

Ecological site R010XC028OR SR Shrubby Cool 12-16 PZ

Last updated: 12/13/2023
Accessed: 05/14/2024

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

The potential native plant community is dominated by Idaho fescue, antelope bitterbrush and a complex of mountain, xeric and basin big sagebrush. Bluebunch wheatgrass and Sandberg bluegrass are common along with a variety of forbs. Thurber's needlegrass and wild crab apple occasionally occur. Vegetative composition of the community is approximately 65 percent grasses, 5 percent forbs and 30 percent shrubs. Approximate ground cover is 80 to 90 percent (basal and crown).

The soils of this site are typically moderately deep over fractured granitic or tuffaceous bedrock and well drained.

Antelope bitterbrush increases over loamy subsoils and fractured substratums where deeper subsurface water is available. Idaho fescue increases on silt loam surfaces. Needlegrasses increase on coarser surfaces and over shallower depths. Bluebunch wheatgrass increases on slight south and west exposures. Mountain big sagebrush increases in relationship to xeric and basin big sagebrush with elevation. Deciduous shrubs increase at the upper end of the precipitation zone and over gravelly and fractured substratum's. Production increases with soil depth and precipitation.

Associated sites

R010XC029OR	SR Shallow Cool 12-16 PZ SR Shallow Cool 12-16 PZ (stony loam surface texture, shallower soil depth, lower production)
-------------	--

R010XC032OR	SR Mountain 12-16 PZ SR Mountain 12-16 PZ (higher elevation, colder site, subsoil with lower permeability, different composition – bitterbrush absent or minor, higher proportion of ARTRV)
R010XC033OR	SR Cool 12-16 PZ SR Cool 12-16 PZ (subsoil with lower permeability and substratum not fractured, deep moisture required for bitterbrush not available, different composition – bitterbrush minor)
R010XC039OR	SR Very Shallow 12-16 PZ SR Very Shallow 12-16 PZ (very shallow soil depth, lower production, different composition – ARRI2/POSE dominant)
R010XC047OR	SR Mountain South 12-16 PZ SR Mountain South 12-16 PZ (south aspect, lower production, different composition – higher proportion of PSSPS)
R010XC054OR	SR Mountain Shallow South 12-16 PZ SR Mountain Shallow South 12-16 PZ (south aspect, shallower soil depth, different composition – higher proportion of PSSPS)
R010XC068OR	SR Cool Mountain North 12-16 PZ SR Cool Mountain North 12-16 PZ (north aspect, higher production)
R010XC075OR	SR Mountain Shallow North 12-16 PZ SR Mountain Shallow North 12-16 PZ (north aspect, shallower soil depth, lower production)
R010XC082OR	SR Dry Pine 14-16 PZ SR Dry Pine 14-16 PZ (higher production, different composition – scattered ponderosa pine present)

Similar sites

R010XC066OR	SR Mountain North 12-16 PZ SR Mountain North 12-16 PZ (higher elevation, north aspect, higher production, different composition – higher proportion of ARTRV)
R010XC032OR	SR Mountain 12-16 PZ SR Mountain 12-16 PZ (higher elevation, colder site, subsoil with lower permeability, different composition – bitterbrush absent or minor, higher proportion of ARTRV)
R010XC037OR	SR Mountain Shallow 12-16 PZ SR Mountain Shallow 12-16 PZ (higher elevation, stony loam surface texture, shallower soil depth, lower production, different composition – higher proportion of ARTRV)
R010XC033OR	SR Cool 12-16 PZ SR Cool 12-16 PZ (subsoil with lower permeability and substratum not fractured, deep moisture required for bitterbrush not available, different composition – bitterbrush minor)
R010XC075OR	SR Mountain Shallow North 12-16 PZ SR Mountain Shallow North 12-16 PZ (north aspect, shallower soil depth, lower production)
R010XC029OR	SR Shallow Cool 12-16 PZ SR Shallow Cool 12-16 PZ (shallower soil depth, lower production)
R010XC082OR	SR Dry Pine 14-16 PZ SR Dry Pine 14-16 PZ (higher production, different composition – scattered ponderosa pine present)
R010XC068OR	SR Cool Mountain North 12-16 PZ SR Cool Mountain North 12-16 PZ (north aspect, higher production)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Purshia tridentata</i> (2) <i>Artemisia tridentata ssp. vaseyana</i>
Herbaceous	(1) <i>Festuca idahoensis</i>

