Ecological site R025XY061OR SHALLOW CLAYPAN 8-11 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 3,500 to 4,500 feet. The soils associated with this site are moderately deep to a duripan or lithic contact and have an abrupt boundary in the top 10 inches resulting in wet non-satiated conditions. The soil climate is mesic-aridic. The reference plant community is characterized by low sagebrush and a mix of bluebunch wheatgrass and Sandberg bluegrass in the understory. (wet non-saturated conditions - Schoeneberger, P.J., 2012, pg 1-15)

Associated sites

R025XY010OR	**LOAMY 8-11 PZ**
R025XY011OR	**VERY SHALLOW 8-13 PZ**

Similar sites

R025XY016OR	**SHALLOW CLAYPAN 11-13 PZ** This site has higher precipitation and production, is frigid, and the perennial deep rooted grass layer is dominated by Idaho fescue.

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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula*
Herbaceous	(1) *Pseudoroegneria spicata subsp. spicata* (2) *Poa secunda*

Physiographic features

This site is on plateaus and tablelands. Slopes range from 2 to 15 percent. Elevations range from 3,500 to 4,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Plateau (2) Tableland
Runoff class	Medium to high
Elevation	1,070 – 1,370 m
Slope	0 – 20 %
Water table depth	250 cm
Aspect	Aspect is not a significant factor

Climatic features

The annual precipitation ranges from 8 to 11 inches, most of which occurs in the form of snow during the months of December through March. Localized convection storms occasionlly occur during the summer. The soil temperature regime is mesic to near frigid with a mean air temperture of 46.5 degrees F. Temperature extremes range from 10 to 90 degrees F. The frost free period ranges from less than 90 to 120 days. The optimum growth period for native plants is from April through June.

Table 3 Representative climatic features

Frost-free period (characteristic range)	90-120 days
Freeze-free period (characteristic range)	100-130 days

Precipitation total (characteristic range)	200-280 mm
Frost-free period (average)	110 days
Freeze-free period (average)	120 days
Precipitation total (average)	250 mm

- (1) ROME 2 NW [USC00357310], Jordan Valley, OR

Influencing water features

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

Soil features

The soils associated with this site are moderately deep over bedrock or an indurated pan. The surface layer is an ashy silt loam to a silty clay 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. Depth to bedrock or an indurated pan is 20 to 40 inches. Permeability is moderate to moderately slow in the surface layer and slow in the subsoil. The available water holding capacity is about 2 to 3 inches for the profile.

The soil series correlated with this site are Carryback and Suncold.

(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) Ashy silt loam (2) Silty clay loam
Family particle size	(1) Fine
Drainage class	Moderately well drained to well drained
Permeability class	Moderate to very slow
Depth to restrictive layer	50 – 100 cm

Soil depth	50 – 100 cm
Surface fragment cover <=3"	0 – 20 %
Surface fragment cover >3"	0 – 20 %
Available water capacity (0-101.6cm)	5.08 – 10.16 cm
Soil reaction (1:1 water) (0-101.6cm)	10
Subsurface fragment volume <=3" (0-101.6cm)	0 – 20 %
Subsurface fragment volume >3" (0-101.6cm)	0 – 20 %

Ecological dynamics

The reference plant community is dominated by low sagebrush (little sagebrush) with an understory of bluebunch wheatagrass. Sandberg bluegrass and Cusick bluegrass are prominent in the stand. The site has low resilience to disturbance and resistance to invasion. 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 effective precipitation (aridic soil moisture regime) and restrictive soil features limit site productivity resulting in more open space for establishment of invasive annual grasses. 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 warmer soil temperature regime (mesic) is also optimal for annual grass establishment and growth. Once annuals are on the site, they are very effective at outcompeting native seedlings, allowing for continued expansion (Chambers 2014b).

This site shows little variation in composition and production. Bluebunch wheatgrass production will increase as the soils become deeper. Sandberg bluegrass will increase as the soils become shallower. Idaho fescue will increase at the upper end of the precipitation zone.

If the condition of the site deteriorates due to extended disturbance, bluebunch wheatgrasss and Cusick bluegrass will decrease while low sagebrush and Sandberg bluegrass will increase. With further deterioration, annuals will invade and bare ground will markedly increase. Excessive erosion in the bare soil interspaces reduces the site productivity.

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 bluebunch wheatgrass. 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.

