USDA Natural Resources Conservation Service

Ecological site R025XY011OR
VERY SHALLOW 8-13 PZ

Last updated: 4/24/2024
Accessed: 04/26/2024

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 the summits of lava plateaus with slopes less than 15 percent. Soils associated with this site formed in volcanic ash and loess over residuum derived from volcanic parent material. These soils are shallow to bedrock and well drained with a layer of clay accumulation (argillic horizon) within 30cm of the soil surface. Important abiotic factors contributing to the presence of this ecological site include the shallow rooting depth and ashy or glassy soil texture modifier. The reference plant community is dominated by stiff sagebrush and Sandberg's bluegrass.

Associated sites

R025XY010OR	**LOAMY 8-11 PZ** Loamy 8-11 PZ
R025XY012OR	**LOAMY 11-13 PZ** Loamy 11-13 PZ

Similar sites

R025XY061OR	**SHALLOW CLAYPAN 8-11 PZ** ARAR8 dominant shrub, higher annual production.
R025XY063OR	**SKELETAL CLAYPAN 11+ PZ** ARAR8 dominant shrub, soils and landscape position do not differ from R025XY011OR

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia rigida*
Herbaceous	(1) *Poa secunda*

Physiographic features

This ecological site is associated with summits on lava plateaus. Slopes range from 2 to 20 percent, but are typically less than 15 percent. This site is well drained with slow runoff and slow permeability. Site elevation is inches 4300 to 5000 (1310 to 1524 meters).

Table 2. Representative physiographic features

Landforms	(1) Lava plateau > Plateau
Runoff class	Low to medium
Elevation	4,300–5,000 ft
Slope	2–20%
Water table depth	72 in
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 typically has 50 frost free-days and 104 day freeze-free period. Mean annual precipitation is 10 inches (25cm), with the highest rainfall occurring in May 1.7 inches (4.3cm) and the lowest in August 0.3 inches (0.7cm). Effective precipitation is between 8 to13 inches (20 to 33 meters). Averages snowfall is around 35 inches (89cm) per year. Air temperatures average 19 Degrees F in December (coldest) and 89 Degree F in July (warmest).

Data was provided by the Danner, Rockville, and MC Dermitt climate stations.

Table 3. Representative climatic features

Frost-free period (characteristic range)	35-90 days
Freeze-free period (characteristic range)	87-121 days
Precipitation total (characteristic range)	8-13 in
Frost-free period (actual range)	31-90 days
Freeze-free period (actual range)	76-129 days
Precipitation total (actual range)	8-13 in
Frost-free period (average)	50 days
Freeze-free period (average)	104 days
Precipitation total (average)	10 in

