USDA Natural Resources Conservation Service

Ecological site R010XB096OR
JD Claypan South 12-16 PZ

Last updated: 12/13/2023
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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): 010X–Central Rocky and Blue Mountain Foothills

This MLRA is characterized by gently rolling to steep hills, plateaus, and low mountains at the foothills of the Blue Mountains in Oregon and the Central Rocky Mountains in Idaho. The geology of this area is highly varied and ranges from Holocene volcanics to Cretaceous sedimentary rocks. Mollisols are the dominant soil order and the soil climate is typified by mesic or frigid soil temperature regimes, and xeric or aridic soil moisture regimes. Elevation ranges from 1,300 to 6,600 feet (395 to 2,010 meters), increasing from west to east. The climate is characterized by dry summers and snow dominated winters with precipitation averaging 8 to 16 inches (205 to 405 millimeters) and increasing from west to east. These factors support plant communities with shrub-grass associations with considerable acreage of sagebrush grassland. Big sagebrush, bluebunch wheatgrass, and Idaho fescue are the dominant species. Stiff sagebrush, low sagebrush, and Sandberg bluegrass are often dominant on sites with shallow restrictive layers. Western juniper is one of the few common tree species and since European settlement has greatly expanded its extent in Oregon. Nearly half of the MLRA is federally owned and managed by the Bureau of Land Management. Most of the area is used for livestock grazing with areas accessible by irrigation often used for irrigated agriculture.

Ecological site concept

In reference condition, this ecological site supports a plant community dominated by low sagebrush (Artemisia arbuscula) and bluebunch wheatgrass (Pseudoroegneria spicata). Abiotically, this site is characterized by typically occupying southerly aspects and having soils with bedrock or claypans at shallow depths encouraging the growth of low sagebrush. The soil climate is frigid to mesic near frigid/xeric. Historically, plant community dynamics were driven primarily by disturbances such as localized fire and drought. Presently, reference conditions are less common and current dynamics are also influenced by the spread of invasive species, proliferation of western juniper (Juniperus occidentalis), livestock grazing pressures and fire suppression.

Associated sites

R010XB029OR	**JD Claypan 9-12 PZ** Non-aspect, aridic moisture regime.
R010XB080OR	**JD Claypan 12-16 PZ** Non-aspect; frigid temperature regime, xeric moisture regime
R010XB081OR	**JD Claypan North 12-16 PZ** North aspect; frigid temperature regime, xeric moisture regime
R010XB082OR	**JD Shrubby Claypan 12-16 PZ** Non-aspect with bitterbrush; frigid temperature regime, xeric moisture regime

Similar sites

R010XC054OR	**SR Mountain Shallow South 12-16 PZ** No low sage; more shrubs
R010XB051OR	**JD Shallow South 9-12 PZ** Aridic moisture regime; no low sage; lower production
R010XB047OR	**JD Shallow South 12-16 PZ** No low sage; more production

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula*
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

This site occurs on south facing valley side hills, mountain slopes and rolling uplands. Slopes range from 12 to 40 percent. Elevations typically range from 4,000 to 5,500 feet. This site is not subject to ponding or flooding and no water table is present within the soil profile.

Table 2. Representative physiographic features

Landforms	(1) Upland > Hill (2) Upland > Mountain slope (3) Valley > Valley side
Flooding frequency	None
Ponding frequency	None
Elevation	4,000–5,500 ft
Slope	12–40%
Aspect	SE, S, SW

Climatic features

The annual precipitation ranges from 12 to 16 inches (300 to 400 mm), most of which occurs in the form of snow during the months of December through March. Localized convection storms occasionally occur during the summer. The soil temperature regime is frigid to mesic near frigid with a mean air temperature of 45° F. Temperature extremes range from 100 to -20° F. The frost free period ranges from 60 to 75 days. The optimum growth period for plant growth is April through June. The graphs below are populated from the closest available weather station to representative site locations and are provided to indicate general climate patterns.

