

Ecological site R010XB058OR JD Mahogany Rockland 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 curlleaf mountain mahogany (*Cercocarpus ledifolius*), antelope bitterbrush (*Purshia tridentata*) and bluebunch wheatgrass (*Pseudoroegneria spicata*). Idaho fescue (*Festuca idahoensis*) and Sandberg bluegrass (*Poa secunda*) are also common. Abiotically, this site is typified by occupying canyon side slopes and very shallow soils with significant stones or cobbles present. The soil climate is mesic to frigid near mesic/xeric. Historically, the ecological dynamics of this site were driven by infrequent fire and cycles of drought. Presently, reference conditions are less common and current dynamics are also influenced by the spread of invasive species, the expansion of western juniper (*Juniperus occidentalis*), livestock grazing pressures and fire suppression.

Associated sites

R010XB051OR	JD Shallow South 9-12 PZ South aspect, shallow soils
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Similar sites

R010XB057OR	JD Mahogany Rockland 9-12 PZ lower herbaceous production
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Table 1. Dominant plant species

Tree	Not specified
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Shrub	(1) <i>Cercocarpus ledifolius</i> (2) <i>Purshia tridentata</i>
Herbaceous	(1) <i>Pseudoroegneria spicata ssp. spicata</i> (2) <i>Festuca idahoensis</i>

Physiographic features

This site typically occurs on canyon side slopes composed of basalt and tuffaceous material. Aspect is typically southerly, but may occur on other aspects with slopes typically ranging from 5 to 90 percent. Elevation typically varies from 2,100 to 4,000 feet (650 to 1,200 meters). 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 > Canyon (3) Upland > Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	2,100–4,000 ft
Slope	5–90%
Aspect	SE, S, SW

Climatic features

The average annual precipitation is 12 to 16 inches (300 to 400 mm) occurring primarily as rain and snow from November through May. The soil temperature regime is mesic to frigid (near mesic) and the soil moisture regime is xeric. Occasional severe convectional storms occur during the summer. The frost-free period is approximately 40 to 100 days. 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)	40-100 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	12-16 in
Frost-free period (average)	70 days
Freeze-free period (average)	
Precipitation total (average)	14 in