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, and annual mustards.

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

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

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

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, therefore the tops 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, bluebunch wheatgrass is considered to experience slight damage to fire but is more susceptible in drought years (Young 1983). Most authors classify the plant as undamaged by fire (Kuntz 1982).

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, perennial, deep rooted grasses**			336-471	
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	336-471	–

2	**Sub-dominant, perennial, deep rooted grasses**			27-101	
	Cusick's bluegrass	POCU3	*Poa cusickii*	13-67	–
	Idaho fescue	FEID	*Festuca idahoensis*	13-34	–
3	**Dominant, perennial, shallow rooted grasses**			34-67	
	Sandberg bluegrass	POSE	*Poa secunda*	34-67	–
4	**Other perennial grasses**			13-40	
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	7-20	–
	squirreltail	ELEL5	*Elymus elymoides*	7-20	–
Forb					
5	**Perennial forbs**			34-67	
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	7-13	–
	fleabane	ERIGE2	*Erigeron*	7-13	–
	buckwheat	ERIOG	*Eriogonum*	7-13	–
	lupine	LUPIN	*Lupinus*	7-13	–
	phlox	PHLOX	*Phlox*	7-13	–
Shrub/Vine					
6	**Dominant, evergreen shrubs**			67-135	
	little sagebrush	ARAR8	*Artemisia arbuscula*	67-135	–
7	**Other shrubs**			4-13	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	2-7	–
	spiny hopsage	GRSP	*Grayia spinosa*	2-7	–

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 2.4 plant community composition

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

Table 12. Community 3.1 plant community composition

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

Table 13. Community 3.2 plant community composition

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

Table 14. Community 4.1 plant community composition

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

Table 15. Community 5.1 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. Grazing management should be keyed to bluebunch wheatgrass and Cusicks bluegrass. Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for livestock. Although bluebunch wheatgrass can be a crucial source of forage, it is not necessarily the most highly preferred species. Cusicks bluegrass begins growth early in the year and remain palatable throughout a relatively long growing season. This pattern of development enables animals to use Cusicks bluegrass when many other grasses are unavailable. 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. Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for wildlife. Bluebunch wheatgrass does not generally provide sufficient cover for ungulates, however, mule deer were frequently found in bluebunch-dominated grasslands. Cusicks bluegrass is valuable forage for wildlife.

Hydrological functions

The soils are in hydrologic group D. The soils of this site have high runoff potential. Infiltration of water is restricted once these soils are wetted and the site is subject to loss of water by runoff. Loss of the surface layer will result in decreased productivity of the site. Pedestalling of some grass plants is common during the winter due to frost heaving. Rills are rare. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid snowmelt. Gullies are rare in areas of this site that occur on stable landforms. Where this site occurs on inset fans, gullies and head cuts associated with ephemeral channel entrenchment are rare to common. Fine litter (foliage from grasses and annual and perennial forbs) is expected to move the distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during catastrophic events. Perennial herbaceous plants (especially deep-rooted bunchgrasses) slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on this site.

Recreational uses

Aesthetic value is derived from the colorful flowering of forbs backgrounded by the verdure of native grasses in the spring and early summer. The site has potential for nature study and photography. Potential for hunting is limited to upland game hunting. Off-road vehicle use can destroy the fragile soil-vegetation complex resulting in severe erosion problems, especially on steeper slopes.

Inventory data references

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

Type locality

Location 1: Malheur County, OR	
Township/Range/Section	TT32S RR44E S13

General legal description	SE 1/4 of section 13. About two miles due south of Little Grassy Mountain.

Other references

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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)	

Contact for lead author	
Date	03/20/2008
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** None to some

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-15%

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 - limited movement

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Significantly resistant to erosion: aggregate stability = 4-6

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Low ground cover (20-35%) and gentle to moderate slopes (0-15%) slightly to moderately limit rainfall impact and overland flow

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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):** None

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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: Deep-rooted, moderate height bunchgrasses

    Sub-dominant: Shallow-rooted, short height bunchgrasses = evergreen shrubs

    Other:

    Additional:

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

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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):** Favorable: 700, Normal: 600, Unfavorable: 500 lbs/acre/year at high RSI (RPC)

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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:** Cheatgrass and Medusahead invade sites that have lost deep rooted perennial grass functional groups

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17. **Perennial plant reproductive capability:** All species should be capable of reproducing annually

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