USDA Natural Resources
Conservation Service

Ecological site R025XY064OR
SHRUBBY SHALLOW CLAYPAN 13-16 PZ

Last updated: 4/25/2024
Accessed: 05/11/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 025X–Owyhee High Plateau

The Owyhee High Plateau, MLRA 25, lies within the Intermontane Plateaus physiographic province. The southern half is found in the Great Basin while the northern half is located in the Columbia Plateaus. The southern section of the Owyhee High Plateau 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 section forms the southern boundary of the extensive Columbia Plateau basalt flows. Deep, narrow canyons drain to the Snake River across the broad volcanic plain.

This MLRA is characteristically cooler and wetter than the neighboring MLRAs of the Great Basin. 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 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. Precipitation occurs mainly as snow in winter. The supply of water from precipitation and streamflow is small and unreliable, except along major rivers. Streamflow depends largely on accumulated snow in the mountains.

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, arid bordering on xeric, or xeric moisture regime. Most of the soils formed in mixed parent material. Volcanic ash and loess mantle the landscape. Surface soil textures are loam and silt loam, and have ashy texture modifiers in some cases. Argillic horizons occur on the more stable landforms.

Ecological site concept

This ecological site is on gently sloping foothills and broad tablelands associated with volcanic plateau landscapes. Elevations range from 4,700 to 6,500 ft. The soils associated with this site have an abrupt boundary in the top 10 inches resulting in wet non-satiated conditions. The soil climate is frigid (soil temperature regime) and xeric (soil moisture regime). The reference plant community is characterized by dominance of antelope bitterbrush and Idaho fescue, however low sagebrush (little sagebrush) is still a large component. Bluebunch wheatgrass and Sandburg bluegrass are also common in the understory.

(wet non-saturated conditions - Schoeneberger, P.J., 2012, pg 1-15)

Associated sites

R025XY026OR	**CLAYPAN SOUTH SLOPES 13-16 PZ**
R025XY028OR	**SHRUBBY SOUTH SLOPES 13-16 PZ**
R025XY034OR	**SHRUBBY NORTH SLOPES 13-16 PZ**
R025XY063OR	**SKELETAL CLAYPAN 11+ PZ**

R025XY065OR	**SHRUBBY LOAM 13-16 PZ**

Similar sites

R025XY018OR	**SHALLOW CLAYPAN 13-16 PZ** Bedrock is less fractured; possibly different geologies. More likely to occur on lithic vs paralithic soils.
R025XY016OR	**SHALLOW CLAYPAN 11-13 PZ** Lower precipitation (aridic); lower production

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Purshia tridentata* (2) *Artemisia arbuscula*
Herbaceous	(1) *Festuca idahoensis* (2) *Pseudoroegneria spicata subsp. spicata*

Physiographic features

This site occurs on plateaus and tablelands. Slopes range from 2 to 12 percent. Elevation varies from 4,700 to 6,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Tableland
Runoff class	High to very high
Elevation	4,700–6,500 ft
Slope	2–12%
Water table depth	100 in
Aspect	Aspect is not a significant factor

Climatic features

The annual precipitation ranges from 13 to 16 inches, most of which occurs in the form of snow during the months of December through March. Localized convection storms occasionally occur during the summer. The soil temperature regime if frigid with a mean annual air temperature of 44 degrees F. Temperature extremes range from 10 to 90 degrees F. The frost free period ranges from less than 50 to 90 days. The optimum growth period for native plants is from April through June.

Table 3. Representative climatic features

Frost-free period (characteristic range)	50-90 days
Freeze-free period (characteristic range)	90-120 days
Precipitation total (characteristic range)	13-16 in
Frost-free period (average)	90 days
Freeze-free period (average)	100 days
Precipitation total (average)	15 in