Physiographic features

This site occurs near woodlands on high terraces, uplands and mountain plateaus. Slopes typically range from 2 to 12 percent. Elevations typically range from 4,000 to 5,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Plateau (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,219–1,524 m
Slope	2–12%
Aspect	Aspect is not a significant factor

Climatic features

The annual precipitation ranges from 12 to 16 inches, 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 mesic near frigid to frigid with a mean air temperature of 45 degrees F. Temperature extremes range from 90 to -20 degrees F. The frost free period ranges from less than 50 to 90 days. The optimum growth period for plant growth is late April through June.

Table 3. Representative climatic features

Frost-free period (characteristic range)	50-90 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	305-406 mm
Frost-free period (average)	90 days
Freeze-free period (average)	
Precipitation total (average)	406 mm

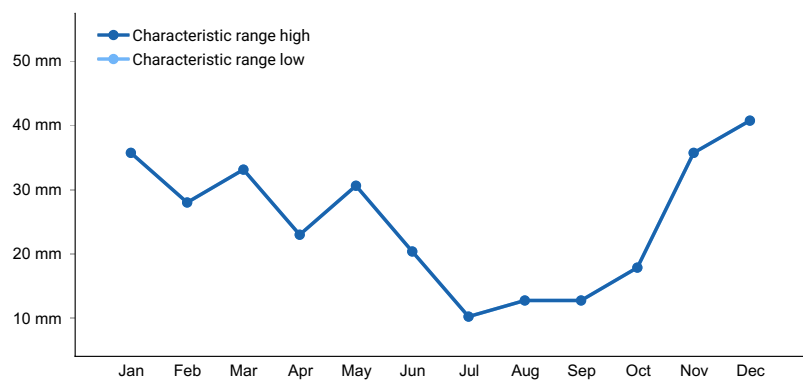


Figure 1. Monthly precipitation range

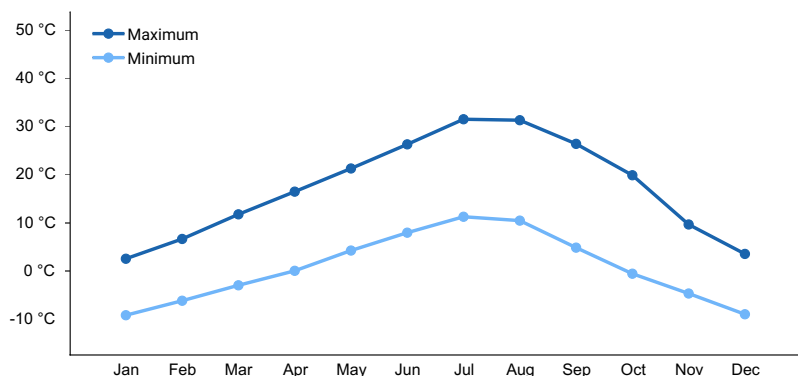


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

Not associated with water features.

Wetland description

Not applicable

Soil features

The soils of this site are typically moderately deep over fractured granitic or tuffaceous bedrock and well drained. Typically, the surface layer is a silt loam 10 to 12 inches thick. The subsoil is a clay loam about 20 inches thick. Depth to a discontinuous indurated pan or fractured bedrock ranges from 20 to 40 inches. Permeability is moderate. The available water holding capacity (AWC) is about 4 to 8 inches for the profile. The erosion potential is moderate.

Table 4. Representative soil features

Parent material	(1) Volcanic ash–granodiorite (2) Loess–rhyolite (3) Residuuum–basalt
Surface texture	(1) Silt loam (2) Clay loam
Family particle size	(1) Clayey
Drainage class	Well drained to moderately well drained
Permeability class	Moderate to moderately slow
Soil depth	51–102 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16–20.32 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0

Ecological dynamics

The potential native plant community is dominated by Idaho fescue, antelope bitterbrush and a complex of

mountain, xeric and basin big sagebrush. Bluebunch wheatgrass and Sandberg bluegrass are common along with a variety of forbs. Thurber's needlegrass and wild crab apple occasionally occur. Vegetative composition of the community is approximately 65 percent grasses, 5 percent forbs and 30 percent shrubs. Approximate ground cover is 80 to 90 percent (basal and crown).

