent quality and suitable for all uses. The basin fill sediments in the narrow alluvial valleys between the mountain ranges provide some ground water for irrigation. The alluvial deposits along the large streams have the most ground water. Based on measurements of water quality in similar deposits in

adjacent areas, the basin fill deposits probably contain moderately hard water. The water is suitable for almost all uses. The carbonate rocks in this area are considered aquifers, but they are little used. Springs are common along the edges of the limestone outcrops.
Soils:
The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic or frigid temperature regime and an aridic, aridic bordering on xeric, or xeric moisture regime. Soils with aquic moisture regimes are limited to drainage or spring areas, where moisture originates or runs on and through. These soils are of a very limited extent throughout the MLRA. They generally are well drained, clayey or loamy, and shallow or moderately deep. Most of the soils formed in mixed parent material. Volcanic ash and loess mantle the landscape. Surface soil textures are loam and silt loam with ashy texture modifiers in some areas. Argillic horizons occur on the more stable landforms. They are exposed nearer the soil surface on convex landforms, where ash and loess deposits are more likely to erode. Soils that formed in carbonatic parent material in areas that receive less than 12 inches of precipitation are characterized by calcic horizons throughout the profile, while soils in areas that receive more than 12 inches of precipitation do not have calcic horizons in the upper part of the profile. Soils that formed on stable landforms at the lower elevations are dominated by ochric horizons. Soils that formed at the middle and upper elevations are characterized by mollic epipedons. Soils in drainage areas at all elevations that receive moisture running on or through them are characterized by thicker mollic epipedons.
Biological Resources:
This MLRA supports shrub-grass vegetation. Lower elevations are characterized by Wyoming big sagebrush associated with bluebunch wheatgrass, western wheatgrass, and Thurber’s needlegrass. Other important plants include bluegrass, squirreltail, penstemon, phlox, milkvetch, lupine, Indian paintbrush, aster, and rabbitbrush. Black sagebrush occurs but is less extensive. Singleleaf pinyon and Utah juniper occur in limited areas. With increasing elevation and precipitation, vast areas characterized by mountain big sagebrush or low sagebrush/early sagebrush in association with Idaho fescue, bluebunch wheatgrass, needlegrasses, and bluegrass become common. Snowberry, curl-leaf mountain mahogany, ceanothus, and juniper also occur. Mountains at the highest elevations support whitebark pine, Douglas-fir, limber pine, Engelmann spruce, subalpine fir, aspen, and curl-leaf mountain mahogany.
Major wildlife species include mule deer, bighorn sheep, pronghorn, mountain lion, coyote, bobcat, badger, river otter, mink, weasel, golden eagle, red-tailed hawk, ferruginous hawk, Swainson’s hawk, northern harrier, prairie falcon, kestrel, great horned owl, short-eared owl, long-eared owl, burrowing owl, pheasant, sage grouse, chukar, gray partridge, and California quail. Reptiles and amphibians include western racer, gopher snake, western rattlesnake, side-blotched lizard, western toad, and spotted frog. Fish species include bull, red band, and rainbow trout.

Ecological site concept

This site is on steep mountain side slopes of northerly exposure. Slopes are between 30 to 75 percent. Elevations range from 6,500 to 9,500 feet (1981 to 2895 meters).

The soils of this site are more than 40 inches (101cm) deep to bedrock and well drained. Available water capacity is moderate. The surface layer is moderately coarse to medium textured and is more than 10 inches (25cm) thick to the subsoil or underlying material. These soils have 35 to over 50 percent rock fragments through the soil profile. These soils typically have a mollic epipedon and an argillic horizon.

The Reference State is dominated by Idaho fescue and other perennial grasses.

Associated sites

F025XY065NV	**Backslope Aspen**
R025XY002NV	**ASPEN THICKET**
R025XY004NV	**LOAMY SLOPE 16+ P.Z.**
R025XY016NV	**SOUTH SLOPE 14-18 P.Z.**

Similar sites

R025XY012NV	**LOAMY SLOPE 12-16 P.Z.** FEID-PSSPS codominant grasses
R025XY027NV	**LOAMY 12-14 P.Z.** ARTRT dominant shrub; on gentler slopes and typically at lower elevations
R025XY029NV	**DEEP LOAMY 14+ P.Z.** LECI4-BRMA4 codominant with FEID; more productive site
R025XY056NV	**LOAMY 14-16 P.Z.** Slopes less than 30 percent; more productive site

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Festuca idahoensis*

Physiographic features

This site is on steep mountain side slopes of northerly exposure. Slopes are 30 to 75 percent. Elevations are 6500 to 9500 feet (1981 to 2895 meters).