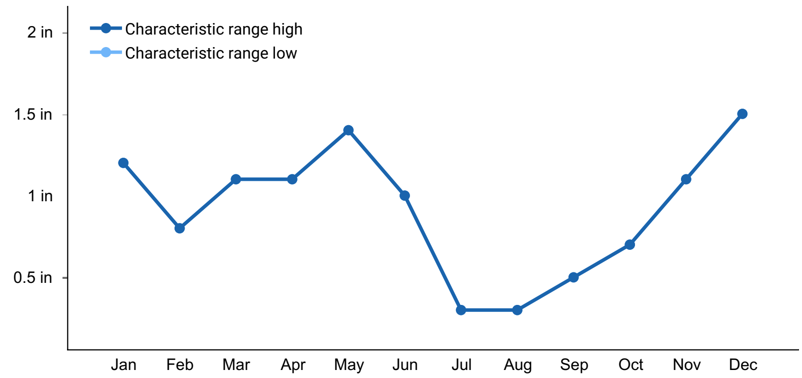


Figure 1. Monthly precipitation range

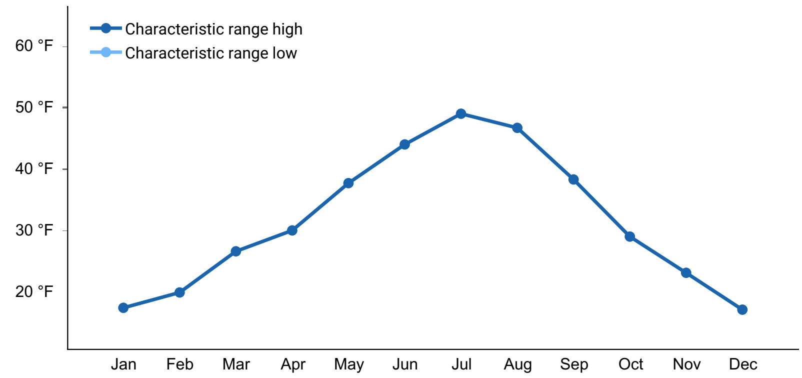


Figure 2. Monthly minimum temperature range

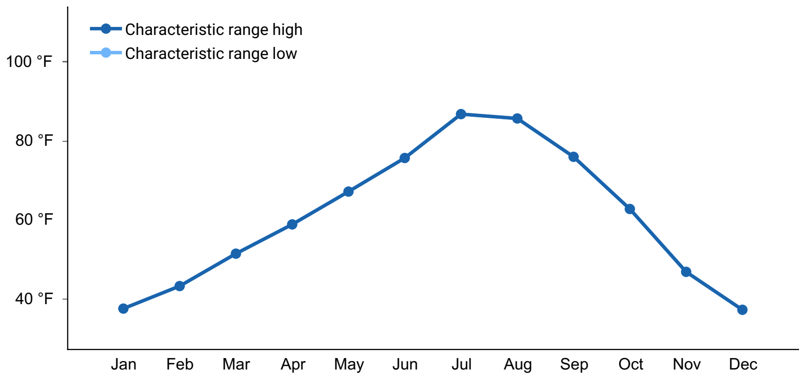


Figure 3. Monthly maximum temperature range

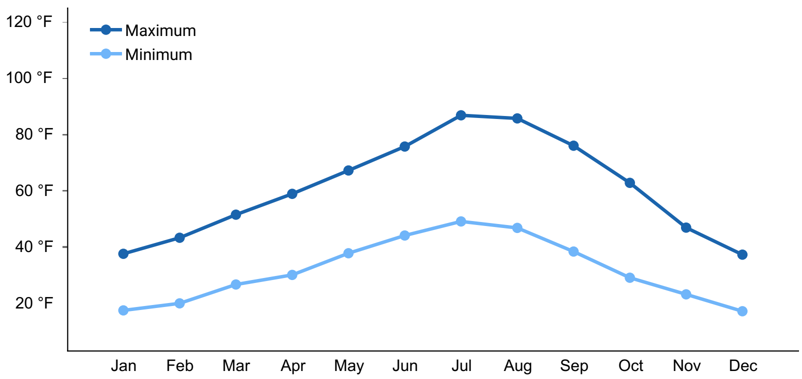


Figure 4. Monthly average minimum and maximum temperature

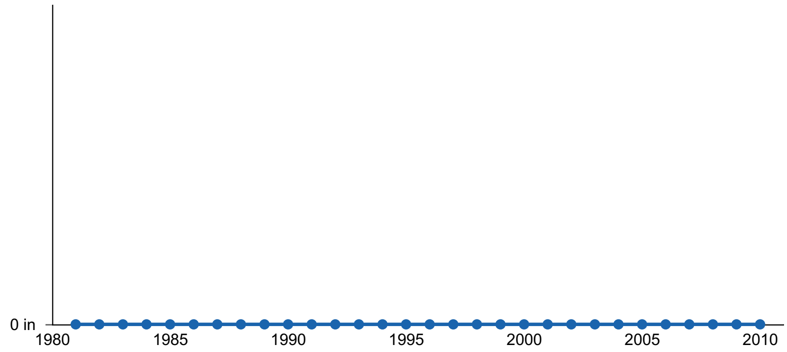


Figure 5. Annual precipitation pattern

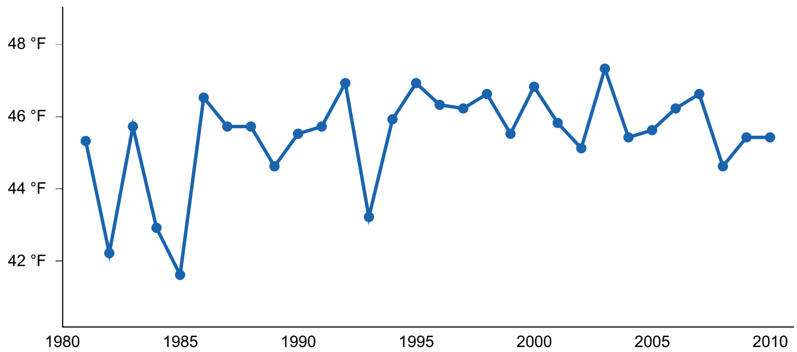


Figure 6. Annual average temperature pattern

Climate stations used

- (1) DANNER [USC00352135], Jordan Valley, OR

Influencing water features

Site is not influenced by water features.
Site is not connected to a water table.