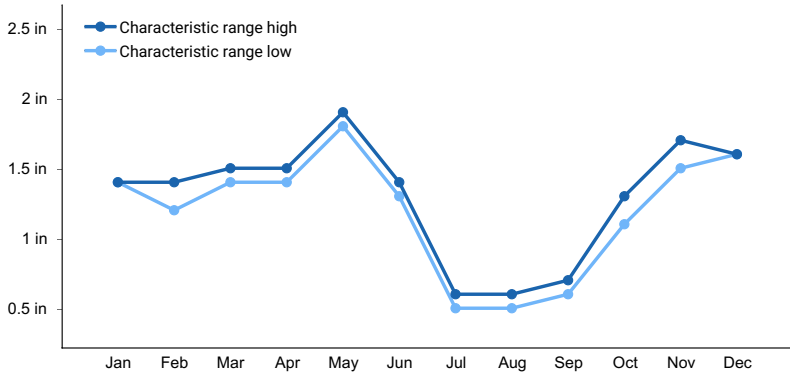


Figure 1. Monthly precipitation range

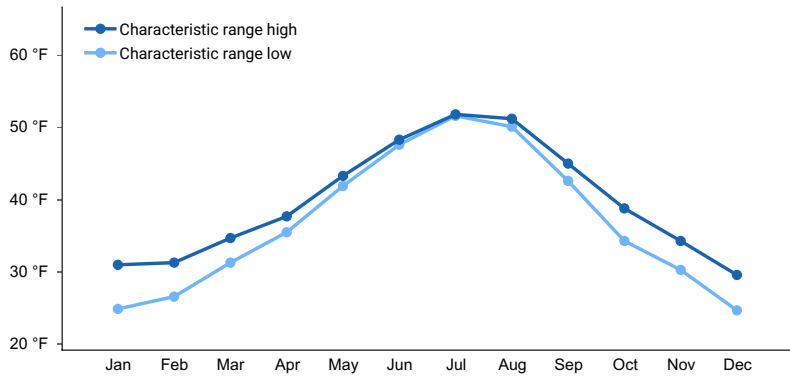


Figure 2. Monthly minimum temperature range

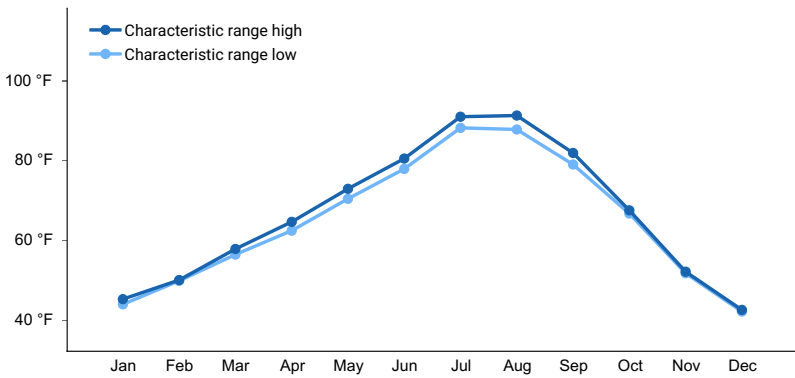


Figure 3. Monthly maximum temperature range

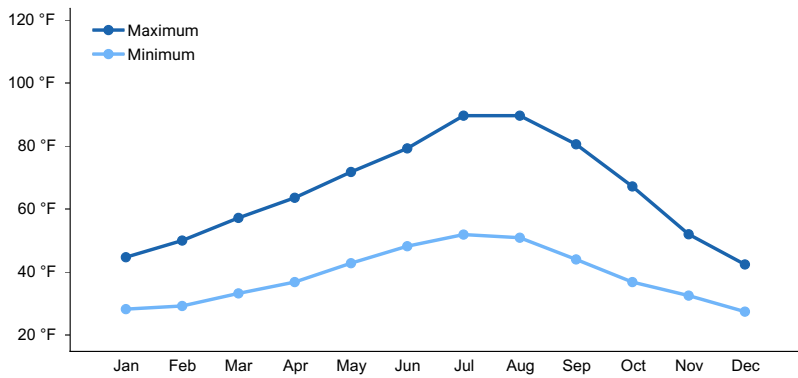


Figure 4. Monthly average minimum and maximum temperature

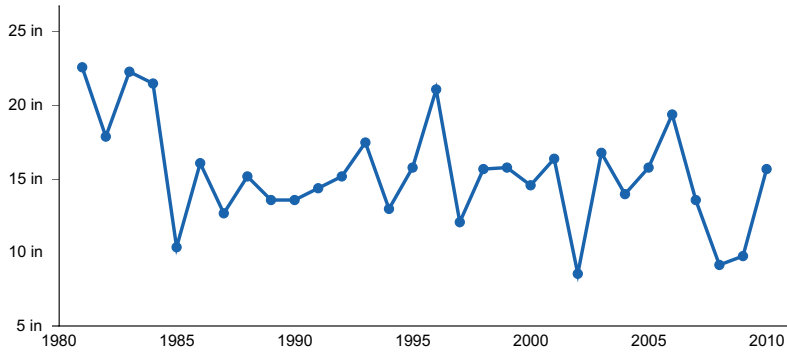


Figure 5. Annual precipitation pattern

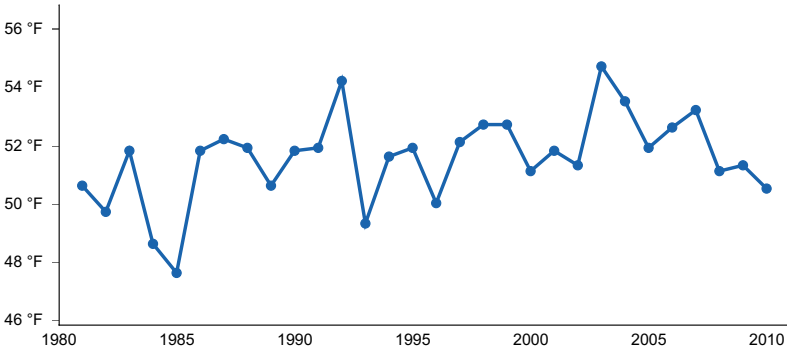


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MONUMENT 2 [USC00355711], Monument, OR
- (2) FOSSIL [USC00353038], Fossil, OR

Influencing water features

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

Wetland description

Not applicable

Soil features

The soils are typically very shallow, very cobbly loamy coarse sand to gravelly loam over fragmental subsoil (less than 10 inches to lithic contact). The erosion hazard is very high.