Table 3. Representative climatic features

Frost-free period (characteristic range)	60-75 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	12-16 in
Frost-free period (average)	65 days
Freeze-free period (average)	
Precipitation total (average)	14 in

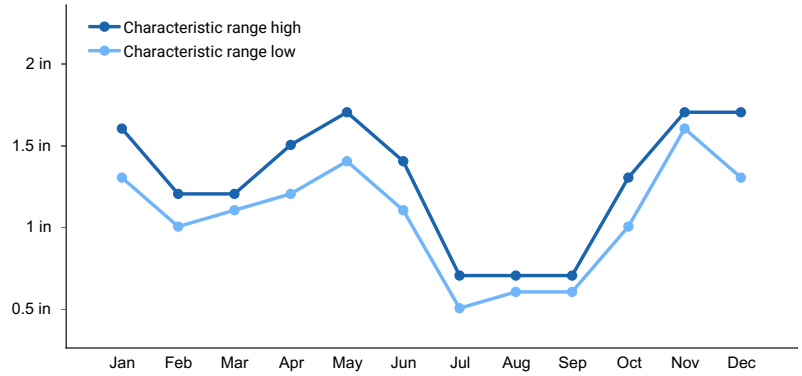


Figure 1. Monthly precipitation range

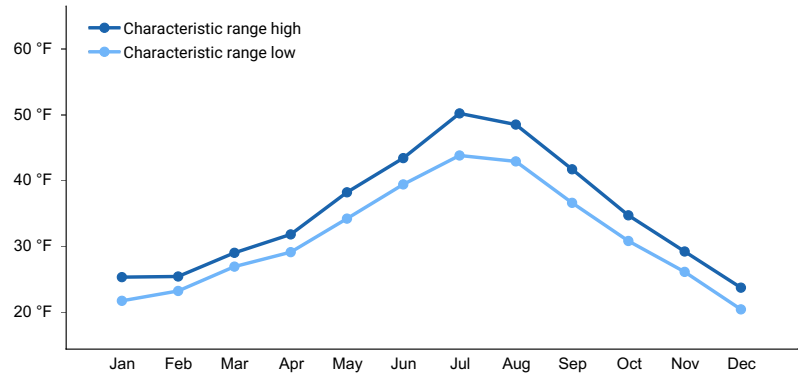


Figure 2. Monthly minimum temperature range

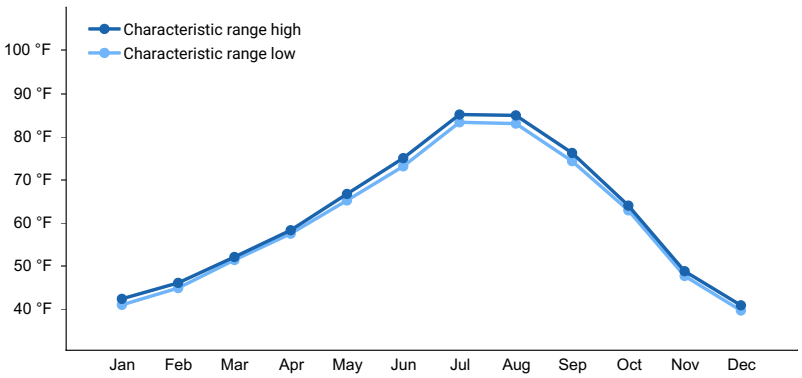


Figure 3. Monthly maximum temperature range

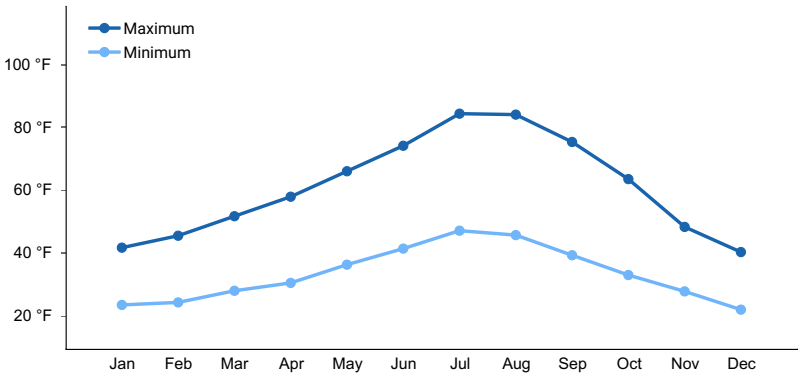


Figure 4. Monthly average minimum and maximum temperature

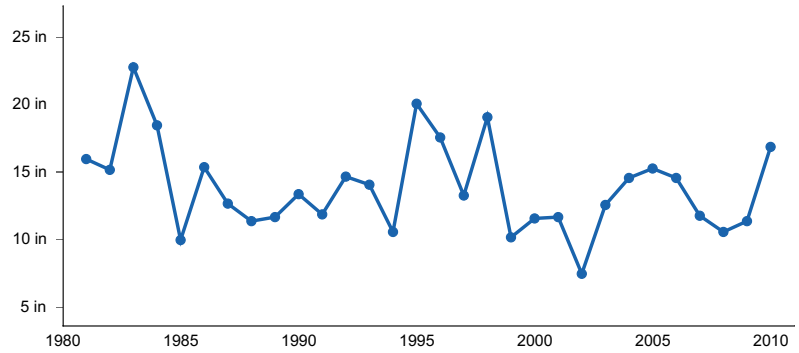


Figure 5. Annual precipitation pattern

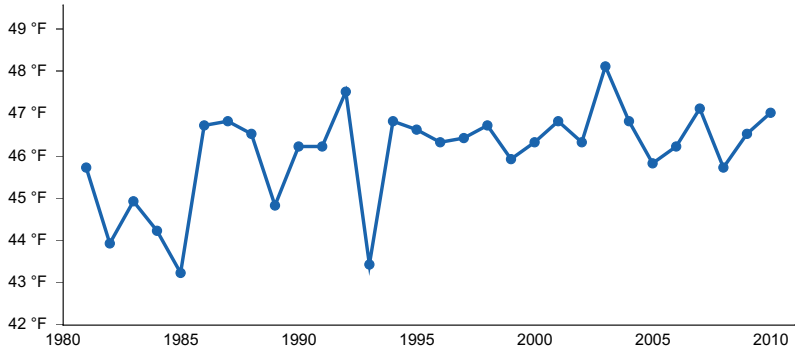


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BARNES STN [USC00350501], Prineville, OR
- (2) MITCHELL 2 E [USC00355638], Mitchell, OR
- (3) GRIZZLY [USC00353542], Madras, OR

Influencing water features

This site is not influenced by water from a wetland or stream.

Wetland description

Not applicable

Soil features

The soils of this site are typically shallow to deep and well drained. Typically the surface layer is a very cobbly silt loam to very stony loam 4 to 6 inches thick. The subsoil is a very gravelly silt loam to clay 11 to 20 inches thick. Depth to bedrock or an indurated pan ranges from 4 to 17 inches. Permeability is moderate to slow. The available water holding capacity (AWC) is about 2 to 4 inches for the profile. The erosion potential is moderate to severe. The soil temperature regime is frigid to mesic near frigid and the soil moisture regime is xeric. Parent materials are residuum and colluvium derived from tuff, basalt, rhyolite, or sediments.

Table 4. Representative soil features

Parent material	(1) Residuum–volcanic and sedimentary rock (2) Colluvium–volcanic and sedimentary rock
Surface texture	(1) Very cobbly silt loam (2) Very stony loam
Family particle size	(1) Clayey (2) Clayey-skeletal

Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Depth to restrictive layer	10–20 in
Soil depth	17–40 in
Surface fragment cover <=3"	5–25%
Surface fragment cover >3"	5–50%
Available water capacity (0-40in)	2–4 in
Soil reaction (1:1 water) (0-40in)	6.6–7.8
Subsurface fragment volume <=3" (4-40in)	0–15%
Subsurface fragment volume >3" (4-40in)	5–50%

