

Ecological site R010XB023OR

JD Shallow

9-12 PZ

Last updated: 4/02/2025
Accessed: 08/31/2026

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.

Classification relationships

US National Vegetation Classification System (closest approximation of reference plant community): Division: 3.B.1.Ne - Western North American Cool Semi-Desert Scrub & Grassland Macrogroup: M169 - Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland Association: CES304.778 - Inter-Mountain Basins Big Sagebrush Steppe Landfire BPS model: 0711250 - Inter-Mountain Basins Big Sagebrush Steppe

Ecological site concept

In reference condition, this ecological site supports a plant community dominated by basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), Thurber's needlegrass (*Achnatherum thurberianum*) and bluebunch wheatgrass (*Pseudoroegneria spicata*). Abiotically, this site is typified by gentle slope aspects and shallow, clayey soils formed in tuffaceous cenozoic sediments. The soil climate is Mesic/Aridic. Historical ecological dynamics would have been driven by infrequent fire, insect outbreaks and periodic drought. Presently, livestock grazing and exotic plant invasion have altered ecological dynamics and influence the composition of many of these communities.

Associated sites

R010XB022OR	JD Clayey 9-12 PZ Adjacent sites with moderately deep clayey subsoils not heavy enough to restrict root penetration
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Similar sites

R010XB035OR	JD Shallow North 9-12 PZ North aspect, steeper slopes
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R010XB043OR	JD Droughty Clayey South 9-12 PZ South aspect, steeper slopes, soils shallow to deep
R010XB051OR	JD Shallow South 9-12 PZ South aspect, steeper slopes, lower production
R010XB052OR	JD Droughty Shallow South 9-12 PZ South aspect, steeper slopes, lower production
R010XB057OR	JD Mahogany Rockland 9-12 PZ Steeper slopes, areas of rockland common, very shallow soils
R010XB064OR	JD North 9-12 PZ South aspect, steeper slopes, soils shallow to deep, higher production
R010XB065OR	JD Droughty Clayey North 9-12 PZ North aspect, primarily steeper slopes very shallow soils

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata ssp. tridentata</i>
Herbaceous	(1) <i>Achnatherum thurberianum</i> (2) <i>Pseudoroegneria spicata</i>

Physiographic features

This site occurs on the tops of low elevation terraces, plateaus and fan remnants composed of early Cenezoic tuffaceous sediments. Slopes typically range from 2 to 12 percent but may occur as steep as 20 percent. Elevation typically varies from 1,800 to 3,000 feet (400 to 900 meters) but may range from 1,300 to 3,800 feet (550 to 1,150 meters). This site occurs on all aspects. No water table is present within the soil profile and the site is not subject to ponding or flooding.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Fan remnant (2) Foothills > Hill
Flooding frequency	None

Ponding frequency	None
Elevation	550 – 910 m
Slope	0 – 10 %
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	400 – 1,160 m
Slope	0 – 20 %

Climatic features

This site generally has an aridic soil moisture regime and a mesic soil temperature regime. Mean annual precipitation ranges from 9 to 12 inches (230 to 300mm) and falls primarily as rain from November through April. The frost-free period ranges from 90 to 150 days. Localized convection storms occasionally occur during the summer. Climate graphs are based on the nearest available climate stations to representative site locations and are provided to indicate general climate patterns.

Table 4 Representative climatic features

Frost-free period (characteristic range)	90-150 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	230-310 mm
Frost-free period (average)	120 days
Freeze-free period (average)	
Precipitation total (average)	280 mm

- (1) MITCHELL 2 NW [USC00355641], Mitchell, OR
- (2) MITCHELL 2 E [USC00355638], Mitchell, OR
- (3) JOHN DAY 35 WNW [USW00004125], Mitchell, OR

- (4) ANTELOPE 6 SSW [USC00350197], Antelope, OR
- (5) MONUMENT 2 [USC00355711], Monument, OR

Influencing water features

This site is not influenced by or associated with water features.

Wetland description

N/A

Soil features

Soils on this site are Mollisols with predominantly very stony to cobbly loam surface textures. The soils are shallow to a duripan or lithic contact, with medium textures and well drained. These soils are typically formed from cenezoic tuffaceous sediments of the John Day (mid-Oligocene) or Clarno (late Eocene) geological formations or basalt. The major taxonomic units correlated to this site include Xeric Argidurids and Xeric Haplargids. Soil components associated with this site concept include: Brisbois very cobbly clay loam, 2 to 15 percent slopes; Buffaran very cobbly loam, 2 to 15 percent slopes; and Reywat very stony loam, 2 to 15 percent slopes.