Soil features

The soils of this site are moderately deep over fractured bedrock or paralithic material. The surface layer is ashy silt loam to gravelly ashy silt loam. The subsoil is a clay to clay loam. An abrupt boundary occurs at the interface of the surface and subsoil, resulting in wet non-satiated conditions in the spring. Depth to lithic or paralithic contact is 20 to 40 inches. Permeability is moderate to moderately slow in the surface layer and slow in the subsoil. The available water holding capacity is about 3 to 5 inches for the profile.

The soil series correlated with this site is Boost.

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Loess (3) Residuum–volcanic rock
Surface texture	(1) Ashy silt loam (2) Ashy, gravelly silt loam
Family particle size	(1) Fine
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to slow
Depth to restrictive layer	20–40 in

Soil depth	20–40 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–3%
Available water capacity (0-40in)	3–5 in
Soil reaction (1:1 water) (0-40in)	7–8
Subsurface fragment volume <=3" (0-40in)	0–10%
Subsurface fragment volume >3" (0-40in)	0–5%

Ecological dynamics

The reference plant community is dominated by antelope bitterbrush and Idaho fescue, however low sagebrush (little sagebrush) is still a large component. Bluebunch wheatgrass and Sandburg bluegrass are also common. The site has moderate resilience to disturbance and moderately low to moderate resistance to invasion (Chambers 2014a). Resilience is a system's capacity to regain its structure, processes, and function following stressors or disturbance (e.g. drought or fire). Resistance is the capacity of the system to retain its structure, processes, and function despite stressors or disturbances (including pressure from invasive species) (Chambers 2014a). Increased resilience increases with elevation, aspect, increased precipitation and increased nutrient availability (Stringham et al. 2015); where greater resource availability and more favorable environmental conditions exist for plant growth and reproduction (Chambers 2014a).

This ecological site's relatively higher effective precipitation (xeric soil moisture regime) makes this site more productive than similar sites in lower precipitation zones. This added productivity results in fewer open spaces where invasive annual grasses can become established. Some of this benefit is counteracted by restrictive soil features that limit site productivity compared to other sites in this precipitation range. While moderately resilient, this site is not immune to annual grass invasion. Timing of precipitation favors invasive annual grasses that are particularly well adapted to cool wet winters and warm dry summers; beginning growth and utilizing resources prior to native species breaking dormancy. The site's cooler soil temperature regime (frigid) does increase resistance compared to warmer sites but is not cold enough to inhibit invasive annual grasses (Chambers 2014b).

This ecological site is dominated by deep-rooted cool season, perennial bunchgrasses and long-lived shrubs (50+ years) with high root to shoot ratios. Community types with low sagebrush as the dominant shrub were found to have soil depths and thus available rooting depths of 71 to 81 centimeters in a study in northeast Nevada (Jensen 1990). Where soil depth is not limiting, tap roots of antelope bitterbrush have been documented from 4.5 to 5.4 m in length (McConnell 1961). These shrubs have a flexible generalized root system with development of both deep taproots and laterals near the surface (Comstock and Ehleringer 1992).

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 with the soil profile (Bates et al. 2006).

Low sagebrush is fairly drought tolerant but also tolerates periodic wetness during some portion of the growing season. Low sagebrush is also susceptible to the sagebrush defoliator Aroga moth. Aroga moth can partially or entirely kill individual plants or entire stands of big sagebrush (Furniss and Barr 1975), but the research is inconclusive of the damage sustained by low sagebrush populations.

The low 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 by 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).

The perennial bunchgrasses that are dominant on this ecological site are Idaho fescue and bluebunch wheatgrass. These species generally have shallower root systems than the shrubs, but root densities are often as high as or higher than those of shrubs in the upper 0.5 m of the soil profile. General differences in root depth distributions between grasses and shrubs results in resource partitioning in these shrub/grass systems.

As ecological condition declines, the sagebrush and rabbitbrush become dominant with increases of Sandberg's bluegrass, bottlebrush squirreltail and mat forming forbs in the understory. Bitterbrush and deep rooted perennial grasses like Idaho fescue and bluebunch wheatgrass decline. The potential invasive/noxious weeds are cheatgrass, rabbitbrush, and annual mustards.

Three possible alternative stable states have been identified for this ecological site.

Fire Ecology:
Prior to 1897, mean fire return intervals for low sagebrush communities have been estimated to be from 35 to over 100 years. Fire most often occurs during wet years with high forage production.