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	6,500–9,500 ft
Slope	30–75%
Water table depth	72 in
Aspect	NW, N, NE

Climatic features

The climate associated with this site is semiarid, characterized by cold, moist winters and warm, dry summers. The average annual precipitation ranges from 14 or more inches (36cm). Mean annual air temperature is typically less than 45 degrees F.

Mean annual precipitation in inches across the range is ES 18.58 (47cm).

Monthly mean precipitation in inches: January 1.65 (4.1cm); February 1.68 (4.2cm); March 1.98 (5.0cm); April 2.43 (6.1cm); May 2.41 (6.1cm); June 1.62 (4.1cm); July 0.61 (1.5cm); August 0.63 (1.6cm); September 0.84 (2.1cm); October 1.41 (3.5cm); November 1.51 (3.8cm); December 1.79 (4.5cm).

*The above data is averaged from the Jarbridge 4N and Lamoille PH WRCC climate stations.

Table 3. Representative climatic features

Frost-free period (characteristic range)	50-70 days
Freeze-free period (characteristic range)	75-100 days
Precipitation total (characteristic range)	16-20 in
Frost-free period (average)	60 days

Freeze-free period (average)	95 days
Precipitation total (average)	18 in

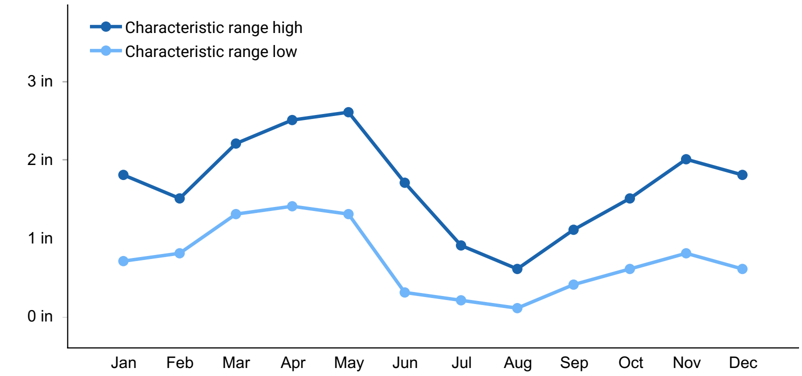

Figure 1. Monthly precipitation range

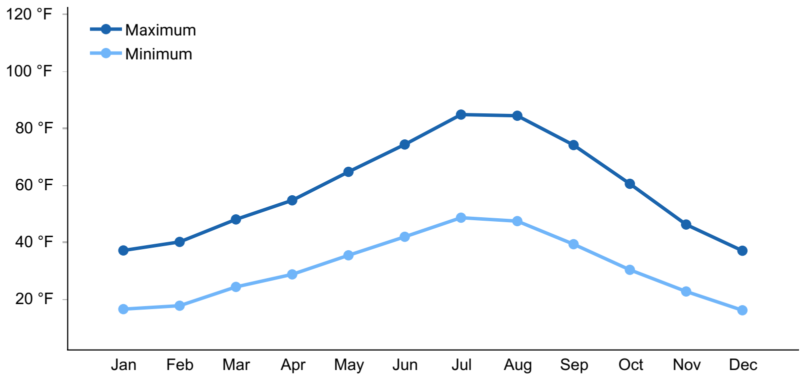

Figure 2. Monthly average minimum and maximum temperature

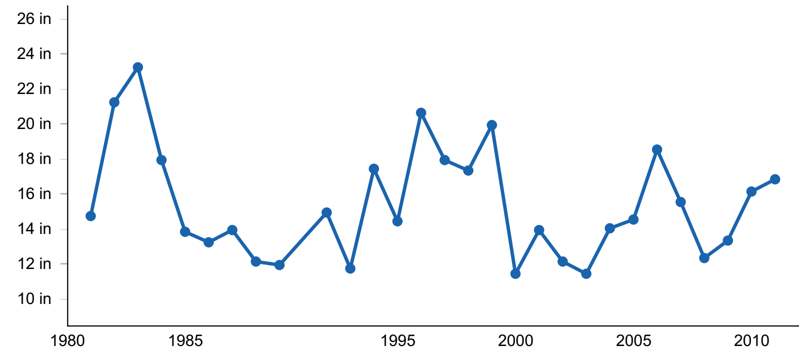

Figure 3. Annual precipitation pattern

Climate stations used

- (1) JARBIDGE 7 N [USC00264039], Jackpot, NV
- (2) LAMOILLE YOST [USC00264394], Spring Creek, NV

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils of this site are more than 40 inches (102cm) deep to bedrock and well drained. Available water capacity is moderate. The surface layer is moderately coarse to medium textured and is more than 10 inches (25cm) thick to the subsoil or underlying material. These soils have 35 to over 50 percent rock fragments through the soil profile.

These soils typically have a mollic epipedon and an argillic horizon. Snow accumulation persists on this site late into spring when the soil is not frozen. Snow melt, at this time, adds to the soil moisture supply. Soil temperatures and evapotranspiration potentials are limited due to reduced insolation on the steep north slopes where this site occurs. Runoff is medium to rapid. The potential for sheet and rill erosion is moderate to high depending upon the slope and amount of surface rock fragments. Soil stability values should be 3 to 6 on most soil textures found on this site.

The soils series associated with this site are Bullville, Itwo, Shively, Stopatoe and Tusel.

