USDA Natural Resources Conservation Service

Ecological site R025XY018NV
CLAYPAN 10-12 P.Z.

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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

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 summits and side slopes of fan remnants and rock pediments. Soils associated with this site formed in alluvium derived from mixed rocks with components of loess high in volcanic ash. Slopes range from 8 to 30 percent with elevations of 5,500 to 6,500 feet (1,676 to 1,981meters). The soil profile is characterized by a light colored surface horizon and a layer of clay accumulation (argillic horizon). Important abiotic factors include an abrupt textural change within 12 inches (30cm) of the soil surface, greater than 30 percent clay in the particle size control section, and linear-linear landform shape. The reference plant community is characterized by a mix of early sagebrush and low sagebrush.

Associated sites

R025XY014NV	**LOAMY 10-12 P.Z.**
R025XY015NV	**SOUTH SLOPE 8-12 P.Z.**
R025XY019NV	**LOAMY 8-10 P.Z.**
R025XY021NV	**SHALLOW LOAM 8-12 P.Z.**

Similar sites

R025XY024NV	**MOUNTAIN RIDGE** FEID codominant grass; less productive site; soils very shallow to hard bedrock
R025XY017NV	**CLAYPAN 12-16 P.Z.** FEID-PSSPS codominant grasses; elevations greater than 6000'; occurs on mountain backslopes; soils form in residuum/colluvium

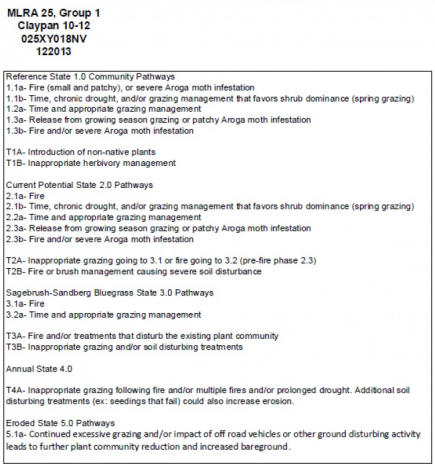


Figure 1.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula* (2) *Artemisia arbuscula ssp. longiloba*
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Achnatherum thurberianum*

Physiographic features

This ecological site is on summits and side slopes of fan remnants and rock pediments, hills and plateaus. Slopes range from 2 to 50 percent, but slopes of 8 to 30 percent are most common. Elevations range from 5,500 to 6,500 feet (1,676 to 1,981meters). This site is characterized by very high runoff.

Table 2. Representative physiographic features

Landforms	(1) Piedmont slope > Fan remnant (2) Rock pediment (3) Hill (4) Plateau
Runoff class	High to very high
Flooding frequency	None
Elevation	1,676–1,981 m
Slope	2–50%
Water table depth	381 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is defined by hot dry summers and cold snowy winters. This site is characterized by less than 145 freeze-free days annually. Mean annual precipitation is 11 inches (28cm), with

effective precipitation between 10 to 12 inches (25 to 31cm). Averages snowfall is between 40 to 65 inches (102 to 165cm) per year.

*The above data is averaged from the Tuscarora and Wells climate stations, NASIS and, the Western Regional Climate Center (wrcc.dri.edu).

Table 3. Representative climatic features

Frost-free period (characteristic range)	56-90 days
Freeze-free period (characteristic range)	63-146 days
Precipitation total (characteristic range)	229-305 mm
Frost-free period (actual range)	50-100 days
Freeze-free period (actual range)	63-166 days
Precipitation total (actual range)	178-508 mm
Frost-free period (average)	75 days
Freeze-free period (average)	126 days
Precipitation total (average)	279 mm