Ecological dynamics

The Reference Plant Community is dominated by low sagebrush and bluebunch wheatgrass. Idaho fescue, Thurber's needlegrass, and a variety of forbs are present. Sandberg bluegrass is the dominant shallow rooted perennial grass. Vegetative composition of the community is approximately 70 percent grasses, 10 percent forbs and 20 percent shrubs.

Ecological Dynamics and Disturbance Response:

Ecological dynamics of this site are primarily driven by interactions between climatic patterns and disturbance regimes. Infrequent and typically small area fires were the historical disturbance that maintained the reference state and drove plant community shifts within the state. Intensity and frequency of these fires is strongly influence by drought cycles and insect or disease attacks on the plant community. Introduction of exotic annual grasses compromises the resistance and resiliency of the site, putting it at higher risk of crossing a threshold into another state.

Periodic drought regularly influences sagebrush ecosystems and drought duration and severity as 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).

The Great Basin 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 or can 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 range and density of western juniper has increased since the middle of the nineteenth century (Tausch 1999, Miller and Tausch 2000). Causes for expansion of western juniper into sagebrush ecosystems include wildfire suppression, historic livestock grazing, and climate change (Bunting 1994). Mean fire return intervals prior to European settlement in low sagebrush ecosystems were greater than 100 years, however frequent enough to inhibit the encroachment of western juniper into these low productive sagebrush cover types (Miller and Tausch 2000). Thus, trees were isolated to fire-safe areas such as rocky outcroppings and areas with low-productivity. An increase in crown density causes a decrease in understory perennial vegetation and an increase in bare ground. This allows for the invasion of non-native annual species such as cheatgrass. With annual species in the understory wildfire can become more frequent and increase in intensity. With frequent wildfires these plant communities can convert to annual species with a sprouting shrub and juvenile tree overstory.