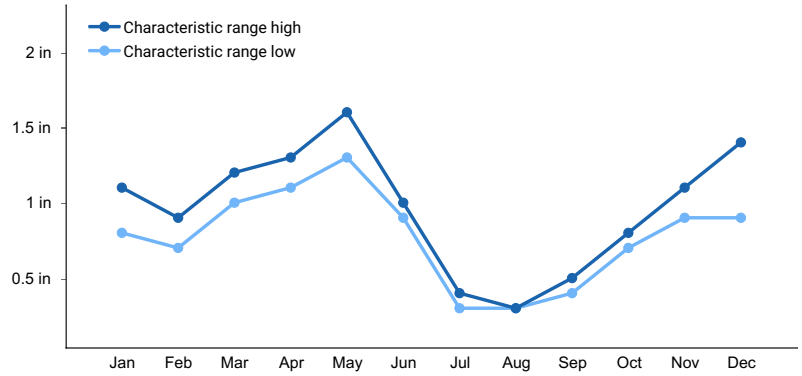


Figure 1. Monthly precipitation range

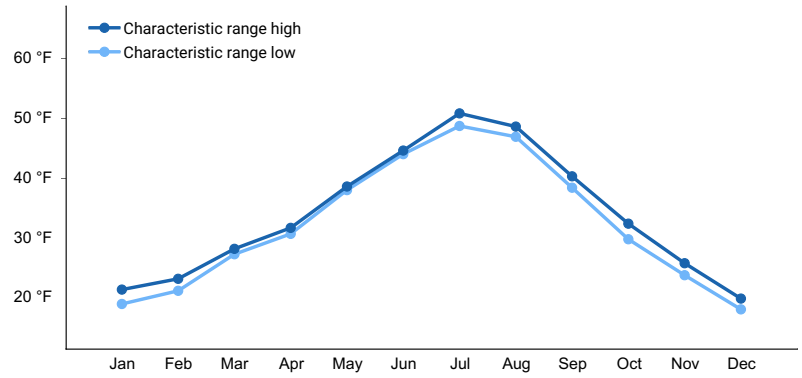


Figure 2. Monthly minimum temperature range

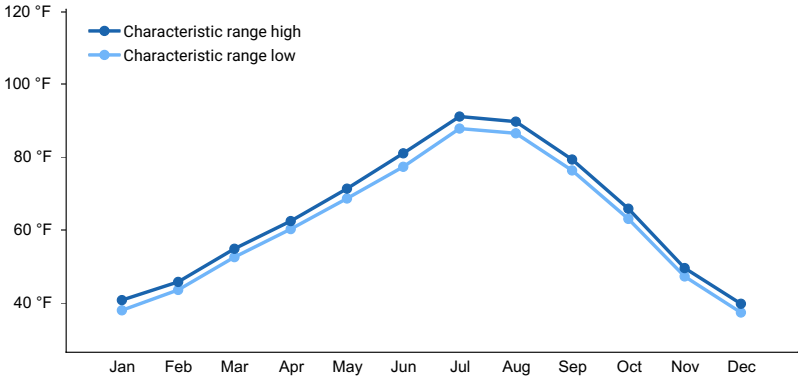


Figure 3. Monthly maximum temperature range

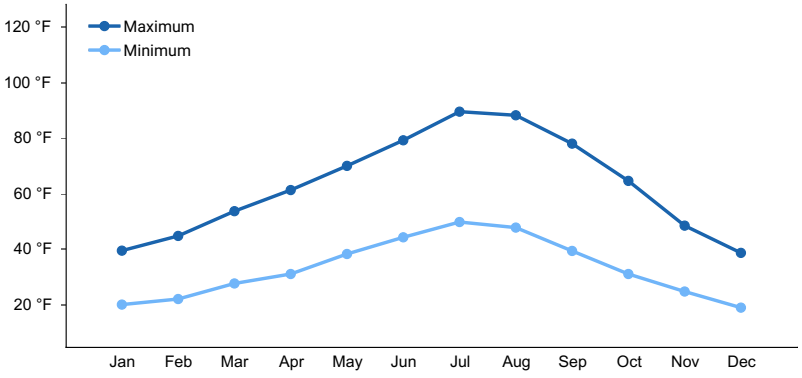


Figure 4. Monthly average minimum and maximum temperature

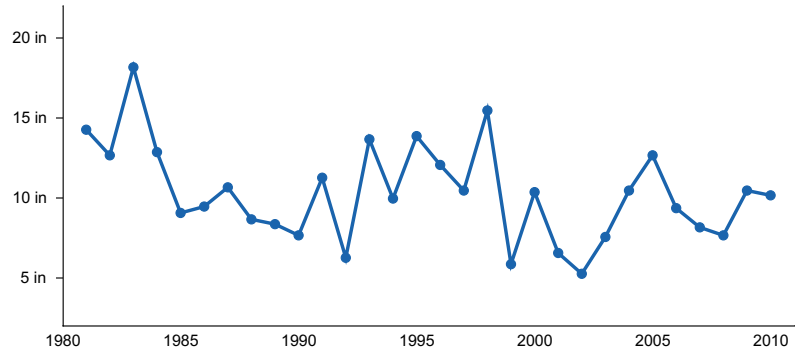


Figure 5. Annual precipitation pattern

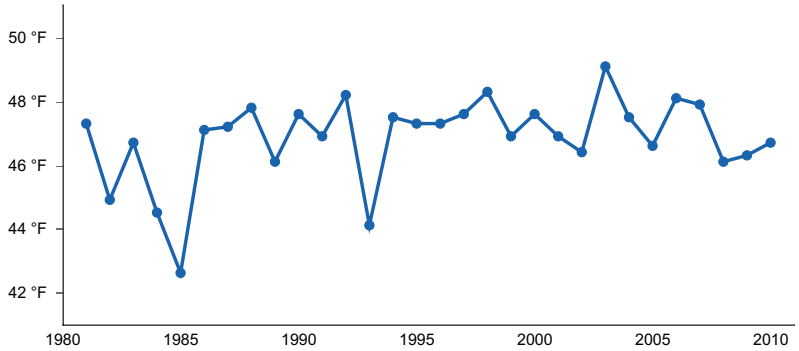


Figure 6. Annual average temperature pattern

Climate stations used

- (1) DANNER [USC00352135], Jordan Valley, OR
- (2) ROCKVILLE 5 N [USC00357277], Adrian, OR
- (3) MC DERMITT 26 N [USC00355335], Jordan Valley, OR

Influencing water features

This ecological site is not influenced by adjacent wetlands, streams or run-on. No water table is present.

Wetland description

N/A

Soil features

The soils associated with this site are very shallow and shallow to hard basalt or rhyolite bedrock, well drained, and formed in volcanic ash and loess over residuum. The soil profile is characterized by a light-colored surface horizon (ochric epipedon), greater than 35 percent rock fragments, and a layer of clay accumulation (argillic horizon) between 20 and 30cm. Rooting depth by is limited by hard bedrock at 30cm, but available water holding capacity is moderate due to clay content and volcanic glass in the soil profile.

Representative soil components associated with this ecological site include Cowlake.

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Residuum–rhyolite
Surface texture	(1) Ashy, very cobbly loam