A representative soil series is Tusel, classified as a loamy-skeletal, mixed, superactive Vitrandic Argicryoll. These soils are deep or very deep, well drained soils that formed in residuum and colluvium derived from quartzite, chert and shale with surficial deposits of loess and volcanic ash. Reaction is slightly acid or neutral. Diagnostic features include a mollic epipedon that occurs from the soil surface to 17 inches (43cm). A vitrandic intergrade feature exists from the soil surface to 17 inches (43cm). An argillic horizon occurs in inches from 17 to 42 (43 to 107cm). Clay content in the particle-size control section ranges from 25 to 35 percent. Sand content is 40 to 60 percent. Rock fragments are 50 to 75 percent, mainly gravel.

Table 4. Representative soil features

Parent material	(1) Colluvium–quartzite (2) Residuum–quartzite
Surface texture	(1) Very gravelly loam (2) Gravelly loam (3) Very gravelly coarse sandy loam
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	20–72 in
Soil depth	20–72 in
Surface fragment cover <=3"	0–45%
Surface fragment cover >3"	0–18%
Available water capacity (0-40in)	1.7–5.7 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–65%
Subsurface fragment volume >3" (Depth not specified)	0–35%

Ecological dynamics

An ecological site is the product of all the environmental factors responsible for its development and has a set of key characteristics that influence a site's resilience to disturbance and resistance to invasives. Key characteristics include 1) climate (precipitation and temperature), 2) topography (aspect, slope, elevation, and landform), 3) hydrology (infiltration and runoff), 4) soils (depth, texture, structure, and organic matter), 5) plant communities (functional groups and productivity), and 6) natural disturbance regime (fire, herbivory, etc.) (Caudle et al. 2013). Biotic factors that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al. 2013).

The Great Basin sagebrush communities have high spatial and temporal variability in precipitation both among years and within growing seasons. Nutrient availability is typically low but increases with elevation and closely follows moisture availability. The invasibility of plant communities is often linked to resource availability. Disturbance can decrease resource uptake due to damage or mortality of the native species and depressed competition. It can also increase resource pools via the decomposition of dead plant material following disturbance. 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).

Periodic drought regularly influences sagebrush ecosystems and drought duration and severity has increased throughout the 20th century in much of the Intermountain West. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability within the soil profile (Bates et al. 2006).