The species most likely to invade these sites are cheatgrass and medusahead. Medusahead is a cool-season annual grass that germinates in the fall, overwinters as a seedling, and initiates growth in the spring (Miller et al. 1999a). Expansion of Medusahead creates seed reserves that can infest adjoining areas and cause changes to the fire regime. Medusahead has a high silica content which may contribute to its resistance to decomposition (Bovey et al. 1961), and the accumulation of the thatch layer. Mature medusahead is very flammable. Fire can remove the thatch layer, consume standing vegetation, and even reduce seed levels. Furbush (1953) reported that timing a burn while the seeds were in the milk stage effectively reduced medusahead the following year. He further reported that adjacent unburned areas became a seed source for reinvasion the following year. Medusahead can be successfully controlled with a combination of prescribed burning and application of pre-emergent herbicide. Revegetation of medusahead invaded rangelands has a higher likelihood of success when using introduced perennial bunchgrasses such as crested wheatgrass (Davies et al. 2015).

Fire Ecology:

Fire will remove aboveground biomass from bluebunch wheatgrass but plant mortality is generally low (Robberecht and Defossé 1995) because the buds are underground (Conrad and Poulton 1966) or protected by foliage. 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). Plant response will vary depending on season, fire severity, fire intensity and post-fire soil moisture availability. Sandberg bluegrass (*Poa secunda*), a minor component of this ecological site, has been found to increase following fire likely due to its low stature and productivity (Daubenmire 1975). Sandberg bluegrass may retard reestablishment of deeper rooted bunchgrass.

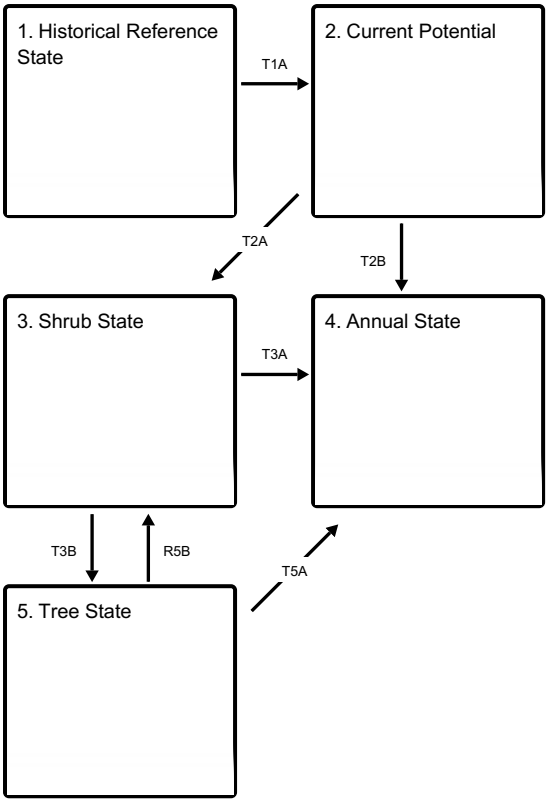
Low sagebrush is killed by fire and does not sprout (Young 1983). Establishment after fire is from seed, generally blown in and not from the seed bank (Bradley et al. 1992). Fire risk is greatest following a wet, productive year when there is greater production of fine fuels (Beardall and Sylvester 1976). Fire return intervals have been estimated at 100 to 200 years in black sagebrush dominated sites (Kitchen and McArthur 2007) and likely is similar in the low sagebrush ecosystems; however, historically fires were probably patchy due to the low productivity of these sites. Fine fuel loads generally average 100 to 400 pounds per acre (110 to 450 kg/ha) but are occasionally as high as 600 pounds per acre (680 kg/ha) in low sagebrush habitat types (Bradley et al. 1992). Recovery time of low sagebrush following fire is variable (Young 1983). After fire, if regeneration conditions are favorable, low sagebrush recovers in 2 to 5 years, however 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).

Western juniper is intolerant of fire and historically was kept in restricted sites by natural fires. With the increased suppression of wildfire and livestock grazing which reduces ground fuels and understory competition, regeneration and establishment of western juniper have expanded into suitable sites previously dominated by sagebrush (Burns and Honkala 1990). Fire resistance depends on age of tree. Seedlings, saplings and poles are highly vulnerable to fire. Mature trees, because they have foliage further from the ground, less fine fuels near the trunk and thick bark have some fire resistance (Burns and Honkala 1990). With the low production of the understory vegetation, high severity fires within this plant community were not likely and rarely became crown fires (Bradley et al. 1992, Miller and Tausch 2000). With an increase of cheatgrass in the understory, fire severity is likely to increase. Western juniper reestablishes by seed from nearby seed source or surviving seeds.