Range in Characteristics:

Antelope bitterbrush increases over loamy subsoils and fractured substratums where deeper subsurface water is available. Idaho fescue increases on silt loam surfaces. Needlegrasses increase on coarser surfaces and over shallower depths. Bluebunch wheatgrass increases on slight south and west exposures. Mountain big sagebrush increases in relationship to xeric and basin big sagebrush with elevation. Deciduous shrubs increase at the upper end of the precipitation zone and over gravelly and fractured substratum. Production increases with soil depth and precipitation.

Response to Disturbance - States:

If the condition of the site deteriorates as a result of overgrazing, Idaho fescue and antelope bitterbrush decreases. Big sagebrush (mountain, basin & xeric) rapidly increases and juniper invades from higher elevation rock outcrops. With continued overgrazing bluebunch wheatgrass decreases, big sagebrush dominates the overstory and Sandberg bluegrass, a shallow rooted perennial dominates the understory. Annual invasion is limited unless ground disturbance occurs. With further deterioration and lack of fire juniper invasion continues, shrubs including big sagebrush decrease and bare ground increases. With fire and heavy use or ground disturbance, annuals and Sandberg or bulbous bluegrass increase. Bare ground increases and excessive erosion contributes to downstream sedimentation.

States: ARTRV-X-T-PUTR2/POSE-*Bare Ground*; JUOC/ARTRV-X-POSE-bare ground; POSE-POBU-Annuals-*Bare Ground* (w/fire and overgrazing)

Juniper Response:

Fine fuel reduction from improper grazing and fire suppression has led to an increase in the historical fire return interval on many western rangelands. A reduction in fire frequency on these sites leads to an increase in juniper cover, a decrease in sagebrush cover followed by a decrease in herbaceous cover and understory diversity. As juniper encroaches on north facing aspects sagebrush declines with a subsequent decrease in forbs, bluebunch wheatgrass and needlegrass. Idaho fescue becomes the primary herbaceous species occurring under the canopy of the juniper trees. Sandberg's bluegrass increases in the plant community on lower elevation north slopes and warmer non-aspect sites while bare ground increases in the interspaces between trees. Bitterbrush is more resistant to juniper encroachment than sagebrush and maintains its presence in the community, however vigor and fitness (seed production) may be thwarted. The potential for soil erosion increases as the juniper woodland matures and the understory plant community cover declines. The combined effect of overgrazing and juniper invasion increases the rate of decline in ecological function and the probability of crossing a threshold is high.

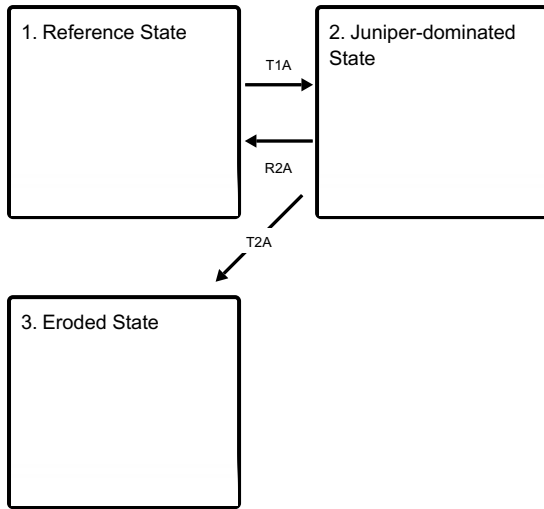
Treatment Response:

This site responds positively to juniper removal if soil erosion is not significant.

Seeding may be necessary if there are less than one to two bunchgrass plants per meter square in the understory. Forbs may also need to be seeded if adult plants are no longer present in the understory.