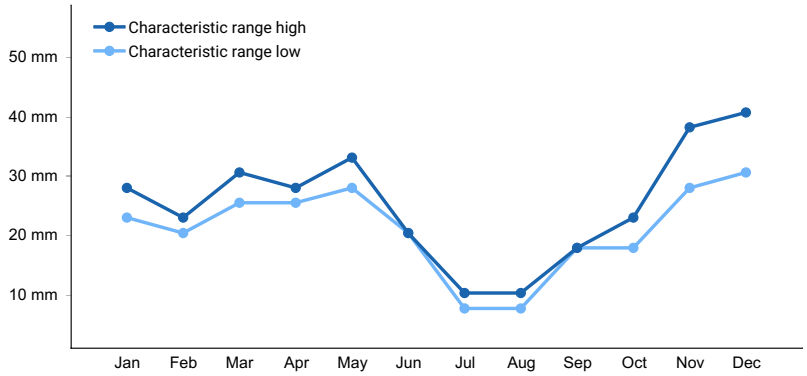


Figure 2. Monthly precipitation range

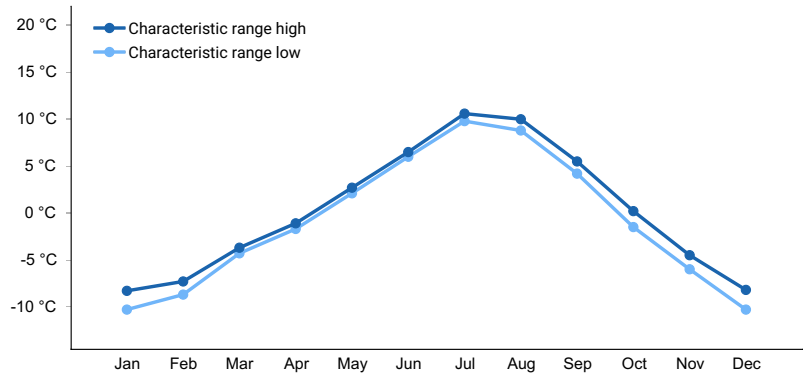


Figure 3. Monthly minimum temperature range

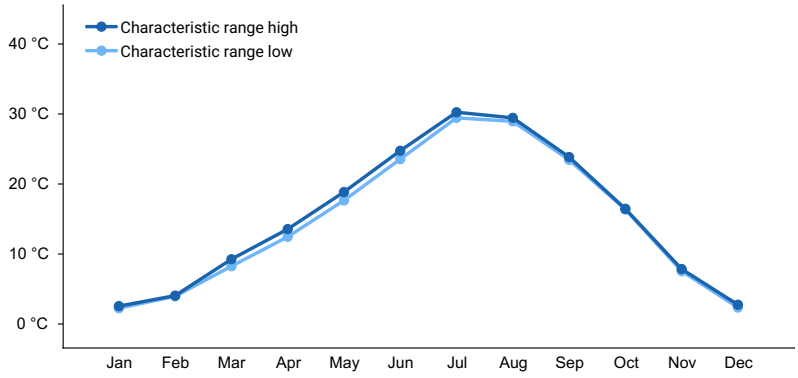


Figure 4. Monthly maximum temperature range

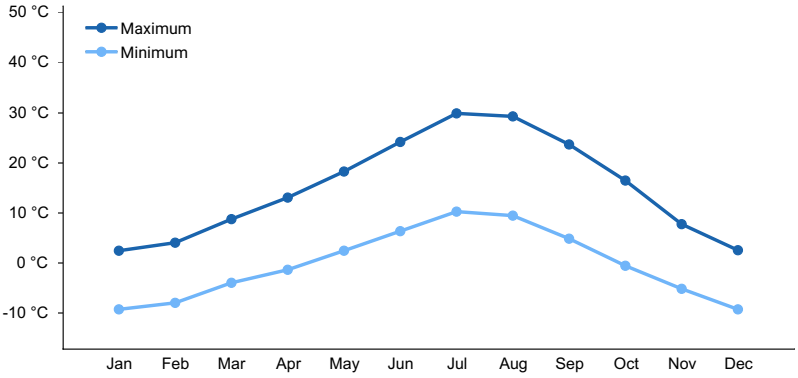


Figure 5. Monthly average minimum and maximum temperature

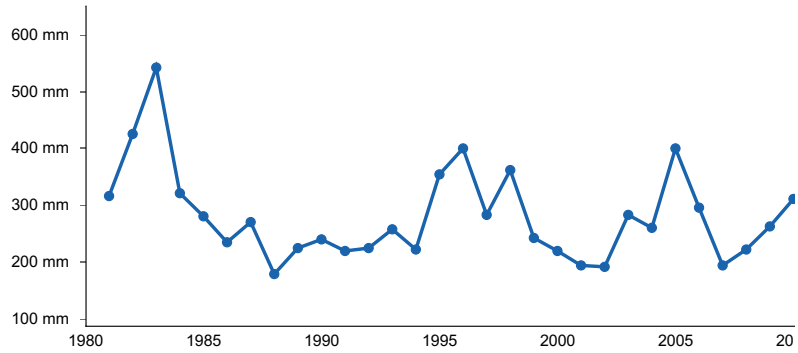


Figure 6. Annual precipitation pattern

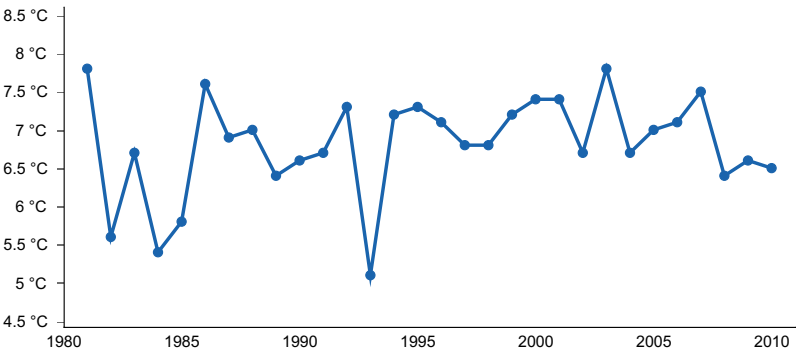


Figure 7. Annual average temperature pattern

Climate stations used

- (1) TUSCARORA [USC00268346], Tuscarora, NV
- (2) WELLS [USC00268988], Wells, NV

Influencing water features

Influencing water features are not associated with this site.

Wetland description

N/A

Soil features

The soils associated with this site are moderately deep to a root restrictive layer, well drained and formed in alluvium derived from mixed rocks with component of loess high in volcanic ash.
Surface texture is gravely loam. The soil profile is characterized by an abrupt textural change to a layer of clay accumulation (argillic horizon) within 12 inches (30cm) of the soil surface and greater than 60 percent clay in the particle size control section. These soils may be wet: non-satiated in the late winter and early spring, but soil moisture is rapidly depleted through evapotranspiration.

Representative soil components associated with this ecological site include the Donna, Linkup, Devada, Fulstone, Anawalt, Pie Creek, Bregar, Mahala, Olac, Freznik, Lunder, and Whitepeak.

Table 4. Representative soil features

Parent material	(1) Alluvium–volcanic rock
Surface texture	(1) Gravelly loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to slow
Depth to restrictive layer	36–102 cm
Soil depth	36–102 cm
Surface fragment cover <=3"	13–27%
Surface fragment cover >3"	3–16%
Available water capacity (0-101.6cm)	3.05–9.65 cm
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	12–23%
Subsurface fragment volume >3" (Depth not specified)	3–13%

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	13–102 cm
Soil depth	13–102 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	Not specified

Soil reaction (1:1 water) (0-101.6cm)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

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). 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).

Little sagebrush is fairly drought tolerant but also tolerates periodic wetness during some portion of the growing season. Little 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 little sagebrush populations.

The little 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 include bluebunch wheatgrass and Thurber’s needlegrass. 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. The potential invasive/noxious weeds are cheatgrass, rabbitbrush, snakeweed, and annual mustards.

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

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

Little 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 little sagebrush ecosystem. Historically, however, fires were probably patchy due to the low productivity of these sites. Fine fuel loads generally average 100 to 400 pounds per acre (110- 450 kg/ha) but are occasionally as high as 600 pounds per acre (680 kg/ha) in little sagebrush habitat types (Bradley et al. 1992). Recovery time of little sagebrush following fire is variable (Young 1983). After fire, if regeneration conditions are

favorable, little 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, a minor component on this site, 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 cheatgrass, an invasive species (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.

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).