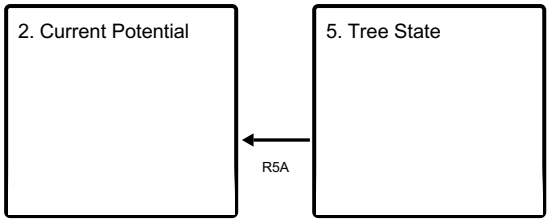
Adapted from: Stringham, T.K., D. Snyder, and A. Wartgow. 2016. State-and-Transition Models for USFS Crooked River National Grassland Major Land Resource Area B10 Oregon. DRAFT Report. University of Nevada Reno.

State and transition model

Ecosystem states



States 2 and 5 (additional transitions)



T1A - Introduction of non-native species

T2A - Grazing management favoring shrubs and/or severe drought will reduce the perennial bunchgrasses in the understory

T2B - Catastrophic fire and soil disturbing treatments such as drill seeding, roller chopper, Lawson aerator etc.. Inappropriate grazing management in the presence of non-native annual species, may be combined with higher than normal spring precipitation

T3A - Catastrophic fire, multiple fires, and/or soil disturbing treatments, Inappropriate grazing management in the presence of non-native species, may be combined with higher than normal spring precipitation.

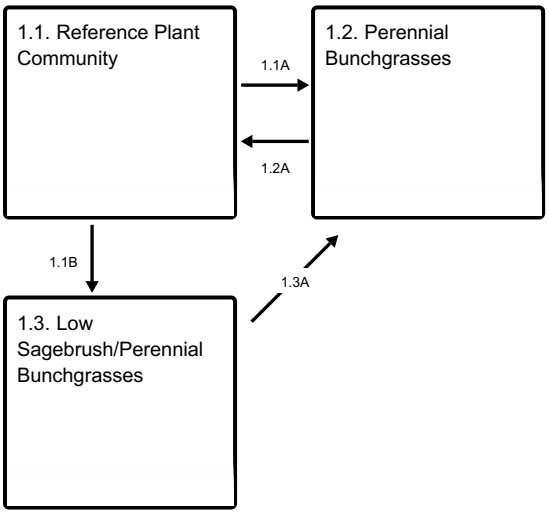
T3B - Time and lack of disturbance allows for maturation of the tree community

R5A - Mechanical treatment of trees coupled with seeding of desired species success of seeding on this site is low.

R5B - Mechanical treatment of trees

T5A - Catastrophic fire

State 1 submodel, plant communities



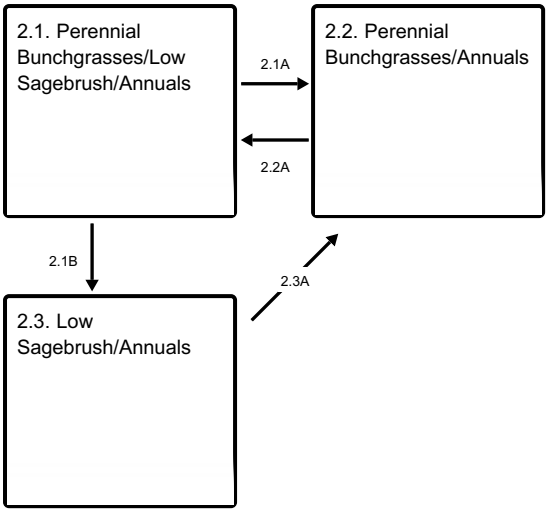
1.1A - Low severity fire and high severity fire

1.1B - Time and lack of disturbance, excessive herbivory, and long-term drought

1.2A - Time and lack of disturbance

1.3A - Low severity fire

State 2 submodel, plant communities



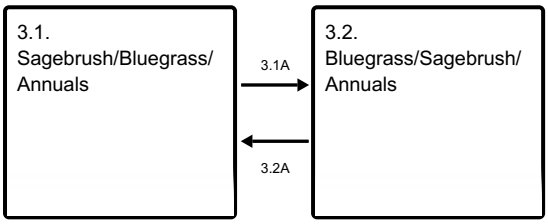
2.1A - Low severity fire and high severity fire

2.1B - Time and lack of disturbance, Inappropriate grazing management, and long-term drought