Low sagebrush is killed by fire and does not sprout (Tisdale and Hironaka 1984). Establishment after fire is from seed, generally blown in and not from the seed bank (Bradley et al. 1992). Fire risk is greatest following a wet, productive year when there is greater production of fine fuels (Beardall and Sylvester 1976). Fire return intervals have been estimated at 100-200 years in black sagebrush-dominated sites (Kitchen and McArthur 2007) and likely is similar in the low sagebrush ecosystem. Historically, however, fires were probably patchy due to the low productivity of these sites. Recovery time of little sagebrush following fire is variable (Young 1983). After fire, if regeneration conditions are favorable, low sagebrush recovers in 2 to 5 years; on harsh sites where cover is low to begin with and/or erosion occurs after fire, recovery may require more than 10 years (Young 1983). Slow regeneration may subsequently worsen erosion (Blaisdell et al. 1982).

Antelope bitterbrush is moderately fire tolerant (McConnell and Smith 1977). It regenerates by seed and resprouting (Blaisdell and Mueggler 1956, McArthur et al. 1982), however sprouting ability is highly variable and has been attributed to genetics, plant age, phenology, soil moisture and texture and fire severity (Blaisdell and Mueggler 1956, Blaisdell et al. 1982, Clark et al. 1982, Cook et al. 1994). Bitterbrush sprouts from a region on the stem approximately 1.5 inches above and below the soil surface; the plant rarely sprouts if the root crown is killed by fire (Blaisdell and Mueggler 1956). Low intensity fires may allow for bitterbrush to sprout; however, community response also depends on soil moisture levels at time of fire (Murray 1983). Lower soil moisture allows more charring of the stem below ground level (Blaisdell and Mueggler 1956), thus sprouting will usually be more successful after a spring fire than after a fire in summer or fall (Murray 1983, Busse et al. 2000, Kerns et al. 2006). If cheatgrass is present, bitterbrush seedling success is much lower. The factor that most limits establishment of bitterbrush seedlings is competition for water resources with the invasive species cheatgrass (Clements and Young 2002).

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 along with seasonality and intensity of the fire all factor into the individual species response. The growing points for most forbs and grasses are located at or below the soil surface, providing relative protection from disturbances which decrease above ground biomass, such as grazing or fire. Thus, fire mortality 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). However, season and severity of the fire and post-fire soil moisture availability will influence plant response.

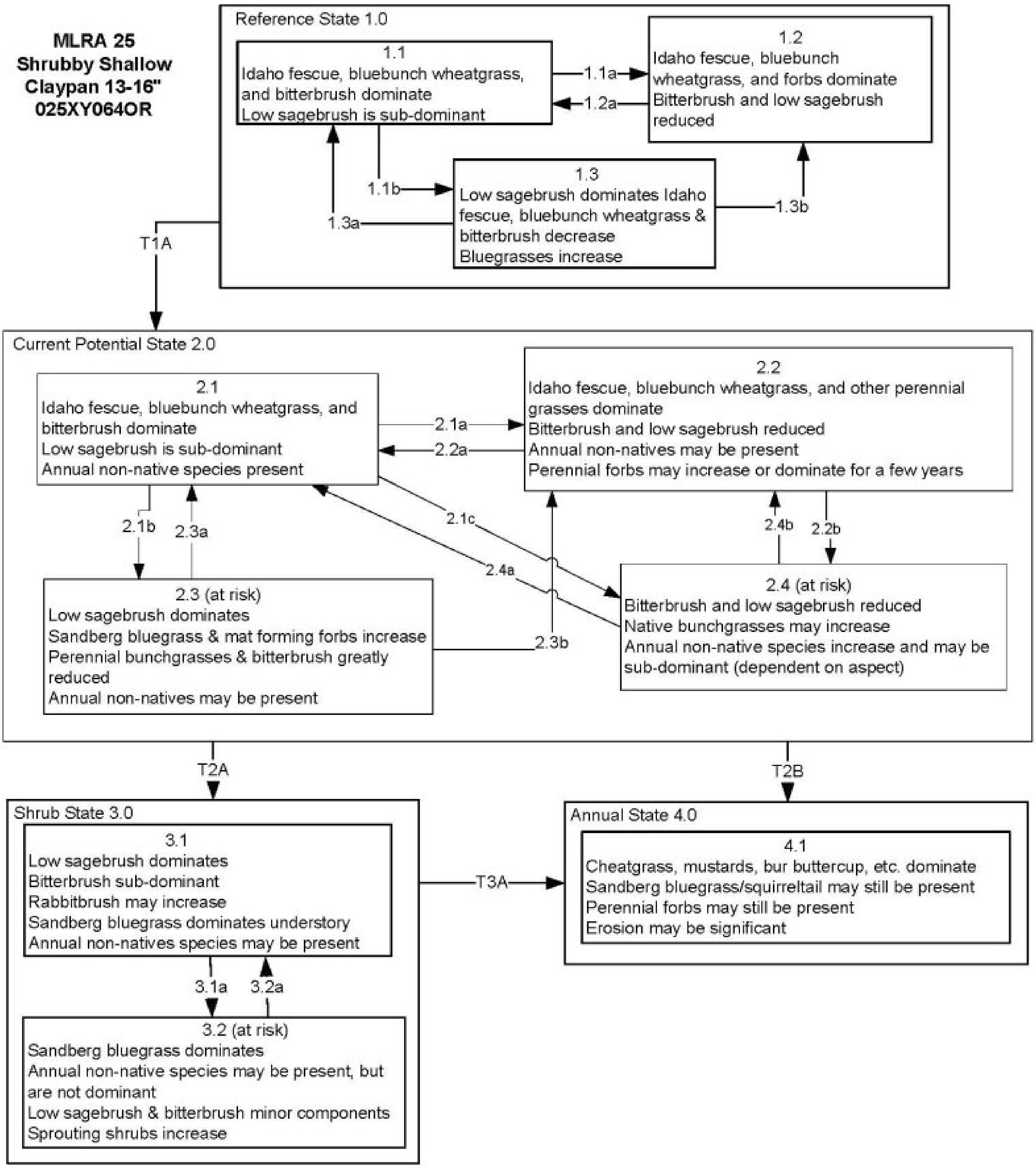
Idaho fescue, the dominant grass within this community, response to fire varies with condition and size of the plant, season and severity of fire, and ecological conditions. Mature Idaho fescue plants are commonly reported to be severely damaged by fire in all seasons (Wright et al. 1979). Initial mortality may be high (in excess of 75%) on severe burns, but usually varies from 20 to 50% (Barrington et al 1988). Rapid 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). However, 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). Idaho fescue is commonly reported to be more sensitive to fire than the other prominent grass on this site, bluebunch wheatgrass (Conrad and Poulton 1966). However Robberecht and Defosse (1995) suggested the latter was more sensitive. They observed culm and biomass reduction with moderate fire severity in bluebunch wheatgrass, whereas a high fire severity was required for this reduction in Idaho fescue. Also, given the same fire severity treatment, post-fire culm production was initiated earlier and more rapidly in Idaho fescue (Robberecht and Defosse 1995).

