Ecological site R025XY063OR SKELETAL CLAYPAN 11+ PZ

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General information

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

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 4,300 to 6,500 ft. The soils associated with this site are very shallow or shallow to a duripan or lithic contact and have an abrupt boundary in the top 10 inches resulting in wet non-satiated conditions. These soils have high amounts of gravels, cobbles, or stones on the surface which occupy plant growing space yet protect the soil from excessive erosion. The available water capacity is low due to a high volume of rock fragments throughout the profile, but the surface cover of rock fragments helps to reduce evaporation and conserve soil moisture. Lower water holding capacity results in lower overall site production. The soil climate is frigid. The reference plant community is characterized by low sagebrush in the overstory and Sandberg bluegrass in the understory. (wet non-saturated conditions - Schoeneberger, P.J., 2012, pg 1-15)

Associated sites

R025XY011OR	VERY SHALLOW 8-13 PZ
R025XY061OR	SHALLOW CLAYPAN 8-11 PZ
R025XY016OR	SHALLOW CLAYPAN 11-13 PZ

R025XY018OR	**SHALLOW CLAYPAN 13-16 PZ**
R025XY064OR	**SHRUBBY SHALLOW CLAYPAN 13-16 PZ**
R025XY010OR	**LOAMY 8-11 PZ**
R025XY012OR	**LOAMY 11-13 PZ**
R025XY014OR	**LOAMY 13-16 PZ**
R025XY065OR	**SHRUBBY LOAM 13-16 PZ**

Similar sites

R025XY011OR	**VERY SHALLOW 8-13 PZ** This site is on very shallow and shallow soils with high rock fragment content. Production is much lower and vegetation is dominated by stiff sage (Artemesia rigida) and Sandberg bluegrass.
R025XY061OR	**SHALLOW CLAYPAN 8-11 PZ** This site has higher available water holding capacity resulting in higher production. The perennial deep rooted grass layer is dominated by bluebunch wheatgrass and Sandberg bluegrass.
R025XY016OR	**SHALLOW CLAYPAN 11-13 PZ** This site has higher available water holding capacity resulting in higher production. The perennial deep rooted grass layer is dominated by Idaho fescue.
R025XY018OR	**SHALLOW CLAYPAN 13-16 PZ** This site has higher available water holding capacity resulting in higher production. The perennial deep rooted grass layer is dominated by Idaho fescue.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula*

Herbaceous	(1) *Poa secunda* (2) *Poa cusickii*

Physiographic features

This site is on plateaus and tablelands. Slopes range from 2 to 12 percent. Elevation varies from 4,300 to 6,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Lava plateau > Plateau (2) Tableland
Runoff class	Medium to high
Elevation	1,310 – 1,980 m
Slope	0 – 10 %
Water table depth	250 cm
Aspect	Aspect is not a significant factor

Climatic features

The annual precipitation ranges from 11 to 13 inches plus, most of which occurs in the form of snow during the months of December through March. Localized convection storms occasionally occur during the summer. High course fragments in the soil limit water holding capacity and therefore limit effective precipitation. The soil temperature regime is frigid with a mean air temperature of 46 degrees F. Temperature extremes range from 10 to 90 degrees F. The frost free period ranges from less than 30 to 100 days. The optimum growth period for native plants is from April through June.

Table 3 Representative climatic features

Frost-free period (characteristic range)	30-100 days
Freeze-free period (characteristic range)	110-130 days
Precipitation total (characteristic range)	280-330 mm
Frost-free period (average)	90 days
Freeze-free period (average)	120 days
Precipitation total (average)	330 mm

- (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 associated with this site are very shallow or shallow over bedrock or an indurated pan. The surface layer is a cobbly to extremely cobbly ashy silt loam or loam less than 10 inches thick. The subsoil is 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 bedrock or an indurated pan is 6 to 25 inches. Permeability is slow. The available water holding capacity is about 0.5 to 3 inches for the profile. High rock fragment cover on the soil surface reduces erosion potential on this site.

The soil series correlated with this site are Knotmer and Salheur.

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

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Residuum – volcanic rock (3) Loess – volcanic rock
Surface texture	(1) Cobbly, ashy silt loam (2) Extremely cobbly, ashy loam
Family particle size	(1) Loamy-skeletal (2) Clayey-skeletal
Drainage class	Well drained to moderately well drained
Permeability class	Slow to moderate
Depth to restrictive layer	20 – 60 cm
Soil depth	20 – 60 cm
Surface fragment cover <=3"	20 – 50 %
Surface fragment cover >3"	10 %
Available water capacity (0-101.6cm)	1.27 – 7.62 cm

Soil reaction (1:1 water) (0-101.6cm)	10
Subsurface fragment volume <=3" (0-101.6cm)	10 – 50 %
Subsurface fragment volume >3" (0-101.6cm)	10 – 50 %

Ecological dynamics

The reference plant community is dominated by low sagebrush (little sagebrush) with an understory of Sandberg bluegrass. The site has low to moderate resilience to disturbance and resistance to invasion (Stringham et al. 2015). 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 lower available water holding capacity and restrictive soil features limit site productivity resulting in more open space for establishment of invasive annual grasses, though this is slightly mitigated by high surface fragment cover. Timing of precipitation also 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 site shows little variation in composition and production. Low sagebrush and Sandberg bluegrass always dominates the site. Cusick bluegrass, bluebunch wheatgrass and Idaho fescue and production will increase as the soils become deeper. Sandberg bluegrass will increase as the soil becomes more shallow.