This ecological site is dominated by Idaho fescue, a deep-rooted cool season perennial bunchgrass. Bluegrasses (Poa spp.), bluebunch wheatgrass (*Pseudoroegneria spicata*), mountain brome (*Bromus marginatus*), and basin wildrye (*Leymus cinereus*) are also common. The perennial bunchgrasses generally have high root densities. Mountain big sagebrush, mountain snowberry (*Symphoricarpos oreophilus*), antelope bitterbrush (*Purshia tridentata*), and Utah serviceberry (*Amelanchier utahensis*) are common shrubs. These shrubs have a flexible generalized root system with development of both deep taproots and laterals near the surface (Comstock and Ehleringer 1992). The dominant shrubs usually root to the full depth of the winter-spring soil moisture recharge, which ranges from 1.0 to over 3.0 meters (Dobrowolski et al. 1990). Root length of mature sagebrush plants was measured to a depth of 2 meters in alluvial soils in Utah (Richards and Caldwell 1987).
As ecological condition declines, mountain big sagebrush, rabbitbrush (Chrysothamnus spp.), and snowberry become dominant on the site. Bottlebrush squirreltail (*Elymus elymoides*) and Sandberg bluegrass (*Poa secunda*) also increase as ecological condition lowers. Cheatgrass is the species that is most likely to invade this site.

This site has moderate to high resilience to disturbance and resistance to invasion. Resilience increases with elevation, aspect, increased precipitation and increased nutrient availability. Two possible stable states have been identified for this ecological site.

Fire Ecology:
Fire was the main disturbance observed within the reference state. The Steep North Slope ecological site occurs within the larger mountain big sagebrush landscape; therefore, its susceptibility to fire is driven by the neighboring ecological sites fire return intervals and fuel accumulation within this site. Pre-settlement fire return intervals in mountain big sagebrush communities varied from 15 to 25+ years (Burkhardt and Tisdale 1969, Houston 1973, Miller 2000). Mountain big sagebrush is killed by fire (Neuenschwander 1980, Blaisdell et al. 1982), and does not resprout (Blaisdell 1953). Post-fire regeneration occurs from seed and will vary depending on site characteristics, seed source, and fire characteristics. Mountain big sagebrush seedlings can grow rapidly and may reach reproductive maturity within 3 to 5 years (Bunting et al. 1987). Mountain big sagebrush may return to pre-burn density and cover within 15 to 20 years following fire, but establishment after severe fires may proceed more slowly and can take up to 50 years (Bunting et al. 1987, Ziegenhagen 2003, Miller and Heyerdahl 2008, Ziegenhagen and Miller 2009).

With fire, this site returns to a community dominated by bunchgrasses. Perennial forbs such as lupine (Lupinus spp.), hawksbeard (Crepis spp.), sunflowers (Senecio spp.), and balsamroot (Balsamorhiza spp.) may be significant components on this site for a few years after a fire.

The effect of fire on bunchgrasses relates to culm density, culm-leaf morphology, and the size of the plant. The initial condition of bunchgrasses within the site, seasonality, and intensity of the fire factor into the individual species' responses. For most forbs and grasses, the growing points are located at or below the soil surface, which provides relative protection from disturbances which decrease above ground biomass, such as grazing or fire. Thus, fire mortality for grasses is more correlated to duration and intensity of heat, which is related to culm density, culm-leaf morphology, size of plant and abundance of old growth (Wright 1971, Young 1983).

Idaho fescue is a dense, fine-leaved bunchgrass, which allows fires to burn and smolder in the accumulated leaves at the base of the plant. Wright and others (1979) found the dense, fine leaves of Idaho fescue provided enough fuel to burn for hours after a fire had passed, thereby killing or seriously injuring the plant regardless of the intensity of the fire (Wright et al. 1979). However, rapid burns have been found to leave little damage to root crowns, and new tillers are produced with onset of fall moisture (Johnson et al. 1994). Mature Idaho fescue plants are commonly reported to be severely damaged by fire in all seasons (Wright et al. 1979). Initial mortality may be high (in excess of 75%) on severe burns, but usually varies from 20 to 50% (Barrington et al 1988). Rapid tillering can occur after fire when root crowns are not killed and soil moisture is favorable (Johnson et al. 1994, Robberecht and Defossé 1995). Plants may reestablish from seed after fire if temperatures are low enough to allow for survival of seed (Cook et al. 1994).

On this site, mountain snowberry, Utah serviceberry and antelope bitterbrush are more likely than sagebrush to regenerate quickly after a fire.