Table 4. Representative soil features

Parent material	(1) Colluvium–basalt (2) Colluvium–serpentinite (3) Residuum–volcanic rock (4) Residuum–serpentinite
Surface texture	(1) Very cobbly loamy coarse sand (2) Gravelly loam
Family particle size	(1) Sandy-skeletal (2) Loamy-skeletal
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid

Depth to restrictive layer	1–10 in
Soil depth	1–10 in
Surface fragment cover <=3"	15–30%
Surface fragment cover >3"	15–30%
Available water capacity (0-40in)	0.2–1.6 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (4-10in)	10–40%
Subsurface fragment volume >3" (4-10in)	20–30%

Ecological dynamics

Range in Characteristics:

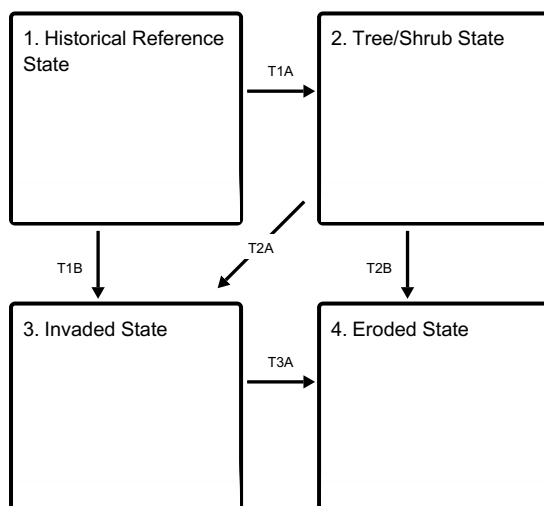
Bluebunch wheatgrass increases with an increase in soil depth. Mountain Mahogany, bitterbrush, and other shrubs respond to available moisture in rock fissures and cracks. The proportion and amount of these shrubs are proportional to the extent and depth of fracturing in the bedrock. Fires on this site are very infrequent, being estimated to occur at intervals of 250 to 500 years.

Response to Disturbance:

If the conditions of the site deteriorates as a result of overgrazing, bluebunch wheatgrass decreases while Sandberg bluegrass increases. Bluebunch wheatgrass is the preferred species during the spring. With further deterioration, mountain mahogany and other shrubs become well hedged. Under deteriorated conditions excessive erosion in the bare soil interspaces markedly reduces the site productivity.

State and transition model

Ecosystem states



T1A - Time without fire, possibly combined with improperly managed grazing

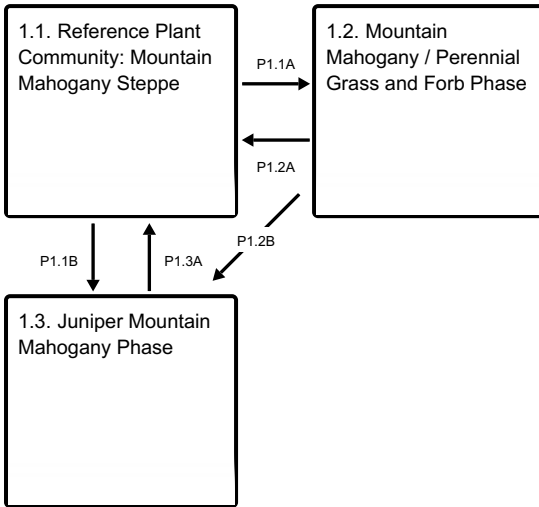
T1B - Crown fire that removes overstory woody species, possibly combined with improperly managed grazing