Family particle size	(1) Ashy-skeletal over loamy-skeletal

Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderately slow
Depth to restrictive layer	18–20 in
Soil depth	10–20 in
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–25%
Available water capacity (0-40in)	2–4 in
Soil reaction (1:1 water) (Depth not specified)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	35–40%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

The Reference Plant Community is dominated by sandberg bluegrass and scabland sagebrush (*Artemisia rigida*). Subdominant species include Thurber needlegrass, Cusicks bluegrass and bottlebrush squirreltail, and Idaho fescue. Total annual production is 250 lbs/acre in a normal year, 300 lbs/acre in a favorable year, and 200 lbs/acre in a unfavorable year. Structurally, shallow rooted bunchgrasses are dominant, followed by shrubs, and perennial forbs. The dominant visual aspect of this site is scabland sagebrush with mixed grasses. Composition by weight is approximately 50 percent grasses, 10 percent forbs and 40 percent shrubs.

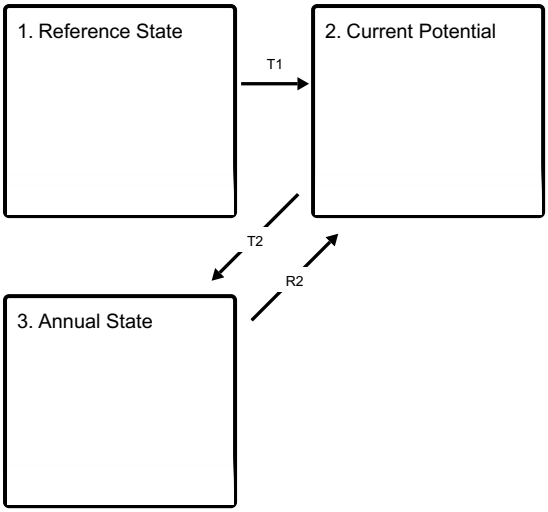
Herbivory has historically occurred on the site at low levels of utilization. Native herbivores include pronghorn antelope, elk, mule deer, sage grouse, lagomorphs and rodents. Overutilization of resources due to grazing (from livestock, wildlife, and feral horses) can degrade the site and decrease forage availability and quality. This will lead to a decrease in perennial bunch grasses and an increase of invasive species (Williamson, 2020). Annual and perennial invasive species compete with desirable plants for moisture and nutrients.