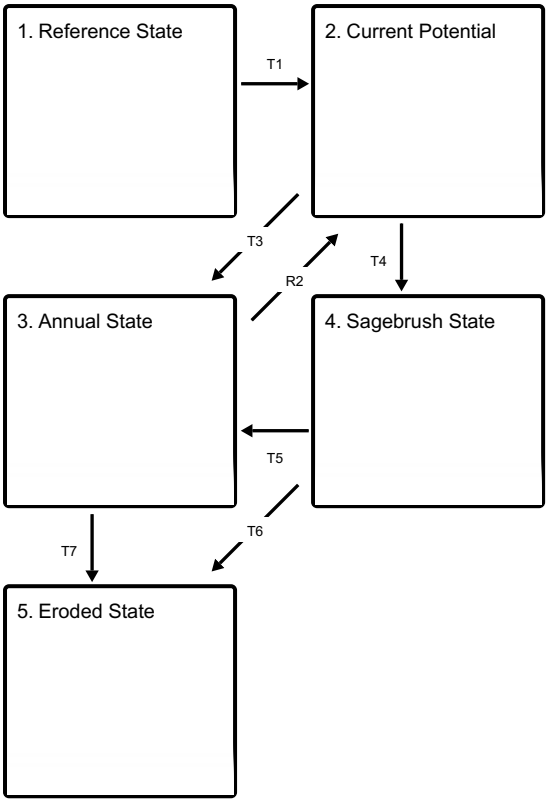
Thurber’s needlegrass is very susceptible to fire-caused mortality. Burning has been found to decrease the vegetative and reproductive vigor of Thurber’s needlegrass (Uresk et al. 1976). Fire can also reduce basal area and yield of Thurber’s needlegrass (Britton et al. 1990). The fine leaves and densely tufted growth form make this grass susceptible to subsurface charring of the crowns (Wright and Klemmedson 1965). Although timing of fire highly influences the response and mortality of Thurber’s needlegrass, smaller bunch sizes are less likely to be damaged by fire (Wright and Klemmedson 1965). Thurber’s needlegrass can and often survives fire and will continue growth when conditions are favorable (Koniak 1985).

Webber’s needlegrass, a minor component on this site, is damaged by burning due to dense plant material that can burn slowly and long, resulting in charring to the growing points. Late summer and early fall fires have been shown to be the least harmful to Webber’s needlegrass.

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.

State and transition model

Ecosystem states

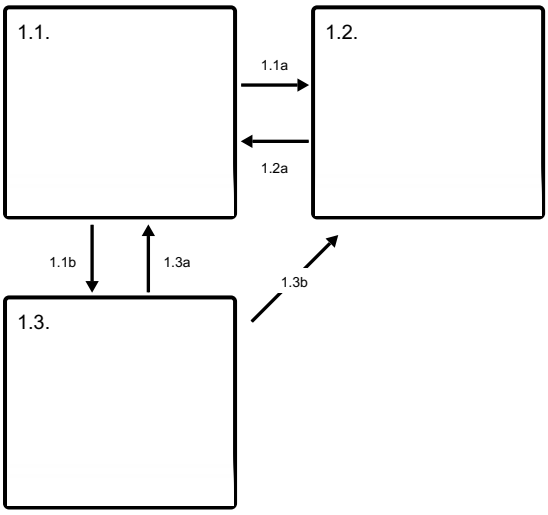


T1 - Introduction of annual non-native species.

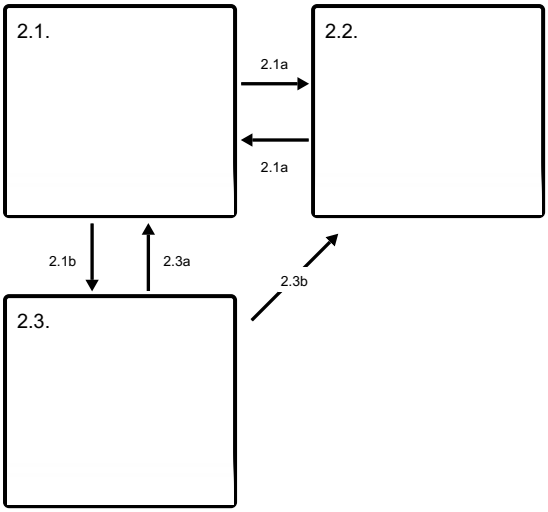
T3 - Repeated, widespread and severe fire.