T2A - Fire, drought event or improperly managed grazing

T2B - Fire, possibly combined with improperly managed grazing

T3A - Catastrophic fire, possibly combined with improperly managed grazing

State 1 submodel, plant communities



P1.1A - Fire

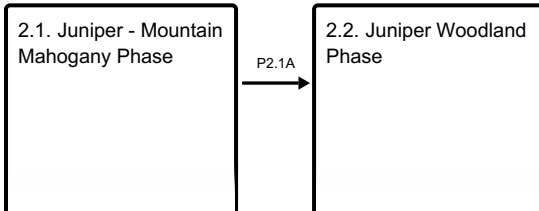
P1.1B - No fire, improper grazing

P1.2A - No fire

P1.2B - No fire, improper grazing

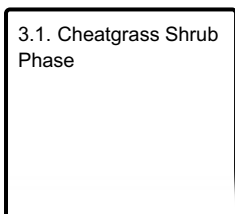
P1.3A - Fire, prescribed grazing

State 2 submodel, plant communities

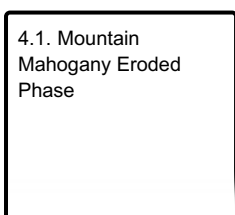


P2.1A - Juniper Maturation

State 3 submodel, plant communities



State 4 submodel, plant communities



State 1

Historical Reference State

There are three phases in the reference state. Phase 1.1 is the mountain mahogany steppe phase dominated by mountain mahogany and bluebunch wheatgrass with antelope bitterbrush being common. The mountain mahogany perennial grass and forb phase, 1.2, results from the occurrence of fire. Phase 1.3 has an increase of juniper as a result of no fire and improper grazing.

Dominant plant species

- curl-leaf mountain mahogany (*Cercocarpus ledifolius*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata* ssp. *spicata*), grass
- Idaho fescue (*Festuca idahoensis*), grass

Community 1.1

Reference Plant Community: Mountain Mahogany Steppe

The reference plant community phase is dominated by mountain mahogany in the overstory, antelope bitterbrush in the shrub layer and bluebunch wheatgrass in the herbaceous layer. Idaho fescue and Sandberg bluegrass are common with a minor amount of forbs. Vegetative composition of the community is approximately 55 percent grasses and grass-like, 10 percent forbs, and 35 percent shrubs and trees. Approximate ground cover is 40 to 60 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	165	330	415
Shrub/Vine	103	205	385
Forb	30	60	90
Tree	2	5	10
Total	300	600	900

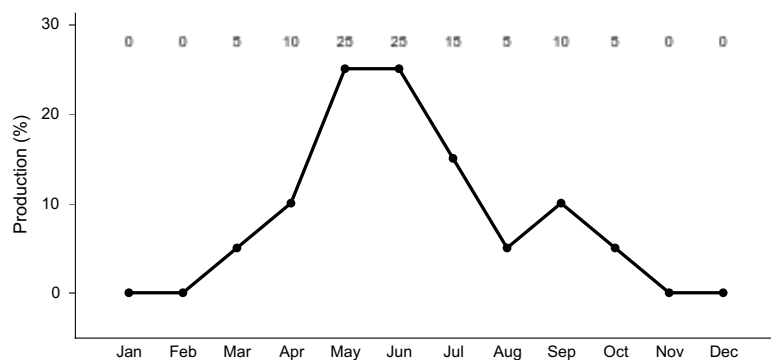


Figure 8. Plant community growth curve (percent production by month). OR4261, B10 JD Mahog. Rockland 12-16 RPC. B10XB JD Mahog. Rockland 12-16 RPC.

Community 1.2

Mountain Mahogany / Perennial Grass and Forb Phase

Phase 1.2, the mountain mahogany, perennial grass and forb phase results from fire that burns the understory shrub and herbaceous species with minimal impact to the overstory mountain mahogany (1.1A). In the long interval between fires the shrub component reestablishes (1.2A) and the community moves toward phase 1.1. With no fire and improper grazing (1.1B) juniper can establish on the site and dominate or co-dominate with the mountain mahogany in the juniper-mountain mahogany phase (1.3)

Community 1.3

Juniper Mountain Mahogany Phase

Phase 1.3 the juniper-mountain mahogany phase results from phase 1.1 and 1.2 when there is no fire and improper grazing allows juniper to establish and become co-dominant with mountain mahogany with a reduced component of shrubs and herbaceous vegetation. With the introduction of fire and prescribed grazing (1.3A) the plant community moves back to phase 1.1. Phase 1.3 is the “at risk” plant community phase. With continued improper grazing and no fire the juniper becomes dominant and the site transitions to State 2 where juniper controls all of the ecological processes. A crown fire that eliminates all of the juniper and mountain mahogany will move the community to State 3 a cheatgrass-shrub dominated community.