2.2A - Time and lack of disturbance

2.3A - Low severity fire, brush treatments, late-fall and winter grazing

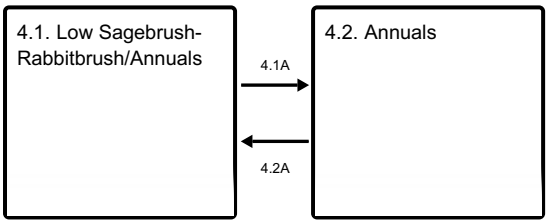
State 3 submodel, plant communities



3.1A - Fire

3.2A - Time without disturbance

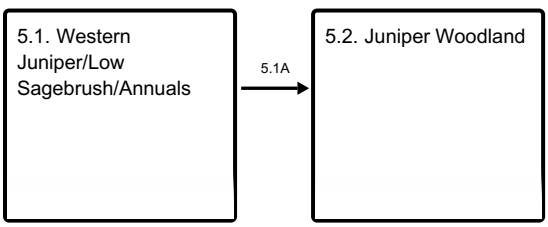
State 4 submodel, plant communities



4.1A - Fire

4.2A - Time without disturbance

State 5 submodel, plant communities



5.1A - Time and lack of disturbance

State 1
Historical Reference State

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The reference state has 3 general community phases; a shrub-grass dominant phase, a perennial grass dominant phase and a shrub dominant phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.

Dominant plant species

- little sagebrush (*Artemisia arbuscula*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), grass

Community 1.1
Reference Plant Community

The reference plant community is dominated by low sagebrush and bluebunch wheatgrass. Idaho fescue, Thurbers needlegrass, and a variety of forbs are present. Sandberg bluegrass is the dominant shallow rooted perennial grass. Vegetative composition of the community is approximately 70 percent grasses, 10 percent forbs and 20 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	275	410	550
Forb	60	90	120
Shrub/Vine	55	85	110
Tree	10	15	20
Total	**400**	**600**	**800**

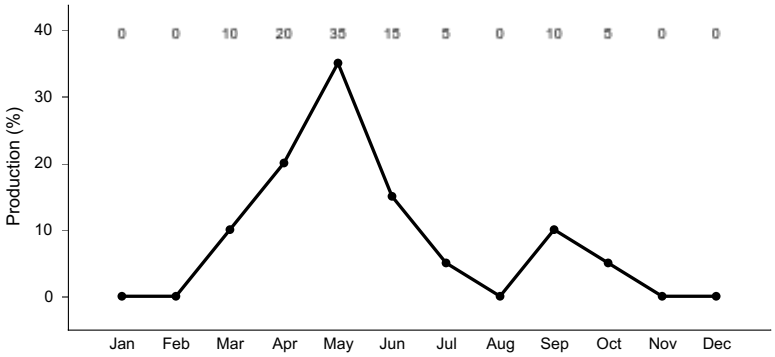


Figure 8. Plant community growth curve (percent production by month). OR4281, JD Claypan South 10-14 PZ.

Community 1.2
Perennial Bunchgrasses

Deep-rooted perennial bunchgrasses are dominant; forbs may increase.

Community 1.3
Low Sagebrush/Perennial Bunchgrasses

Low sagebrush increases. Deep-rooted perennial bunchgrasses decrease. Young juniper increasing.

Pathway 1.1A
Community 1.1 to 1.2

Low severity fire creates a grass and sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to an early- to mid-seral community , dominated by grasses and forbs.

Pathway 1.1B
Community 1.1 to 1.3

Time and lack of disturbance. Excessive herbivory and long-term drought may also reduce perennial understory.

Pathway 1.2A
Community 1.2 to 1.1

Time and lack of disturbance allows for shrub regeneration.

Pathway 1.3A
Community 1.3 to 1.2

Low severity fire creates a sagebrush and grass mosaic.

State 2
Current Potential

This state is similar to the Reference State 1.0 with three similar community phases. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-natives may increase in abundance but will not become dominant within this State. 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 feedbacks include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Dominant plant species

- little sagebrush (*Artemisia arbuscula*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), grass

Community 2.1
Perennial Bunchgrasses/Low Sagebrush/Annuals

Deep-rooted perennial bunchgrasses and low sagebrush are dominant, with a diverse forb component present. Annual non-native species are present.

Community 2.2
Perennial Bunchgrasses/Annuals

Deep-rooted perennial bunchgrasses are dominant. Annual non-native species are present to increasing. Forbs may increase.

Community 2.3
Low Sagebrush/Annuals

Low sagebrush increases. Deep-rooted perennial bunchgrasses decrease. Young juniper increasing. Non-native annual species present to increasing.

Pathway 2.1A

Community 2.1 to 2.2

Low severity fire creates a grass and shrub mosaic; high severity fire significantly reduces sagebrush cover and leads to an early- to mid-seral community, dominated by grasses and forbs.