R2 - Seeding with native species/prescribed grazing

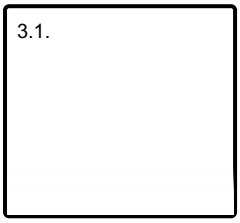
State 1 submodel, plant communities



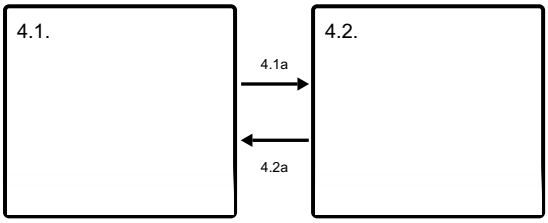
State 2 submodel, plant communities



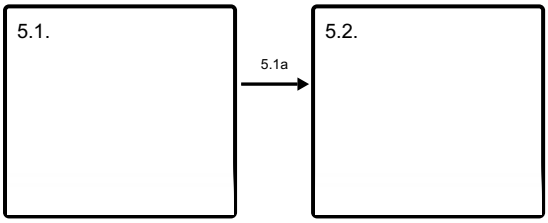
State 3 submodel, plant communities



State 4 submodel, plant communities



State 5 submodel, plant communities



State 1
Reference State

The Reference State is a representative of the natural range of variability under pristine conditions. 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.

Dominant plant species

- little sagebrush (*Artemisia arbuscula ssp. arbuscula*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- Thurber's needlegrass (*Achnatherum thurberianum*), grass

Community 1.1

This community phase is characteristic of a mid-seral plant community and is dominated by little sagebrush,

bluebunch wheatgrass and thurbers needlegrass. Potential vegetative composition by weight is about 60 percent grasses, 10 percent forbs and 30 percent shrubs. Total vegetative cover averages 20 to 30 percent.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	269	404	538
Shrub/Vine	135	202	269
Forb	45	67	90
Total	**449**	**673**	**897**

Community 1.2

This community phase is characterized by a post-disturbance, early seral, plant community. Sagebrush and other shrubs are reduced, or patchy. Perennial bunchgrasses and forbs dominate the visual aspect of the plant community. Disturbance tolerant shrubs such as rabbitbrush and antelope bitterbrush will sprout from the root-crown following low and medium intensity wildfire and may begin to dominate the plant community 2 to 5 years post-disturbance.

Community 1.3

Absence of disturbance allows sagebrush to mature and dominate the plant community. Perennial bunchgrasses and forbs are reduced in both vigor and productivity due to competition for light, moisture and nutrient resources.

Pathway 1.1a
Community 1.1 to 1.2

Wildfire. Low severity fire creates sagebrush/grass mosaic; higher intensity fires significantly reduce sagebrush cover and lead to early seral community dominated by grasses and forbs. Frequency and intensity of wildfire is primarily driven by cover and amount of herbaceous vegetation. Under pre-Eurosettlement conditions fire return interval is estimated to be between 20 and 50 years.

Pathway 1.1b
Community 1.1 to 1.3

Time, absence of disturbance and natural regeneration over time allows sagebrush to dominate site resources. This community phase pathway may be coupled with drought and/or herbivory further reducing herbaceous understory.

Pathway 1.2a
Community 1.2 to 1.1

Time, absence of disturbance and natural regeneration over time allows sagebrush to recover. Recovery of sagebrush depends on the availability of a local seed source (patches of mature shrubs) as well as precipitation patterns favorable for germination and seedling recruitment. Sagebrush seedlings are susceptible to less than favorable conditions for several years. Completion of this community phase pathways may take decades.

Pathway 1.3a
Community 1.3 to 1.1

Low intensity, patchy wildfire or insect infestation would reduce sagebrush overstory creating a mosaic on the landscape. Perennial bunchgrasses and forbs dominate disturbed patches due to an increase in light, moisture and nutrient resources.