Pathway P1.1A Community 1.1 to 1.2

Fire consumes the understory shrub and herbaceous species with minimal impact to the overstory mountain mahogany

Pathway P1.1B Community 1.1 to 1.3

With no fire and improper grazing juniper can establish on the site and dominate or co-dominate with the mountain mahogany in the juniper-mountain mahogany phase

Pathway P1.2A Community 1.2 to 1.1

In the long interval between fires the shrub component reestablishes

Pathway P1.2B Community 1.2 to 1.3

With no fire and improper grazing juniper can establish on the site and dominate or co-dominate with the mountain mahogany in the juniper-mountain mahogany phase

Pathway P1.3A Community 1.3 to 1.1

Introduction of fire and prescribed grazing

Context dependence. Prescribed grazing will only be an effective conservation tool if improper grazing impacts have not significantly altered site by severely compacting soils or severely diminishing the seed source for important herbaceous species

State 2 Tree/Shrub State

State 2 is a state dominated by juniper and mountain mahogany. Phase 2.1 maintains only a very sparse component of shrubs, grasses and forbs. As the juniper matures it becomes the juniper woodland phase (2.2) with juniper in complete control of the ecological processes. There is no potential repair pathway for this state to state 1 due to the steepness of the site, very shallow soils, low available water capacity and high erosion potential.

Dominant plant species

- western juniper (*Juniperus occidentalis*), tree
- curl-leaf mountain mahogany (*Cercocarpus ledifolius*), shrub

Community 2.1 Juniper - Mountain Mahogany Phase

Community 2.2

Juniper Woodland Phase

Pathway P2.1A

Community 2.1 to 2.2

Juniper Maturation - as juniper mature, mahogany is crowded out.

State 3

Invaded State

State 3 is cheatgrass and shrub dominated as a result of improper grazing and severe fire in the juniper-mountain mahogany phase (1.3) or severe fire, improper grazing and drought in the juniper woodland phase (2.2). This process eliminates the woody overstory components and allows the increase of cheatgrass which gains control of the site ecological processes. There is no potential repair pathway for this state to State 1 due to the steepness of the site, very shallow soils, low available water capacity and high erosion potential.

Dominant plant species

- cheatgrass (*Bromus tectorum*), grass

Community 3.1

Cheatgrass Shrub Phase

State 4

Eroded State

State 4 is the eroded state of this site. Improper grazing and fire in the juniper woodland phase (2.2) and the cheatgrass shrub phase (3.1) exposes significant amounts of bare ground which leads to severe erosion.

Dominant plant species

- curl-leaf mountain mahogany (*Cercocarpus ledifolius*), shrub

Community 4.1

Mountain Mahogany Eroded Phase

Transition T1A

State 1 to 2

Time without fire, possibly combined with improperly managed grazing

Transition T1B

State 1 to 3

Crown fire that removes overstory woody species, possibly combined with improperly managed grazing in the presence of invasive annual species

Transition T2A

State 2 to 3

Fire, drought event or improperly managed grazing in the presence of invasive annual species