Pathway 2.1B
Community 2.1 to 2.3

Time and lack of disturbance. Inappropriate grazing management and long-term drought may also reduce perennial understory.

Pathway 2.2A
Community 2.2 to 2.1

Time and lack of disturbance allows for shrub regeneration.

Pathway 2.3A
Community 2.3 to 2.2

Low severity fire creates a sagebrush and grass mosaic. Brush treatments with minimal soil disturbance; late-fall and winter grazing caused mechanical damage to sagebrush would reduce the shrub overstory.

State 3
Shrub State

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

Dominant plant species

- little sagebrush (*Artemisia arbuscula*), shrub
- Sandberg bluegrass (*Poa secunda*), grass

Community 3.1
Sagebrush/Bluegrass/Annuals

Low sagebrush is dominant. Sandberg bluegrass increases. Deep-rooted perennial grasses are a minor component or missing. Non-native annual species present to increasing. Western juniper present to increasing.

Community 3.2
Bluegrass/Sagebrush/Annuals

Sandberg bluegrass is dominant and Low sagebrush decreased. Deep-rooted perennial grasses are a minor component or missing. Non-native annual species present to increasing. Western juniper present to increasing.

Pathway 3.1A
Community 3.1 to 3.2

Fire

Pathway 3.2A
Community 3.2 to 3.1

Time without disturbance

State 4
Annual State

This community is characterized by the dominance of annual non-native species such as medusa head, cheatgrass and tansy mustard in the understory. Sagebrush and/or rabbitbrush may dominate the overstory.

Dominant plant species

- cheatgrass (*Bromus tectorum*), grass
- medusahead (*Taeniatherum caput-medusae*), grass
- North Africa grass (*Ventenata dubia*), grass

Community 4.1
Low Sagebrush-Rabbitbrush/Annuals

Low sagebrush and rabbitbrush are dominant. Annual non-native species are dominant in the understory. Mat forming forbs increase and western juniper is present or increasing.

Community 4.2
Annuals

Annual non-native species are dominant. Perennial grasses decrease. Western juniper may be present. Rabbitbrush and other sprouting shrubs may increase.

Pathway 4.1A
Community 4.1 to 4.2

Fire

Pathway 4.2A
Community 4.2 to 4.1

Time without disturbance

State 5
Tree State

This state is characterized by a dominance of western juniper in the overstory. Low sagebrush and perennial bunchgrasses may still be present, but they are no longer controlling site resources. Soil moisture, soil nutrients and soil organic matter distribution and cycling have been spatially and temporally altered.

Dominant plant species

- western juniper (*Juniperus occidentalis*), tree

Community 5.1
Western Juniper/Low Sagebrush/Annuals

Western juniper is dominant. Low sagebrush decreases. Deep-rooted perennial grasses decrease. Sandberg bluegrass may increase. Non-native annual species increase.

Community 5.2
Juniper Woodland

Western juniper is dominant. Low sagebrush is a minor component. Deep-rooted perennial grasses are a minor component or missing. Non-native annual species increase and bare ground may be increasing.

Pathway 5.1A
Community 5.1 to 5.2

Time and lack of disturbance allows for maturation of the tree community.

Transition T1A
State 1 to 2

Introduction of non-native species

Transition T2A
State 2 to 3

Grazing management favoring shrubs and/or severe drought will reduce the perennial bunchgrasses in the understory

Transition T2B
State 2 to 4

Catastrophic fire and soil disturbing treatments such as drill seeding, roller chopper, Lawson aerator etc. Inappropriate grazing management in the presence of non-native annual species, may be combined with higher than normal spring precipitation

Constraints to recovery. Probability of success of seeding on this site is low.

Transition T3A
State 3 to 4

Catastrophic fire, multiple fires, and/or soil disturbing treatments, Inappropriate grazing management in the presence of non-native species, may be combined with higher than normal spring precipitation.

Context dependence. Bare ground levels depend on variations in annual precipitation

Transition T3B
State 3 to 5

Time and lack of disturbance allows for maturation of the tree community

Restoration pathway R5A
State 5 to 2

Mechanical treatment of trees coupled with seeding of desired species success of seeding on this site is low.