Bluebunch wheatgrass has coarse stems with little leafy material, the aboveground biomass burns rapidly and little heat is transferred downward into the crowns (Young 1983). Bluebunch wheatgrass was described as fairly tolerant of burning, other than in May in eastern Oregon (Britton et al. 1990). Uresk et al. (1976) reported burning increased vegetative and reproductive vigor of bluebunch wheatgrass, thus it experiences slight damage to fire but is more susceptible in drought years (Young 1983).

Sandberg bluegrass has been found to increase following fire, likely due to its low stature and productivity (Daubenmire 1975) and may retard reestablishment of deeper rooted bunchgrasses.

Adapted from: Stringham, T.K., P. Novak-Echenique, P. Blackburn, D. Snyder, and A. Wartgow. 2015. Final Report for USDA Ecological Site Description State-and-Transition Models by Disturbance Response Groups, Major Land Resource Area 25 Nevada. University of Nevada Reno, Nevada Agricultural Experiment Station Research Report 2015-02. p. 569

State and transition model



(Adapted from Stringham, T.K. et all., 2015)

MLRA 25
Shrubby Shallow
Claypan 13-16
025XY064OR

Reference State 1.0 Community Pathways
1.1a: Low severity fire creates grass/shrub mosaic; high severity fire significantly reduces sagebrush and bitterbrush cover and leads to early/mid seral community, dominated by grasses and forbs.
1.1b: Time and lack of disturbance. Excessive herbivory and/or long-term drought may also reduce perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: Low severity fire creates sagebrush/grass mosaic.
1.3b: High severity fire significantly reduces sagebrush and bitterbrush cover leading to early/mid seral community.

Transition T1A: Introduction of non-native species

Current Potential State 2.0 Community Pathways
2.1a: Low severity fire creates grass/shrub mosaic; high severity fire significantly reduces sagebrush and bitterbrush cover and leads to early/mid seral community, dominated by grasses and forbs.
2.1b: Time and lack of disturbance. Inappropriate grazing management and/or long-term drought may also reduce perennial understory.
2.1c: Rainfall pattern favoring annual species production (higher than normal spring precipitation)
2.2a: Time and lack of disturbance allows for shrub regeneration.
2.2b: Rainfall pattern favoring annual species production (higher than normal spring precipitation)
2.3a: Low severity fire creates sagebrush/grass mosaic. Brush treatments with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to shrubs would reduce the shrub overstory.
2.3b: High severity fire significantly reduces sagebrush and bitterbrush cover leading to early/mid seral community.
2.4a: Rainfall pattern favoring perennial bunchgrass production and reduced cheatgrass production (less than normal spring with higher than normal summer precipitation)
2.4b: Rainfall pattern favoring perennial bunchgrass production and reduced cheatgrass production (less than normal spring with higher than normal summer precipitation)

Transition T2A: Grazing management favoring shrubs and/or balsamroot.
Transition T2B: Catastrophic fire and/or soil disturbing treatments such as drill seeding, roller chopper, Lawson aerator etc. Probability of success of seeding on this site is low (4.1).