State and transition model

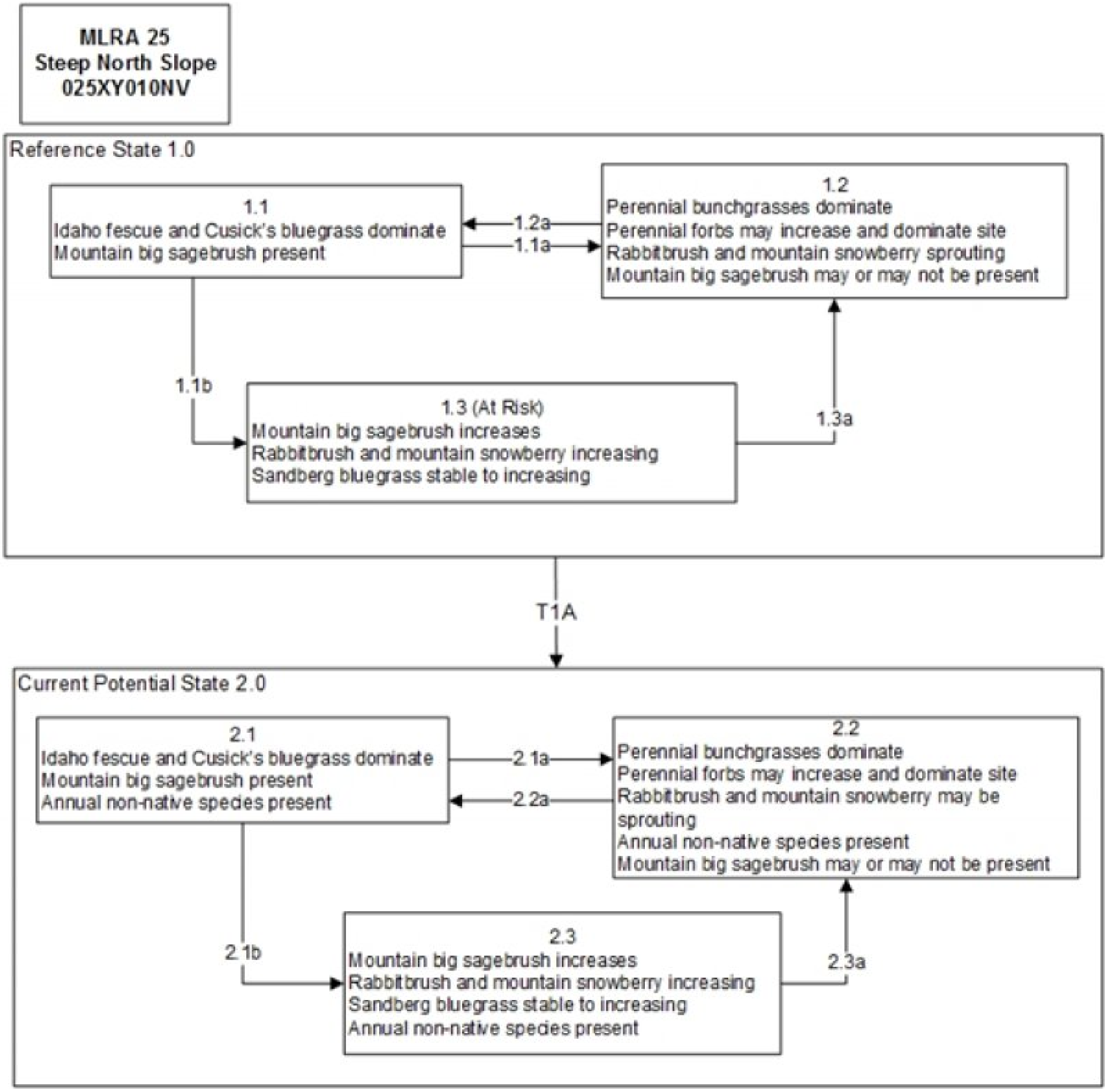

Figure 5. State and Transition Model, TK Stringham 6/2015

MLRA 25
Steep North Slope
025XY010NV
KEY

Reference State 1.0 Community Phase Pathways
1.1a: Low severity fire, may occur in a mosaic pattern.
1.1b: Time and lack of disturbance such as fire or drought. Excessive herbivory may also decrease the perennial understory
1.2a: Time and lack of disturbance such as fire or drought. Excessive herbivory may also decrease the perennial understory.
1.3a: Low severity fire, may occur in a mosaic pattern.