Pathway 1.3b
Community 1.3 to 1.2

Wide spread wildfire removes sagebrush and allows perennial bunchgrasses and forbs to dominate.

State 2
Current Potential

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-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 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. Management would be to maintain high diversity of desired species to promote organic matter inputs and prevent the dispersal and seed production of the non-native invasive species.

Dominant plant species

- little sagebrush (*Artemisia arbuscula*), shrub
- cheatgrass (*Bromus tectorum*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass

Community 2.1

This community phase is similar to the Reference State Community Phase 1.1, with the presence of non-native species in trace amounts.

Resilience management. The presence of non-native annuals has reduced site resilience. Management actions should focus on maintaining the presence of all functional and structural groups and minimizing wildfire and soil disturbing practices.

Community 2.2

This community phase is characteristic of a post-disturbance, early seral community where annual non-native species are present. Perennial bunchgrasses and forbs recover rapidly following wildfire. Annual non-native species are stable or increasing within the community. Disturbance tolerant shrubs typically recover 2 to 5 years post fire and may dominate the sites for many years.

Community 2.3

This community phase is characterized by decadent sagebrush, reduced perennial bunchgrass and increasing bare ground. Annual non-natives species are stable or increasing due to lack of competition from perennial bunchgrasses. Sandberg bluegrass may increase and become co-dominate with remaining deep-rooted bunchgrasses.

Pathway 2.1a
Community 2.1 to 2.2

Fire reduces the shrub overstory and allows for perennial bunchgrasses to dominate the site. Fire may be patchy resulting in a mosaic pattern with patches of mature sagebrush remaining. 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. Mature sagebrush is controlling the spatial and temporal distribution of moisture, nutrient and light resources. Native perennial bunchgrasses are reduced due to competition for these resources. Non-native annuals are stable to increasing.

Pathway 2.1a
Community 2.2 to 2.1

Time, lack of disturbance and natural regeneration of sagebrush. The establishment of little sagebrush depends on presence of seed source and favorable weather patterns. It may take decades for sagebrush to recover to pre-disturbance levels.

Pathway 2.3a
Community 2.3 to 2.1

Low intensity wildfire, insect infestation, or brush management with minimal soil disturbance reduces sagebrush overstory and releases herbaceous understory.

Pathway 2.3b
Community 2.3 to 2.2

Fire reduces or eliminates the overstory of sagebrush and allows for the understory perennial grasses and forbs to increase. Annual non-native species respond well to fire and may increase post-burn.

State 3
Annual State

Annual non-natives dominated site productivity and site resources. The dominance of non-native annuals control the spatial and temporal distribution of soil moisture, soil nutrients and energy resources. Remaining patches of sagebrush and/or perennial bunchgrass suffer from increased competition and narrowed fire return intervals.

Characteristics and indicators. This state experiences frequent fire due to increased cover and continuity of fine fuels. Fire is frequent enough to prevent the recovery of long-lived native perennials like little sagebrush. Disturbance tolerant shrubs may be present or increasing depending on time since disturbance.

Dominant plant species

- cheatgrass (*Bromus tectorum*), grass

Community 3.1

Cheatgrass, mustards, and bur buttercup dominate. Sandberg bluegrass and perennial forbs may be present in trace amounts. Erosion may be significant.

State 4
Sagebrush State

Sagebrush and rabbitbrush dominate overstory while sandberg bluegrass dominate understory.

Community 4.1

Sagebrush and rabbitbrush dominate overstory while sandberg bluegrass dominates understory. Annuals may be present.

Community 4.2

Rabbitbrush is the dominate shrub with traces of sagebrush. Sandberg bluegrass dominates understory with annual species increasing.

Pathway 4.1a
Community 4.1 to 4.2

Wildfire eliminates sagebrush and creates opportunity for faster growing vegetation to dominate.

Pathway 4.2a
Community 4.2 to 4.1

With time and lack of disturbance sagebrush will have the opportunity to grow and will eventually become the dominate shrub.

State 5
Eroded State

Soil erosion is present with gullying and rills present.