Wildfire frequency across this site has historically been low. Sagebrush evolved with low intensity wildfire that left a mosaic of burned and unburned patches (Baker, 2006). Annual species such as cheatgrass and medusahead can be troublesome invaders on this site after wildfire, preventing perennial grass and shrub re-establishment. Invasive, annual plant communities increase wildfire frequency and intensity (K. Haubensak, 2009). This could cause the dominate shrub population to shift away from scabland sagebrush to a shrub population with quicker establishment.

High annual precipitation will increase the total plant production. Higher wildfire frequency following annual plant production can be expected due to a larger fuel load (Pilliod, 2017). Extended periods of drought significantly impact this site because of the grasses and shrubs that depend on annual moisture and the shallow soil. Extended drought reduces the vigor of perennial grasses and shrubs, while extreme drought may cause plant mortality. Extreme drought could also cause a state change that will favor bunch grasses over shrubs. Runoff potential following large precipitation events is high. Decreased infiltration, increased runoff, and increased erosion often occur when sagebrush is removed by frequent wildfires (C.J. Williams, 2018).

State and transition model

Ecosystem states

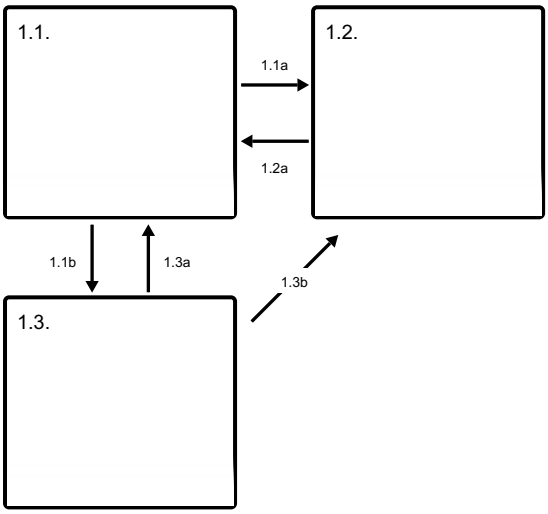


T1 - Introduction of annual non-native species.

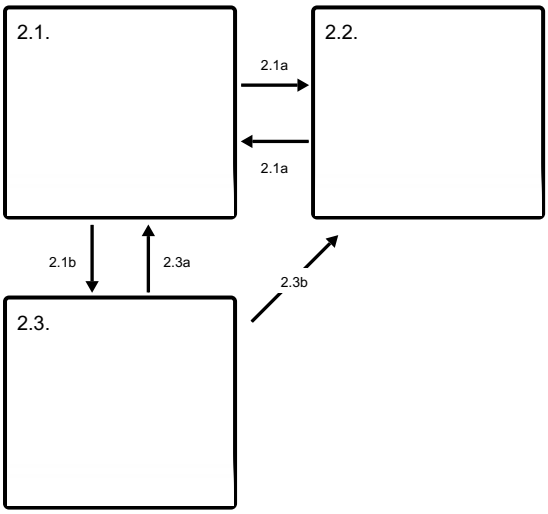
T2 - Repeated, widespread and severe fire.