Table 5. Representative soil features

Parent material	(1) Residuum – sedimentary rock (2) Colluvium – basalt
Surface texture	(1) Cobbly loam (2) Very stony loam
Family particle size	(1) Clayey (2) Loamy-skeletal
Drainage class	Well drained
Permeability class	Slow to very slow
Depth to restrictive layer	30 – 50 cm
Soil depth	30 – 50 cm
Surface fragment cover ≤3"	20 – 30 %
Surface fragment cover >3"	20 %
Available water capacity (0-50.8cm)	2.79 – 5.08 cm

Calcium carbonate equivalent (0-50.8cm)	Not specified
Electrical conductivity (0-50.8cm)	Not specified
Sodium adsorption ratio (0-50.8cm)	Not specified
Soil reaction (1:1 water) (0-50.8cm)	6.6 – 8.4
Subsurface fragment volume <=3" (10.2-50.8cm)	0 – 10 %
Subsurface fragment volume >3" (10.2-50.8cm)	0 – 50 %

Ecological dynamics

The historic reference community of this site supports a grassland-shrub community. The potential grass understory is dominated by Thurber's needlegrass (*Achnatherum thurberianum*) with bluebunch wheatgrass (*Pseudoroegneria spicata*) and minor amounts of Sandberg bluegrass (*Poa secunda*) also common. Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) is the most common shrub. Broom snakeweed (*Gutierrezia sarothrae*) and rabbitbrush (*Chrysothamnus* spp.) may also occur and may be more common on disturbed sites. Forbs may include members of the buckwheat (*Eriogonum* spp.), yarrow (*Achillea* spp.) and astragalus (*Astragalus* spp.) genera.

Basin big sagebrush is a fire intolerant species that is readily killed by most fires and does not resprout, it will often be reduced on a site following fire and may be eliminated with frequent fires. Periodic insect outbreaks of Aroga moth (*Aroga websteri*) are an important component of the natural disturbance regime for big sagebrush, resulting in complete or partial mortality of sagebrush plants and potentially impacting thousands of acres.

Gutierrezia is typically associated with disturbed habitats and early seral conditions in the sagebrush biome (Tirmstein 1999). It can rapidly invade following improperly managed grazing. Broom snakeweed is highly drought tolerant and tends to rapidly increase in density following drought periods as well as fire. While broom snakeweed is typically killed by fire, seeds are often unharmed and rapid colonization from nearby sites is common. It has been found to increase following fire in Great Basin sagebrush communities where it often appears by the sixth year but may require up to 25 years to become dominant. While it effectively competes with many grasses (similar rooting depth and possible allelopathy) it is often out-competed by other shrubs overtime.

Thurber's needlegrass is a common bunchgrass in the sagebrush steppe of Eastern Oregon, especially within the 8 to 10 inch precipitation zone (Archer 2000). Considered to be the least fire-resistant needlegrass, Thurber's is often damaged by moderately severe fire. It recovers slowly following fire and regenerates primarily by seed rather than resprouting from crowns.

Bluebunch wheatgrass is considered to be a highly fire adapted grass species with low buds often protected from fire. Recovery following fire is rapid and it often increases relative to other plants post fire, especially after spring burning. While burning may improve the nutritional quality of bluebunch, defoliation during the regeneration period can be very detrimental to the stand and grazing should be avoided immediately after.

Western juniper (*Juniperus occidentalis*) is a native conifer species in western North America but its density and range have dramatically

increased since the late 1800s likely due to a combination of factors, namely: reductions in fire frequency; heavy livestock grazing; and increased atmospheric carbon dioxide (Fryer and Tirmenstein 2019). Juniper is sensitive to fire and most young trees are killed by even low severity fire. As Juniper trees mature and bark thickens, however, they become resistant to low severity fire yet are still killed by crown fires or high severity surface fires.

Climate cycles would have been an important driver of ecological dynamics historically, with drought periods possibly leading to reductions in sagebrush cover and wet years increasing fire occurrence due to increased perennial grass production and fine fuels loads. Historically these communities would have likely encountered infrequent mixed and replacement severity fires with an average fire return interval of 50 years (yet with a high degree of variability depending on the site) (Landfire 2007). Livestock grazing has altered the plant community composition of much of the extent of this site. Increases in shrub and juniper cover and decreases in perennial grass cover may result from chronic improperly managed grazing. Given an altered disturbance regime and degraded site conditions, invasions of exotic forb species and annual grass species may occur on this site. Exotic annual grasses such as cheatgrass (*Bromus tectorum*) and medusahead (*Taeniatherum caput-medusae*) may invade and become problematic. Exotic annual grass invasion may increase the frequency of fires and extend the season when fires are likely by augmenting early season fine fuel loads and fuel continuity. Sites may be particularly fire prone following years of above average precipitation during which invasive annual grass production can increase dramatically (Pilliod et al. 2017). In addition to exotic species, native shrub species such as broom snakeweed and rabbitbrush may also increase following disturbance and may be important members of early seral communities.