Community 5.1

Sagebrush and rabbitbrush dominate overstory. Sandberg bluegrass or annuals species dominate understory. Soils are actively eroding with bare ground cover increasing and excessive frost-heaving/ pedestalling.

Community 5.2

Soil erosion is significant with extreme gullying, rills, and waterflow paths.

Pathway 5.1a
Community 5.1 to 5.2

Excessive grazing, vehicle usage, and other ground disturbing activity lead to increased bare ground and soil erosion.

Transition T1
State 1 to 2

Trigger: Introduction of annual non-native species Slow variable: Over time the annual non-native plants 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 T3
State 2 to 3

Trigger: Repeated, widespread and severe fire. Slow variables: Increased production and cover of non-native annual species over time. Threshold: Loss of deep-rooted perennial bunchgrasses and shrubs truncates, spatially and temporally, nutrient capture and cycling within the community.

Transition T4
State 2 to 4

Trigger: Inappropriate grazing or increased wildfire activity. Controlling Variables: Decreased perennials will increase resource availability for sagebrush and annuals. Threshold: Loss of deep-rooted perennial bunchgrasses, spatially and temporally, nutrient capture and cycling within the community.

Restoration pathway R2
State 3 to 2

Seeding with native species followed by prescribed grazing Minimize soil disturbance and maximize non-native annual plant biomass removal during early spring. Combine prescribed grazing with seeding of native species. Continue to protect site from wildfire. Probability of success is extremely low.

Transition T7
State 3 to 5

Trigger: Inappropriate grazing, wildfire, prolonged droughts, and soil disturbing treatments. Controlling Variables: Excessive grazing will eliminate ground cover that holds soil. Soil disturbing treatments will create soil instability and could cause compaction. Wind and precipitation will begin to create rills and gullies along unstable and compacted soils. Threshold: When the soil is disturbed, climatic influences such as precipitation and wind can begin forming gullies and rills.

Transition T5
State 4 to 3

Trigger: Wildfire or shrub eliminating treatments. Controlling Variables: Wildfire eliminates shrubs and perennial grasses, providing sufficient resources for annuals to dominate the landscape. Threshold: Decreasing shrubs and perennial annuals create opportunities of annuals to populate the landscape. With time, more annuals will be present causing frequent severe wildfires. These conditions will favor annual species due to the availability of nutrients, soil, sunlight, and moisture.

Transition T6
State 4 to 5

Trigger: Inappropriate grazing or soil disturbing treatments. Controlling Variables: Excessive grazing will eliminate ground cover that holds soil. Soil disturbing treatments will create soil instability and could cause compaction. Wind and precipitation will begin to create rills and gullies along unstable and compacted soils. Threshold: When the soil is disturbed, climatic influences such as precipitation and wind can begin forming gullies and rills.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				269–538	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	135–269	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	101–202	–
	Webber needlegrass	ACWE3	*Achnatherum webberi*	13–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	13–28	–
	squirreltail	ELEL5	*Elymus elymoides*	3–6	–
	cheatgrass	BRTE	*Bromus tectorum*	3–6	–
Forb					
2				45–90	
	phlox	PHLOX	*Phlox*	7–13	–
	balsamroot	BALSA	*Balsamorhiza*	7–13	–
	bluebells	MERTE	*Mertensia*	7–13	–
	aster	ASTER	*Aster*	7–13	–
	buckwheat	ERIOG	*Eriogonum*	7–13	–
	milkvetch	ASTRA	*Astragalus*	7–13	–
Shrub/Vine					
3				135–269	
	little sagebrush	ARAR8	*Artemisia arbuscula*	112–224	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	11–22	–
	rabbitbrush	CHRYS9	*Chrysothamnus*	11–22	–

Animal community

Livestock Interpretations:
Due to the elevations at which this site occurs, livestock utilize it primarily during the summer and fall. This site generally receives limited use by cattle and sheep. It is a low-producing site and due to its normal topographic position is somewhat inaccessible and removed from adequate water. Rock outcrops, cliffs and escarpments may be advantageously used in pasture fence design. Considerations for grazing management include timing, intensity, frequency, and duration of grazing.

In general, bunchgrasses 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 that 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.