Shrub State 3.0 Community Pathways
3.1a: Fire.
3.2a: Time without disturbance.

Transition T3A: Catastrophic fire or multiple fires. Bare ground levels depend on variations in annual precipitation (4.1)

Annual State 4.0 Community Pathways
None

(Adapted from Stringham, T.K. et all., 2015)

State 1
Reference State 1.0

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The reference state has three 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 drought and/or insect or disease attack.

Community 1.1
Reference Plant Community

This community is dominated by Idaho fescue with a large component of bitterbrush, low sagebrush, and bluebunch wheatgrass. Bluegrass is common within the community. An assortment of perennial forbs is present and may comprise a significant portion of total production.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	825	975	1125
Shrub/Vine	220	260	300
Forb	55	65	75
Total	**1100**	**1300**	**1500**

Community 1.2

This community phase is characteristic of a post-disturbance, early/mid-seral community. Idaho fescue, bluebunch wheatgrass, other perennial bunchgrasses and forbs dominate. Depending on fire severity patches of intact bitterbrush and sagebrush may remain. Rabbitbrush and other sprouting shrubs may be sprouting. Perennial forbs may be a significant component for a number of years following fire.

Community 1.3

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

Pathway P1.1a
Community 1.1 to 1.2

Fire will decrease or eliminate the overstory of bitterbrush and sagebrush and allow for the perennial bunchgrasses and forbs to dominate the site. Fires will typically be low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring may be more severe and reduce sagebrush cover to trace amounts.

Pathway P1.1b
Community 1.1 to 1.3

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

Pathway P1.2a
Community 1.2 to 1.1

Time and lack of disturbance will allow shrubs to increase.

Pathway P1.3a
Community 1.3 to 1.1

A low severity fire, herbivory or combinations will reduce the shrub overstory and create a shrub/grass mosaic.

Pathway P1.3b
Community 1.3 to 1.2

Fire will decrease or eliminate the overstory of sagebrush and bitterbrush and allow for the perennial bunchgrasses to dominate the site. Fires may be high severity in this community phase due to the dominance of sagebrush resulting in removal of overstory shrub community.

State 2
Current Potential State 2.0

This state is similar to the Reference State 1.0. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. This state has the same three general community phases. These non-native species can be highly flammable, and 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 nonnatives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Community 2.1

This community phase is compositionally similar to the Reference State Community Phase 1.1 with the presence non-native species in trace amounts. This community is dominated by Idaho fescue with a large component of bitterbrush, low sagebrush, and bluebunch wheatgrass. Bluegrass is common within the community. An assortment of perennial forbs is present and may comprise a significant portion of total production.

Community 2.2

This community phase is characteristic of a post-disturbance, early to mid-seral community where annual non-native species are present. Bitterbrush and sagebrush are present in trace amounts; perennial bunchgrasses and forbs dominate the site. Depending on fire severity patches of intact shrubs may remain. Rabbitbrush may be sprouting or dominant in the community. Perennial forbs may be a significant component for a number of years following fire. Annual non-native species are stable or increasing within the community.

Community 2.3
(At Risk)

This community is at risk of crossing a threshold to another state. Sagebrush dominates the overstory and perennial bunchgrasses in the understory are reduced, either from competition with shrubs or from inappropriate grazing management, or from both. Rabbitbrush may be a significant component. Sandberg bluegrass may increase and become co-dominate with deep rooted bunchgrasses. Annual non-natives species may be stable or increasing due to lack of competition with perennial bunchgrasses. This site is susceptible to further degradation from inappropriate grazing management, drought, and fire.

Community 2.4
(At Risk)

This community is at risk of crossing into an annual state. Native bunchgrasses dominate; however, annual non-native species such as cheatgrass may be sub-dominant in the understory. Annual production and abundance of these annuals may increase drastically in years with heavy spring precipitation. Bitterbrush and sagebrush are a minor components. This site is susceptible to further degradation from grazing, drought, and fire.

Pathway P2.1a
Community 2.1 to 2.2

Fire reduces the shrub overstory and allows for perennial bunchgrasses and forbs to dominate the site. Fires are typically low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management favoring an increase in fine fuels may be more severe and reduce sagebrush cover to trace amounts. Annual non-native species are likely to increase after fire.

Pathway P2.1b
Community 2.1 to 2.3

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

Pathway P2.1c

Community 2.1 to 2.4

Higher than normal spring precipitation favors annual nonnative species such as cheatgrass. Non-native annual species will increase in production and density throughout the site. Perennial bunchgrasses may also increase in production.

Pathway P2.2a
Community 2.2 to 2.1

Time and/or grazing management that favors the establishment and growth of bitterbrush and sagebrush allowing the shrub component to recover. The establishment of shrubs may take a very long time.