An understanding of the site specific ecological dynamics for this site are incomplete. Thresholds between states and phases have yet to be quantified and restoration pathways and outcomes are poorly understood. Current and anticipated effects of climate change are not included in this model, yet this site may experience significant impacts as climate continues to change. The model below represents an approximation of ecological dynamics informed by group 4 of (Stringham 2007) and is likely to undergo refinements and revisions as more data becomes available. The reference plant community described below has been determined by study of rangeland relic areas or areas protected from excess disturbance.

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Perennial Grasses			646-1031	
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	448-628	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	179-359	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	18-45	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	–	–
Forb					
4	Forbs			73-161	
	buckwheat	ERIOG	<i>Eriogonum</i>	0-27	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	0-27	–
	milkvetch	ASTRA	<i>Astragalus</i>	0-27	–
	purple clover	TRPU15	<i>Trifolium purpureum</i>	0-27	–
	fleabane	ERIGE2	<i>Erigeron</i>	0-27	–
	onion	ALLIU	<i>Allium</i>	0-27	–
Shrub/Vine					
7	Shrubs			2-81	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	18-45	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-18	–
	rabbitbrush	CHRY9	<i>Chrysothamnus</i>	0-18	–

Table 7. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.3 plant community composition

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

Grazing Livestock- Grazing is suitable for this site as long as management objectives include the improvement or maintenance of this site. It is easy to overuse this site and cause a shift in vegetation this is difficult to change. This site has the potential to produce a moderate amount of forage. Management should be aimed at harvesting the forage as quickly as possible, letting the site recover from the grazing event prior to fall dormancy. Initial stocking rate will be based on forage preference ratings. Bluebunch wheatgrass is considered moderately grazing tolerant during dormancy, and is very sensitive to damage from defoliation during periods of active growth and is deferment of grazing is suggested until at least the late boot stage by some. Thurber's needlegrass has been found to decrease under heavy grazing and increase when protected from grazing, although the opposite has been found to occur in one instance (Archer 2000). It can be toxic to livestock in large quantities and generally provides little browse. While broom snakeweed may be used by livestock it can be toxic in large quantities and generally provides little browse. Wildlife- The main wildlife species of concern on this site are large herbivores. These are mule deer and elk. Being an open grassland, this site is home to a variety of small herbivores, birds and their associated predators. This site is mainly a foraging area for the larger wildlife. This site will offer food and cover for mule deer, rodents, and a variety of birds. It is an important wintering area for mule deer. Big sagebrush leaves and seeds provide high forage value for numerous large mammals and is especially important to wildlife during winter in many areas. Many birds, small mammals and invertebrates depend on sagebrush for habitat and feed as well. Thurber's needlegrass provides forage for livestock and wildlife including large ungulates and small mammals. Bluebunch wheatgrass is one of the most important perennial grasses for forage for livestock and wildlife in the Western US (Zlatnik 1999).

Wood products

This site is susceptible to an increase in western juniper. Where this has occurred, the site will yield fence posts, firewood and specialty products.

Type locality

Location 1: Grant County, OR	
Township/Range/Section	T7S R19E S35
General legal description	NW1/4 NE1/4 Sec35 T7SR19E WM Ridge top, 3/4 miles east of Camp Hancock (90% SI)
Location 2: Grant County, OR	
Township/Range/Section	T10S R21E S32
General legal description	NE1/4 SE1/4 Sec32 T10S R21E WM East of picnic area Painted Hills Unit (90% SI)

References

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Contributors

Ed Petersen, Alan Bahn

JPR

Andrew Neary 2021 update and model

Jennifer Moffitt - minor updates for PES

Cici Brooks

Approval

Kirt Walstad, 4/02/2025

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	08/06/2012

Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills: None to some, moderate to severe sheet & rill erosion hazard

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): 10-20%

5. Number of gullies and erosion associated with gullies: None

6. Extent of wind scoured, blowouts and/or depositional areas: None, moderate to severe wind erosion hazard

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): Moderately resistant to erosion: aggregate stability = 4-6

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): Shallow to very shallow, well drained very stony to very cobbly loams to andesite or hardpan: low OM (1-2%)

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Moderate ground cover (60-70%) and gentle slopes (2-12%) moderately limit rainfall impact and overland flow

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: Thurber needlegrass > Bluebunch wheatgrass > forbs > other grasses > other shrubs

Sub-dominant:

Other:

Additional:

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

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

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):
Favorable: 1000, Normal: 800, Unfavorable: 600 lbs/acre/year at high RSI (HCPC)
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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: Perennial brush species will increase with deterioration of plant community. Western Juniper readily invades the 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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