T1A: Introduction of annual non-native species.

Current Potential State 2.0 Community Phase Pathways
2.1a: Fire.
2.1b: Time and lack of disturbance such as fire or drought. Inappropriate grazing management may also decrease the perennial understory.
2.2a: Time and lack of disturbance such as fire or drought. Inappropriate grazing management may also decrease the perennial understory.
2.3a: Fire.

Figure 6. Legend

State 1
Reference State

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The reference state has 3 general community phases; a shrub-grass dominant phase, a perennial grass dominant phase and a shrub dominant phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic long-term drought and/or insect or disease attack.

Community 1.1
Idaho fescue-Cusick's bluegrass

The representative plant community is dominated by Idaho fescue. Potential vegetative composition is about 75 percent grasses, 15 percent forbs and 10 percent shrubs. Approximate ground cover (basal and crown) is 45 to 60 percent. Bare ground is approximately 25 percent. Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 25 percent of total woody canopy; some of the mature bunchgrasses (<10 percent) have dead centers. Litter cover occurs within plant interspaces at a depth of about 1/4 inch.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	450	600	900
Forb	90	120	180
Shrub/Vine	60	80	120
Total	**600**	**800**	**1200**

Community 1.2

Perennial bunchgrasses/sprouting shrubs

Idaho fescue and other perennial bunchgrasses dominate the site. Rabbitbrush and snowberry may be sprouting. Perennial forbs such as lupine and arrowleaf balsamroot may dominate the site after fire and persist for several years.

Community 1.3
Mountain big sagebrush

Sagebrush increases in the absence of disturbance. Decadent sagebrush dominates the overstory and the deep-rooted perennial bunchgrasses in the understory are reduced either from competition with shrubs and/or from herbivory.

Pathway 1.1a
Community 1.1 to 1.2

Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses, forbs and sprouting shrubs to dominate the site. Fires would typically be low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth (Aroga websteri) could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

Pathway 1.1b
Community 1.1 to 1.3

Time and lack of disturbance such as fire allows for sagebrush to increase and become decadent. Long-term drought, herbivory, or combinations of these would cause a decline in perennial bunchgrasses and fine fuels leading to a reduced fire frequency allowing big sagebrush to dominate the site.

Pathway 1.2a
Community 1.2 to 1.1

Time and lack of disturbance would allow for the mountain big sagebrush to recover.

Pathway 1.3a
Community 1.3 to 1.2

Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses, forbs and sprouting shrubs to dominate the site. Fires would typically be low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth (Aroga websteri) could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

State 2
Current Potential

This state is similar to the Reference State 1.0 with three similar community phases. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These feedbacks include the presence of all structural and functional groups, low fine fuel loads and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate and adaptations for seed dispersal.

Community 2.1
Perennial bunchgrasses/mountain big sagebrush/annual non-native species

Figure 8. Steep North Slope (R025XY010NV) Phase 2.1 T. K. Stringham, July 2011

Figure 9. Steep North Slope (R025XY010NV) Phase 2.1 T. K. Stringham, July 2011

This community phase is similar to the Reference State Community Phase 1.1, with the presence of non-native species in trace amounts. The dominant species within this plant community is Idaho fescue with Cusick's bluegrass and other perennial bunchgrasses making up a minor component. Mountain big sagebrush, antelope bitterbrush, mountain snowberry, Utah serviceberry and perennial forbs are also present on this site.

Community 2.2
Perennial bunchgrasses/sprouting shrubs/annual non-native species

This community phase is characteristic of a post-disturbance, early seral community where annual non-native species are present. Idaho fescue and other perennial bunchgrasses dominate the site. Rabbitbrush and snowberry may be sprouting. Perennial forbs such as lupine and arrowleaf balsamroot may dominate the site after fire and persist for several years. Depending on fire severity or intensity of Aroga moth infestations, patches of intact sagebrush may remain.