Pathway P2.2b
Community 2.2 to 2.4

Higher than normal spring precipitation favors annual nonnative species such as cheatgrass. Non-native annual species will increase in production and density throughout the site. Perennial bunchgrasses may also increase in production.

Pathway P2.3a
Community 2.3 to 2.1

A change in grazing management that reduces shrubs will allow for the perennial bunchgrasses in the understory to increase. Heavy late-fall or winter grazing may cause mechanical damage and subsequent death to sagebrush, facilitating an increase in the herbaceous understory. Brush treatments with minimal soil disturbance will also decrease sagebrush and release the perennial understory. A low severity fire would decrease the overstory of sagebrush and allow for the understory perennial grasses to increase. Due to low fuel loads in this State, fires will likely be small creating a mosaic pattern. Annual non-native species are present and may increase in the community.

Pathway P2.3b
Community 2.3 to 2.2

Fire eliminates/reduces the overstory of bitterbrush and sagebrush and allows for the understory perennial grasses and forbs to increase. Fires may be high severity in this community phase due to the dominance of sagebrush resulting in removal of overstory shrub community. Annual non-native species respond well to fire and may increase post burn.

Pathway P2.4a
Community 2.4 to 2.1

Rainfall patterns favoring perennial bunchgrasses. Less than normal spring precipitation followed by higher than normal summer precipitation will increase perennial bunchgrass production.

Pathway P2.4b
Community 2.4 to 2.2

Rainfall patterns favoring perennial bunchgrasses. Less than normal spring precipitation followed by higher than normal summer precipitation will increase perennial bunchgrass production.

State 3
Shrub State 3.0

This state is a product of many years of inappropriate grazing management during time periods harmful to perennial bunchgrasses. Sandberg bluegrass will increase with a reduction in deep rooted perennial bunchgrass competition and become the dominant grasses. Sagebrush dominates the overstory and rabbitbrush may be a significant component. Sagebrush cover increases and may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. The shrub overstory and bluegrass understory dominate site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed.

Community 3.1

Decadent sagebrush dominates the overstory. Rabbitbrush may be a significant component. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Sandberg bluegrass and annual non-native species increase. Bare ground is significant. Balsamroot and other perennial forbs may make up a significant component of the understory. Some excessive pedestalling of grasses may be seen. Bare ground may be increasing.

Community 3.2
(At Risk)

Bluegrass dominates the site; annual non-native species may be present but are not dominant. Rabbitbrush may be sprouting. Balsamroot and other perennial forbs may make up a significant component of the understory. Trace amounts of sagebrush may be present.

Pathway P3.1a
Community 3.1 to 3.2

Fire, heavy fall grazing causing mechanical damage to shrubs, and/or brush treatments with minimal soil disturbance, will greatly reduce the overstory shrubs to trace amounts and allow for Sandberg bluegrass to dominate the site.

Pathway P3.2a
Community 3.2 to 3.1

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 low sagebrush can take many years.

State 4
Annual State 4.0

An abiotic threshold has been crossed and state dynamics are driven by fire and time. The herbaceous understory is dominated by annual non-native species such as cheatgrass and mustards. Resiliency has declined and further degradation from fire facilitates a cheatgrass and sprouting shrub plant community. Fire return interval has shortened due to the dominance of cheatgrass in the understory and is a driver in site dynamics.

Community 4.1

Non-native annual species are dominant. Sandberg bluegrass may still be present in trace amounts. Perennial forbs may be present in trace amounts.

Transition T1A
State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual plants, such as cheatgrass, mustards, and bur buttercup. Slow variables: Over time the annual non-native species will increase within the community. 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.

Transition T2A
State 2 to 3

Trigger: To Community Phase 3.1: Inappropriate grazing management will decrease or eliminate deep rooted perennial bunchgrasses, increase Sandberg bluegrass and favor shrub growth and establishment. Trigger: To Community Phase 3.2: Severe fire in community phase 2.3 will remove sagebrush overstory, decrease perennial bunchgrasses and enhance Sandberg bluegrass. Annual non-native species will increase. Slow variables: Long term decrease in deep-rooted perennial grass density and reduction in organic matter. Threshold: Loss of deep-rooted perennial bunchgrasses changes nutrient cycling, nutrient redistribution, and reduces soil organic matter and results in decreased soil moisture.

Transition T2B
State 2 to 4

Trigger: Fire or soil disturbing treatment would transition to Community Phase 4.1. Slow variables: Increased production and cover of non-native annual species. Threshold: Loss of deep-rooted perennial bunchgrasses and shrubs changes temporal and spatial nutrient capture and cycling within the community. Increased, continuous fine fuels modify the fire regime by increasing frequency, size and spatial variability of fires.