If the condition of the site deteriorates due to extended disturbance, Idaho fescue and Cusick bluegrass will decrease while low sagebrush and Sandberg bluegrass increase. With further deterioration, annuals will invade and bare ground will markedly increase.

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).

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 dominant perennial bunchgrass on this site is Sandberg bluegrass. Perennial bunchgrasses 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.

Fire Ecology:
Prior to 1897, mean fire return intervals for low sagebrush communities have been estimated to be from 35 to over 100 years. This site's low production and high surface fragments greatly limit fire spread. 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).

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.

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

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant, shallow rooted perennial grasses**			84-112	
	Sandberg bluegrass	POSE	*Poa secunda*	84-112	–
2	**Sub-dominant, deep rooted perennial grasses**			26-84	
	Idaho fescue	FEID	*Festuca idahoensis*	6-28	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	13-28	–
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	6-28	–
3	**Other, deep rooted perennial grasses**			4-11	
	squirreltail	ELEL5	*Elymus elymoides*	2-6	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	2-6	–
Forb					
4	**Dominant, perennial forbs**			11-22	
	balsamroot	BALSA	*Balsamorhiza*	3-6	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	2-6	–
	fleabane	ERIGE2	*Erigeron*	3-6	–
	phlox	PHLOX	*Phlox*	2-6	–
5	**Other perennial forbs**			3-10	
	common yarrow	ACMI2	*Achillea millefolium*	1-3	–
	pussytoes	ANTEN	*Antennaria*	1-3	–
	desertparsley	LOMAT	*Lomatium*	1-3	–
Shrub/Vine					
6	**Dominant, perennial, evergreen shrubs**			56-84	

	little sagebrush	ARAR8	*Artemisia arbuscula*	56-84	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

LIVESTOCK INTERPRETATIONS: This site is suited to use by cattle, sheep and horses in late spring, summer and fall under a planned grazing system. Use should be potponed until the soils are firm enough to prevent trampling damage and soil compaction. Domestic sheep and to a much lesser degree cattle consume low sagebrush, particularly during the spring, fall and winter (Sheehy and Winward 1981). 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. Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year. WILDLIFE INTERPRETATIONS: This site offers food and cover for antelope, mule deer, rodents and a variety of birds. It is important spring, summer and fall use area for antelope and mule deer. Low sagebrush is considered a valuable browse plant during the spring, fall and winter months. In some areas it is of little value in winter due to heavy snow. Mule deer utilize and sometimes prefer low sagebrush, particularly in winter and early spring. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Open Wyoming sagebrush communities are preferred nesting habitat. Meadows surrounded by sagebrush may be used as feeding and strutting grounds. 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.

Inventory data references

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

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Contributors

Bob Gillaspy
C.D. Tackman, A.V. Bahn
Jennifer Moffitt

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)	C. TACKMAN, K. MUNDAY, A.RICE, M. KRUEGER, J. FERGUSON, T. ALLAI
Contact for lead author	State Rangeland Management Specialist for NRCS in Oregon
Date	05/15/2017
Approved by	
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

2. **Presence of water flow patterns:** Water flow patterns are none to rare. In areas subject to summer convection storms and rapid snowmelt, short (<1m) and stable flow patterns can be expected. Flow paths are not connected.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are common on this site. Occurrence is usually limited to shallow rooted perennial grasses (Sandbergs bluegrass) and in areas of water flow patterns and shrub interspaces.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 20-25% depending on amount of surface gravels. This site typically has high amount of surface gravels and cobbles.

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) – limited movement; expected to move no more than 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):** Low to moderate resistance to erosion. Aggregate stability values should be 1 to 3 on most soil textures found on this site. High amount of surface cobbles and gravels.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface texture is typically gravelly ashy silt loam. Soil surface color is typically light to pale brown (10YR6/3)(dry). Weak fine and very fine subangular blocky structure (A-- 0-10 cm) Surface is covered with 20 percent gravels and 5 percent cobble. (Salheur) ////Surface texture is typically extremely cobbly loam. Soil surface color is typically brown(10YR4/3)(dry). Fine platy structure (A-- 0-5 cm)(Ninemile). Surface is covered with 36 percent cobbles and 20 percent gravels (Ninemile) *Draft Soil Survey-subject to change.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** **Typical vegetation composition is 50 percent grasses. 10 percent forbs and 40 percent shrubs. Perennial herbaceous plants (dominated by Sandbergs's bluegrass) help 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. Subangular blocky structure or subsoil argillic horizons are not to be interpreted as compacted layers.**

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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: Shallow rooted perennial bunch grasses (Sandbergs's bluegrass)

Sub-dominant: Low sagebrush

Other: Other perennial grasses > forbs = other shrubs

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** **Rare to slight decadence and mortality on low sagebrush. Slight to none decadence on perennial bunch grasses.**

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **Favorable – 300 lbs/ac, Average -- 250 lbs/ac, Unfavorable – 200 lbs/ac. Spring moisture significantly affects total 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:** **Potential invaders include cheatgrass, medusahead, annual mustards.**

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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 conditions.**