Community 2.3
Mountain big sagebrush/Sandberg bluegrass/annual non-native species

Sagebrush dominates the overstory and perennial bunchgrasses in the understory are reduced, either from competition with shrubs or from inappropriate grazing, or from both. Rabbitbrush may be a significant component. Sandberg bluegrass may increase and become co-dominant with deep rooted bunchgrasses. Annual non-natives species may be stable or increasing due to lack of competition with perennial bunchgrasses.

Pathway 2.1a
Community 2.1 to 2.2

Fire would reduce the shrub overstory and allow for perennial bunchgrasses, forbs and sprouting shrubs to dominate the site. Fires would typically be low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs. Annual non-native species are likely to increase after fire.

Pathway 2.1b
Community 2.1 to 2.3

Time and lack of disturbance allows for sagebrush to increase and become decadent. Long-term drought would reduce fine fuels and lead to a reduced fire frequency allowing big sagebrush to dominate the site. Inappropriate grazing management would reduce the perennial bunchgrass understory; conversely Sandberg bluegrass may increase in the understory depending on grazing management.

Pathway 2.2a
Community 2.2 to 2.1

Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The establishment of big sagebrush can take many years.

Pathway 2.3a
Community 2.3 to 2.2

Fire would reduce the shrub overstory and allow for perennial bunchgrasses, forbs and sprouting shrubs to dominate the site. Fires would typically be low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs. Annual non-native species are likely to increase after fire.

Transition T1A
State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual plants, such as cheatgrass and mustards. Slow variables: Over time the annual non-native species will increase within the community. Organic matter inputs are reduced. Threshold: Any amount of introduced non-native species causes an immediate decrease in the resilience of the site. Annual non-native species cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation.

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	**Primary Perennial Grasses**			456–680	
	Idaho fescue	FEID	*Festuca idahoensis*	400–520	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	40–120	–
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	16–40	–
2	**Secondary Perennial Grasses**			40–120	
	needlegrass	ACHNA	*Achnatherum*	4–24	–
	mountain brome	BRMA4	*Bromus marginatus*	4–24	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	4–24	–
	basin wildrye	LECI4	*Leymus cinereus*	4–24	–
	Sandberg bluegrass	POSE	*Poa secunda*	4–24	–
Forb					
3	**Perennial**			80–160	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	4–40	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	4–40	–
	lupine	LUPIN	*Lupinus*	4–40	–
	ragwort	SENEC	*Senecio*	4–40	–
Shrub/Vine					
4	**Primary Shrubs**			16–64	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	16–64	–
5	**Secondary Shrubs**			16–40	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	4–16	–
	yellow rabbitbrush	CHVIL4	*Chrysothamnus viscidiflorus ssp. lanceolatus*	4–16	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	4–16	–
	snowberry	SYMPH	*Symphoricarpos*	4–16	–

Animal community

Livestock Interpretations:
This site is suited to cattle and sheep grazing during the summer and early fall. Attentive grazing management is required due to steep slopes and erosive surface conditions. Considerations for grazing management include timing, intensity and duration of grazing.

Reduced bunchgrass vigor or density provides an opportunity for Sandberg bluegrass in increase. Cheatgrass and other invasive species may also be able to occupy interspaces, leading to increased fire frequency and potentially an annual plant community. Sandberg bluegrass increases under grazing pressure (Tisdale and Hironaka 1981) and is capable of co-existing with cheatgrass. Excessive sheep grazing favors Sandberg bluegrass; however, where cattle are the dominant grazers, cheatgrass often dominates (Daubenmire 1970). Thus, depending on the season of use, the grazer and site conditions, either Sandberg bluegrass or cheatgrass may become the dominant understory with inappropriate grazing management.

Idaho fescue provides important forage for many types of domestic livestock. The foliage cures well and is preferred by livestock in the late fall and winter. Idaho fescue tolerates light to moderate grazing (Ganskopp and Bedell 1980) and is moderately resistant to trampling (Cole 1987). Heavy grazing may lead to replacement of Idaho fescue with non-native species such as cheatgrass (Mueggler 1984).

Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for livestock. Although bluebunch wheatgrass can be a crucial source of forage, it is not necessarily the most highly preferred species. Bluebunch wheatgrass is moderately grazing-tolerant and is very sensitive to defoliation during the active growth period (Blaisdell and Pechanec 1949, Laycock 1967, Anderson and Scherzinger 1975). Herbage and flower stalk production was shown to be reduced at all times during the growing season; however, clipping was most harmful during the boot stage (Blaisdell and Pechanec 1949, Britton et al. 1990). Tiller production and growth of bluebunch wheatgrass was greatly reduced when drought was coupled with clipping (Busso and Richards 1995). Mueggler (1975) estimated that low-vigor bluebunch wheatgrass may need up to 8 years rest to recover.

Cusick's bluegrass typically makes up only a small proportion of the biomass of the sagebrush communities in which it lives, but it is often taken preferentially by cattle, especially early in the season.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine-tuned by the client by adaptive management through the year and from year to year.

Wildlife Interpretations:
This site provides good yearlong food and cover value to deer. Upland game animals such as rabbits, sage grouse, chukar and Hungarian partridges use this site when snow free. The site is used by various songbirds, rodents and reptiles and associated predators natural to the area. Feral horses also make use of this site.

Idaho fescue is an important source of forage for pronghorn and deer in ranges of northern Nevada.

Deer, elk, and mountain goat also use Cusick's bluegrass early in the season. The value of Cusick's bluegrass as cover for small animals has been rated as poor to fair.

Bluebunch wheatgrass does not generally provide sufficient cover for ungulates; however, mule deer were frequently found in bluebunch-dominated grasslands.

Hydrological functions

Rills are usually non-existent. Water flow patterns are rare but can be expected on steeper slopes in areas recently subjected to summer convection storms or rapid snowmelt. Pedestals are rare on this site. Frost heaving of shallow rooted plants should not be considered a "normal" condition. Gullies are non-existent in areas of this site that occur on stable landforms. Fine litter (foliage from grasses and annual and perennial forbs) is expected to move the distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during catastrophic events. Perennial herbaceous plants (especially deep-rooted bunchgrasses) slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

Recreational uses

Aesthetic value is derived from the colorful flowering of forbs and shrubs in the spring and early summer. The diverse floral and faunal populations offer rewarding opportunities to photographers and for nature study. Steep slopes inhibit many forms of recreation. Off-road vehicles can destroy the fragile vegetation/soil complex and cause severe erosion problems. This site has potential for deer and upland game hunting.

Wood products

None

Other products

Native Americans used big sagebrush leaves and branches for medicinal teas, and the leaves as a fumigant. Bark was woven into mats, bags and clothing.

Inventory data references

NRCS-RANGE-417 - 5 records
NASIS soil component data

Type locality

Location 1: Elko County, NV	
Township/Range/Section	T37N R53E S3
General legal description	About 30 miles north of Elko, south side of road above Rip Van Winkle Mine (Lone Mountain area), Elko County, Nevada.

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Contributors

RK/GKB

TK Stringham
P NovakEchenique

Approval

Kendra Moseley, 4/24/2024

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)	GK BRACKLEY
Contact for lead author	State Rangeland Management Specialist
Date	06/22/2006
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are typically non-existent.

2. **Presence of water flow patterns:** Water flow patterns are rare but can be expected on steeper slopes in areas recently subjected to summer convection storms or rapid snowmelt.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare. Frost heaving of shallow rooted plants should not be considered a "normal" condition.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 25% depending on amount of surface rock fragments

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during large rainfall events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 3 to 6 on most soil textures found on this site. (To be field tested.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically platy or subangular blocky. Soil surface colors are dark and soils are typified by a mollic epipedon. Organic matter of the surface 2 to 4 inches is typically 1.25 to 3 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Idaho fescue] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are none. Subsoil argillic horizons not to be interpreted as compacted.

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, cool season, perennial bunchgrasses

    Sub-dominant: tall shrubs (big sagebrush)>>associated shrubs>shallow-rooted, cool season, perennial grasses>deep-rooted, cool season, perennial forbs>fibrous, shallow-rooted, cool season, perennial and annual forbs

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<10%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (35-50%) and litter depth is ±¼ inch.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through mid-June) ± 800 lbs/ac; Spring moisture significantly affects total 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: Invaders include cheatgrass.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years

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