Transition T3A
State 3 to 4

Trigger: Fire and/or treatments that disturb the soil and existing plant community. Slow variables: Increased seed production (following a wet spring) and cover of annual nonnative species. Threshold: Increased, continuous fine fuels modify the fire regime by changing frequency, intensity, size and spatial variability of fires. Changes in plant community composition and spatial variability of vegetation due to the loss of perennial bunchgrasses and sagebrush truncate energy capture and impact the temporal and spatial aspects of nutrient cycling and distribution.

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, deep rooted perennial grasses**			650–780	
	Idaho fescue	FEID	*Festuca idahoensis*	650–780	–
2	**Sub-dominant, deep rooted perennial grasses**			130–260	
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	130–260	–
3	**Sub-dominant, perennial, shallow rooted grasses**			26–65	
	Sandberg bluegrass	POSE	*Poa secunda*	26–65	–
4	**All other perennial grasses**			32–104	
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	8–26	–
	squirreltail	ELEL5	*Elymus elymoides*	8–26	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	8–26	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	8–26	–
Forb					
5	**Dominant, perennial forbs**			65–130	
	balsamroot	BALSA	*Balsamorhiza*	13–26	–
	fleabane	ERIGE2	*Erigeron*	13–26	–
	buckwheat	ERIOG	*Eriogonum*	13–26	–
	desertparsley	LOMAT	*Lomatium*	13–26	–
	lupine	LUPIN	*Lupinus*	13–26	–
6	**Other perennial forbs**			18–54	
	common yarrow	ACMI2	*Achillea millefolium*	5–10	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	5–10	–
	phlox	PHLOX	*Phlox*	5–10	–
	deathcamas	ZIGAD	*Zigadenus*	1–8	–
	stoneseed	LITHO3	*Lithospermum*	1–8	–
	onion	ALLIU	*Allium*	1–8	–
Shrub/Vine					
7	**Dominant, perennial shrubs**			195–260	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	195–260	–
8	**Sub-dominant perennial shrub**			65–130	
	little sagebrush	ARAR8	*Artemisia arbuscula*	65–130	–
9	**Other perennial shrubs**			30–65	
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	12–26	–
	horsebrush	TETRA3	*Tetradymia*	6–13	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–13	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	6–13	–

Animal community

Livestock Grazing Interpretations:
This site is suitable for livestock grazing. Grazing management considerations include timing, intensity and duration of grazing.

Domestic sheep and, to a much lesser degree, cattle consume low sagebrush, particularly during the spring, fall, and winter (Sheehy and Winward 1981). Heavy dormant season grazing by sheep will reduce sagebrush cover and increase grass production (Laycock 1967). Severe trampling damage to supersaturated soils could occur if sites are used in early spring when there is abundant snowmelt. Trampling damage, particularly from cattle or horses, in low sagebrush habitat types is greatest when high clay content soils are wet.

Bunchgrasses, in general, best tolerate light grazing after seed formation. Britton et al. (1990) observed the effects of clipping date on basal area of 5 bunchgrasses in eastern Oregon and found grazing from August to October (after seed set) has the least impact. Heavy grazing during the growing season will reduce perennial bunchgrasses and increase sagebrush (Laycock 1967). Abusive grazing by cattle or horses will likely increase low sagebrush, rabbitbrush and some forbs such as arrowleaf balsamroot. Annual non-native weedy species such as cheatgrass and mustards, and potentially medusahead, may invade.

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 moderately grazing tolerant and is very sensitive to defoliation during the active growth period (Blaisdell and Pechanec 1949, Laycock 1967, Anderson and Scherzinger 1975, Britton et al. 1990). Herbage and flower stalk production was reduced with clipping at all times during the growing season; however, clipping was most harmful during the boot stage (Blaisdell and Pechanec 1949). Tiller production and growth of bluebunch was greatly reduced when clipping was coupled with drought (Busso and Richards 1995). Mueggler (1975) estimated that low vigor bluebunch wheatgrass may need up to 8 years rest to recover. Although an important forage species, it is not always the preferred species by livestock and wildlife.

Reduced bunchgrass vigor or density provides an opportunity for Sandberg bluegrass expansion and/or cheatgrass and other invasive species to occupy interspaces. Sandberg bluegrass increases under grazing pressure (Tisdale and Hironaka 1981) and is capable of co-existing with cheatgrass or other weedy species. 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.

(Adapted from Stringham, T.K. et al., 2015)
Wildlife
Antelope bitterbrush a minor component on this site is a critical browse species for mule deer, antelope and elk and is often utilized heavily by domestic livestock (Wood 1995). Grazing tolerance is dependent on site conditions (Garrison 1953) and the shrub can be severely hedged during the dormant season for grasses and forbs.

(Adapted from Stringham, T.K. et al., 2015)

Inventory data references

Vale District BLM Ecological Site Inventory
NASIS component and pedon data
Range Site Descriptions
Field knowledge of range-trained personnel

Other references

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Approval

Kendra Moseley, 4/25/2024

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)	
Contact for lead author	
Date	05/11/2025

Approved by	Kendra Moseley
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:**