R2 - Seeding with native species/prescribed grazing

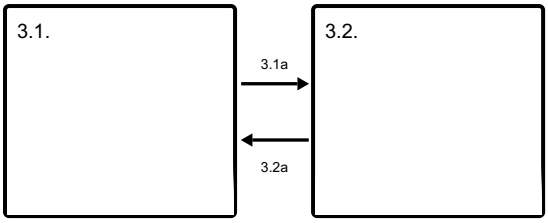
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 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

- scabland sagebrush (*Artemisia rigida*), shrub
- Sandberg bluegrass (*Poa secunda*), grass

Community 1.1

This community phase is characteristic of a mid-seral plant community and is dominated by scabland sagebrush and sandberg bluegrass.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	100	125	150
Shrub/Vine	80	100	120
Forb	20	25	30
Total	**200**	**250**	**300**

Community 1.2

This community phase is characterized by a post-disturbance, early seral, plant community. Scabland 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 scabland 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 scabland 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 scabland 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 an insect infestation would reduce scabland 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 scabland 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

- scabland sagebrush (*Artemisia rigida*), shrub
- cheatgrass (*Bromus tectorum*), grass
- Sandberg bluegrass (*Poa secunda*), 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.

Resilience management. This community is at risk of crossing a threshold to another state. This site is susceptible to further degradation from poor grazing management, drought, and/or fire.

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 scabland 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 mountain big sagebrush.

Disturbance tolerant shrubs may be present or increasing depending on time since disturbance.

Dominant plant species

- cheatgrass (*Bromus tectorum*), grass

Community 3.1

This community phase in dominated by annual non-native plants such as medusahead or cheatgrass and shallow-rooted perennial grasses like Sandberg bluegrass. Sprouting shrubs such as rabbitbrush may also common. Patches of mature sagebrush may or may not be present.

Community 3.2

This community phase is characteristic of a post-wildfire community where annual non-natives are controlling site resources. Depending on season and/or intensity of fire the visually aspect of the site in dominated annual non-natives and bare ground. Site may be experiencing soil loss.

Resilience management. This community phases is high susceptible to frequent and repeated wildfire. Best management practices prevent sites from reaching this community phase. Management options are extremely limited.

Pathway 3.1a
Community 3.1 to 3.2

Fire reduces or eliminates the overstory shrubs and shallow-rooted perennials and allows for annual non-natives to increase

Pathway 3.2a
Community 3.2 to 3.1

Time and lack of fire allows for sagebrush/rabbitbrush to establish. Probability of sagebrush establishment is very unlikely and dependent on a near-by seed source from unburned patches of sagebrush.

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 T2
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.

Constraints to recovery. Increased, continuous fine fuels from annual non-native plants modify the fire regime by changing intensity, size and spatial variability of fires. This increased disturbance prevents recovery of long-lived native perennials.

Restoration pathway R2
State 3 to 2

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

from wildfire.

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				100–150	
	Sandberg bluegrass	POSE	*Poa secunda*	40–60	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	5–10	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	2–10	–
	squirreltail	ELEL5	*Elymus elymoides*	2–5	–
	Idaho fescue	FEID	*Festuca idahoensis*	0–3	–
Forb					
2				20–30	
	phlox	PHLOX	*Phlox*	1–2	–
	buckwheat	ERIOG	*Eriogonum*	1–2	–
	balsamroot	BALSA	*Balsamorhiza*	1–2	–
	clover	TRIFO	*Trifolium*	1–2	–
Shrub/Vine					
3				80–120	
	scabland sagebrush	ARRI2	*Artemisia rigida*	30–50	–

Inventory data references

Old SS Manuscripts, Range Site Descriptions, etc.

References

Haubensak K. and D'Antonio C. 2009. Effects of fire and environmental variable on plant structure and composition in grazed salt desert shrublands of the Great Basin (USA). Journal of Arid Environment. Elsevier. 643–650.

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Williams, C.J. and F.B. Pierson. 2018. Effectiveness of prescribed fire to re-establish sagebrush steppe vegetation and ecohydrologic function on woodland-encroached sagebrush rangelands, Great Basin, USA: Part I: Vegetation, hydrology, and erosion responses.

Williamson, M.A. and E. Fleishman. 2019. Fire, livestock grazing, topography, and precipitation affect occurrence and prevalence of cheatgrass (Bromus tectorum) in the central Great Basin, USA.

Contributors

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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)	
Contact for lead author	
Date	04/26/2024
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):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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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):**

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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:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