Restoration pathway R5B
State 5 to 3

Mechanical treatment of trees

Transition T5A
State 5 to 4

Catastrophic fire

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	**Deep rooted perennial bunchgrasses**			270–420	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	180–240	–
	Idaho fescue	FEID	*Festuca idahoensis*	60–90	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	30–90	–
3	**Other perennial bunchgrasses**			0–60	
	squirreltail	ELEL5	*Elymus elymoides*	0–12	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–12	–
	basin wildrye	LECI4	*Leymus cinereus*	0–12	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	0–12	–
3	**Shallow rooted perennial bunchgrass**			12–42	
	Sandberg bluegrass	POSE	*Poa secunda*	12–42	–
Tree					
6	**Trees**			6–18	
	western juniper	JUOC	*Juniperus occidentalis*	6–18	–
Shrub/Vine					
7	**Shrubs**			60–90	
	little sagebrush	ARAR8	*Artemisia arbuscula*	60–90	–
8	**Other Shrubs**			0–60	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–12	–
Forb					
4	**Forbs**			30–54	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	12–18	–
	phlox	PHLOX	*Phlox*	6–12	–
	buckwheat	ERIOG	*Eriogonum*	6–12	–
	fleabane	ERIGE2	*Erigeron*	6–12	–
5	**Other Forbs**			0–60	
	milkvetch	ASTRA	*Astragalus*	0–18	–
	common yarrow	ACMI2	*Achillea millefolium*	0–18	–
	lupine	LUPIN	*Lupinus*	0–18	–
	pussytoes	ANTEN	*Antennaria*	0–18	–
	desertparsley	LOMAT	*Lomatium*	0–18	–
	sagebrush buttercup	RAGL	*Ranunculus glaberrimus*	0–18	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	0–18	–
	agoseris	AGOSE	*Agoseris*	0–18	–
	stoneseed	LITHO3	*Lithospermum*	0–18	–
	onion	ALLIU	*Allium*	0–18	–
	larkspur	DELPH	*Delphinium*	0–18	–
	bushy bird's beak	CORA5	*Cordylanthus ramosus*	0–18	–
	brodiaea	BRODI	*Brodiaea*	0–18	–

	rough eyelashweed	BLSC	*Blepharipappus scaber*	0–18	–
	woodland-star	LITHO2	*Lithophragma*	0–18	–

Animal community

Livestock Grazing:

This site is suitable for livestock grazing use in the spring, early summer, and fall under a planned grazing system. Use should be postponed until the soils are firm enough to prevent trampling damage and soil compaction. Grazing management should be keyed for bluebunch wheatgrass. Deferred grazing or rest is recommended at least once every three years.

Native Wildlife Associated with the Reference Plant Community:

This site is commonly used by pronghorn antelope, mule deer, rabbits, rodents, upland birds and various predators. Antelope and mule deer make excellent use of the site for winter and spring forage.

Hydrological functions

The soils of this site are typically in an upland topographic position. They have medium to rapid runoff potential and moderate to slow infiltration rates when the hydrologic cover is high. Hydrologic cover is high when the perennial deep rooted bunchgrass component is greater than 70 percent of potential.

Wood products

The soils are not suitable to tree production. Incidental juniper trees may produce minimal amounts of fence posts and firewood.

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Jenni Moffitt, general edits and updates 8/2020
Tamzen Stringham et al. (2016), Ecological Dynamics and S&T Model
Cici Brooks, extensively updated using BLM ESI data and soil survey correlations - 2/2010
Kate Peterson, BLM Prineville District 6/2005
Andrew Neary - table population and edits 2021

Approval

Kirt Walstad, 12/13/2023

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)	Cici Brooks, Rangeland Management Specialist for MLRA B10
Contact for lead author	
Date	09/18/2008
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slopes >20% will have slight to moderate rills due to low moisture holding capacity and low plant productivity.

2. **Presence of water flow patterns:** Some minor water flow patterns are apparent due to slope and slow infiltration rates of the soils.

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):** 5-15% bare ground is expected for this site.

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 movement would be approximately 10" depending on slope.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Values are expected to be 4-5, but need to be validated.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A horizon structure varies from very cobbly silt loam with weak fine granulary structure to a very stony loam with weak platy structure. Dry soil colors range from 5YR 4/4 to 10 YR 4/2. Soil organic matter ranges from 1 to 4 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Slope, aspect, soil depth and low productivity of plant community limit the infiltration of precipitation and increase runoff potential.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** A compaction layer does not occur but a claypan or bedrock does occur on this site within 6-10" of the surface.

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 perennial, cool season bunchgrasses>>

    Sub-dominant: Shallow-rooted shrubs=shallow rooted, perennial, cool season bunchgrasses>>

    Other: Shallow rooted and annual forbs.

    Additional:

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

14. **Average percent litter cover (%) and depth (in):** Needs to be verified.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Favorable 900 lbs/acre; Normal 700 lbs/acre; Unfavorable 500 lbs/acre.

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, Medusahead, Toadflax, Thistle.

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