Reduced bunchgrass vigor or density provides an opportunity for Sandberg bluegrass expansion and/or cheatgrass and other invasive species to occupy interspaces. Bluegrass is a widespread, palatable forage grass that is one of the earliest grasses in the spring and is sought by domestic livestock and several wildlife species. Its production is closely tied to weather conditions; little forage is produced in drought years, making it a less dependable food source than other perennial bunchgrasses. 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.

Idaho fescue provides important forage for many types of domestic livestock. The foliage cures well and is preferred

by livestock in 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 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 also 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.

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 may 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. In drier areas that contain more gravelly soils, no serious trampling damage occurs, even when the soils are wet (Hironaka et al. 1983).

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:
Pronghorn and deer utilize Idaho fescue in ranges of northern Nevada.

Low sagebrush is considered a valuable browse plant for wildlife during the spring, fall and winter months. In some areas, it is of little value in winter due to heavy snow, though mule deer utilize and sometimes prefer low sagebrush in winter and early spring.
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.

Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover. Leks are often located on low sagebrush sites, grassy openings, dry meadows, ridgetops, and disturbed sites.

Hydrological functions

Rills are none to rare. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid snowmelt. Water flow patterns are rare but can be expected in areas subjected to summer convection storms or rapid snowmelt. Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants is common and should not be mistaken for pedestalling due to erosion. Gullies and erosion associated with gullies are non-existent. Fine litter (foliage from grasses and annual and perennial forbs) expected to move distance of slope length during intense summer convection storms or rapid snowmelt events. High winds over ridge top landscapes limit accumulation of fine litter. 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 this site.

Recreational uses

This site derives aesthetic value from its topographic position, affording an unobstructed view of the surrounding mountains and valleys. Normally it is an unspoiled site and is a place for peace and quiet to enjoy the scenic vistas. The site provides fair to good hunting for sage grouse and chukar. The open vistas offer rewarding opportunities to photographers. Steep slopes may inhibit some forms of recreation.

Other information

Low sagebrush can be successfully transplanted or seeded in restoration.

Inventory data references

NRCS-RANGE-417 - 2 records
NV-ECS-1 - 2 records
NV-4400-13(BLM) - 2 records
Old SS Manuscripts, Range Site Descriptions, etc.

Type locality

Location 1: Elko County, NV	
Township/Range/Section	TT42N RR59E S2
General legal description	Section 2, T42N. R59E. MDBM. Northwest of Hawk's Mary's River Ranch headquarters, about 3 miles west of Anderson Homestead, Elko County, Nevada. This site also occurs in Humboldt County, Nevada

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Contributors

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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)	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 rare. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt.

2. **Presence of water flow patterns:** Water flow patterns are rare but can be expected in areas recently subjected to summer convection storms or rapid snowmelt, usually on steeper slopes. Flow patterns are short (<1m), meandering and not connected.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition. Terracettes are rare and may occur on steeper slopes.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 45%; surface cover of rock fragments variable but often more than 35%; shrub canopy 25 to 35%; foliar cover of perennial herbaceous plants ± 40%.

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) 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 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 coarse platy. Soil surface colors are brownish grays and the soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 1.5 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., Thurber needlegrass & bluebunch wheatgrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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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. Platy or massive sub-surface horizons, subsoil argillic horizons or duripans are not to be interpreted as compacted.

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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: Reference Plant Community: Deep-rooted, cool season, perennial bunchgrasses>>low shrubs (low sagebrush). (By above ground production)

    Sub-dominant: Deep-rooted, cool season, perennial forbs > shallow-rooted, cool season, perennial bunchgrasses > associated shrubs > fibrous, shallow-rooted, cool season, perennial and annual forbs. (By above ground production)

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<20%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (± 20-30%) and litter depth is ± 0.25 inch.

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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) ± 600 lbs/ac; Spring moisture significantly affects total production. Unfavorable years ± 400 lbs/ac and favorable years ± 800 lbs/ac.

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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:** Potential invaders include cheatgrass, snakeweed, and annual mustards are invaders on this site.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Reduced growth and reproduction occur during extreme or extended drought periods.