Transition T2B

State 2 to 4

Catastrophic fire, possibly combined with improperly managed grazing

Transition T3A
State 3 to 4

Catastrophic fire, possibly combined with improperly managed grazing

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	Perennial deep-rooted			90–270	
	bluebunch wheatgrass	PSSPS	<i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>	90–270	–
2	Perennial deep-rooted			45–135	
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	45–135	–
4	Perennial shallow-rooted bunchgrass			15–45	
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	15–45	–
5	Grass-like perennial			15–45	
	Geyer's sedge	CAGE2	<i>Carex geyeri</i>	15–45	–
Forb					
6	Perennial forbs			20–60	
	common yarrow	ACMI2	<i>Achillea millefolium</i>	3–10	–
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	3–10	–
	fleabane	ERIGE2	<i>Erigeron</i>	3–10	–
	buckwheat	ERIOG	<i>Eriogonum</i>	3–10	–
	desertparsley	LOMAT	<i>Lomatium</i>	3–10	–
	phlox	PHLOX	<i>Phlox</i>	3–10	–
7	Other perennial forbs			10–30	
	pussytoes	ANTEN	<i>Antennaria</i>	3–10	–
	phacelia	PHACE	<i>Phacelia</i>	3–10	–
	stonecrop	SEDUM	<i>Sedum</i>	3–10	–
Shrub/Vine					
11	Perennial evergreen			60–220	
	curl-leaf mountain mahogany	CELE3	<i>Cercocarpus ledifolius</i>	60–220	–
12	Perennial evergreen			30–110	
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	30–110	–
15	Other shrubs			10–40	
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	5–20	–
	currant	RIBES	<i>Ribes</i>	5–20	–
16	Perennial, deciduous			5–15	
	netleaf hackberry	CELAR	<i>Celtis laevigata</i> var. <i>reticulata</i>	5–15	–
Tree					
18	Perennial evergreen			2–10	
	western juniper	JUOC	<i>Juniperus occidentalis</i>	2–10	–

Animal community

Livestock grazing: This site is not suited for use by livestock. Limitations are unstable soils, steep and rocky slopes.

Native Wildlife Associated with the Potential Climax Community: This site provides critical cover and forage for deer and elk during the fall and winter. The mountain mahogany shrubs provide suitable habitat for nesting sites for a variety of birds.

Hydrological functions

The soils are in hydrologic group D. The soils of this site have high runoff potential.

Recreational uses

The larger acreage areas of this site may provide some big game hunting opportunities.

Type locality

Location 1: Grant County, OR	
Township/Range/Section	T13S R28E S33
General legal description	Southeast slope on ridge south of Widow Creek.

References

- . Fire Effects Information System. <http://www.fs.fed.us/database/feis/>.
- . 2021 (Date accessed). USDA PLANTS Database. <http://plants.usda.gov>.

Other references

Stringham, Tamzen, 2007. Final Report for USDA Ecological Site Description. Oregon State University, Corvallis, Oregon.

USDI Bureau of Land Management, US Geological Survey; USDA Natural Resources Conservation Service, Agricultural Research Service; Interpreting Indicators of Rangeland Health. Technical Reference 1734-6; Version 4-2005.

Contributors

Ed Petersen, Alan Bahn
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)	James Cornwell, State Rangeland Management Specialist, NRCS, Idaho (Retired) Lee Brooks, Assistant State Conservationist, NRCS, Idaho (Retired).
Contact for lead author	
Date	09/09/2009
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills can occur on this site, especially on the steeper slopes.

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

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):** Bare ground is 40 to 60 percent.

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** Does not occur on this site.

7. **Amount of litter movement (describe size and distance expected to travel):** Fine. Litter movement, typically would be < two feet.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** stability values should range from 3 to 5, but needs to be verified.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Structure is single grain and weak to moderate fine and very fine granular. The A horizon is 3 to 5 inches thick and SOM 0.5 to 3 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Significant cover (40-60% basal and crown) mediates the rainfall impact even on steeper slopes (40-80%). The root mass of perennial bunchgrasses provides significant soil stability.

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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):** The soils are shallow to fragmental subsoil or bedrock.
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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: Tall shrubs>
- Sub-dominant: Deep-rooted, perennial, cool season bunchgrasses>
- Other: Shallow-rooted, perennial, cool season bunchgrasses > Forbs>trees
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Normal decadence would be expected in both the mountain mahogany and the bunchgrasses.
-
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: 900; Normal: 600; Unfavorable: 300 lbs/ac/yr
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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:** Russian, diffuse, and spotted knapweed and cheatgrass.
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17. **Perennial plant reproductive capability:** All species should be capable of reproducing annually. Mountain mahogany is a prolific seed producer.
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