State and transition model

Ecosystem states

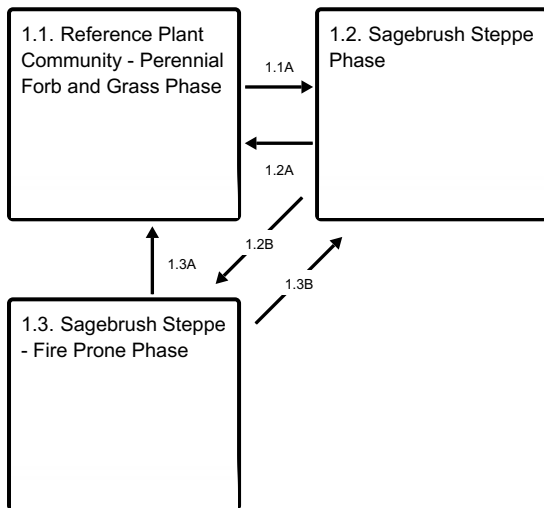


T1A - Continued Fire Suppression

R2A - Mechanical Juniper Removal

T2A - Soil Erosion

State 1 submodel, plant communities



1.1A - Reduced Fire and Increased Grazing

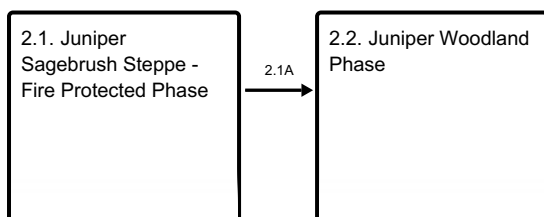
1.2A - Fire

1.2B - Reduced Fire and Increased Grazing

1.3A - Fire

1.3B - Fire

State 2 submodel, plant communities



2.1A - No Fire

State 3 submodel, plant communities

3.1. Juniper Woodland
Erosional Phase

**State 1
Reference State**

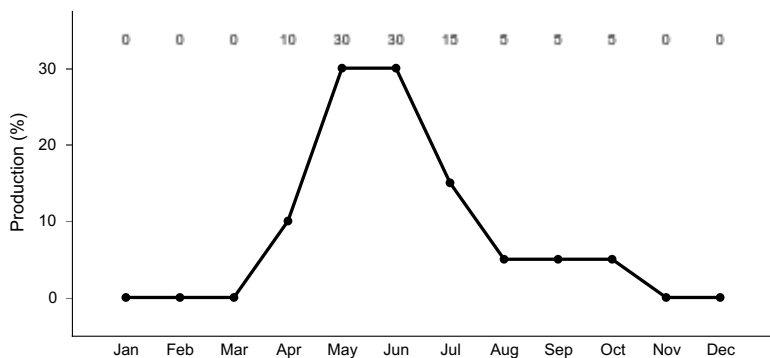
**Community 1.1
Reference Plant Community - Perennial Forb and Grass Phase**



The reference native plant community is dominated by Idaho fescue, antelope bitterbrush and a complex of mountain, xeric and basin big sagebrush. Bluebunch wheatgrass and Sandberg bluegrass are common along with a variety of forbs. Thurber’s needlegrass and wild crab apple occasionally occur. Vegetative composition of the community is approximately 65 percent grasses, 5 percent forbs and 30 percent shrubs. Approximate ground cover is 80 to 90 percent (basal and crown).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	874	1093	1311
Shrub/Vine	404	504	605
Forb	67	84	101
Total	1345	1681	2017



**Figure 4. Plant community growth curve (percent production by month).
OR4481, B10 SR Mtn, Cool & No 12-16pz. SR Mtn, Cool & No 12-16pz RPC
Growth Curve.**

Community 1.2
Sagebrush Steppe Phase

Community 1.3
Sagebrush Steppe - Fire Prone Phase

Pathway 1.1A
Community 1.1 to 1.2

Reduced Fire and Increased Grazing

Pathway 1.2A
Community 1.2 to 1.1

Fire

Pathway 1.2B
Community 1.2 to 1.3

Reduced Fire and Increased Grazing

Pathway 1.3A
Community 1.3 to 1.1

Fire

Pathway 1.3B
Community 1.3 to 1.2

Fire

State 2
Juniper-dominated State

Community 2.1
Juniper Sagebrush Steppe - Fire Protected Phase

Community 2.2
Juniper Woodland Phase

Pathway 2.1A
Community 2.1 to 2.2

No Fire

State 3
Eroded State

Community 3.1
Juniper Woodland Erosional Phase

Transition T1A
State 1 to 2

Continued Fire Suppression

Restoration pathway R2A

State 2 to 1

Mechanical Juniper Removal

Transition T2A

State 2 to 3

Soil Erosion

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Dominant, moderate rooted bunchgrass			504–841	
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	504–841	–
2	Sub-dominant, moderate rooted bunchgrass			168–336	
	bluebunch wheatgrass	PSSPS	<i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>	168–336	–
3	Common, perennial moderate & shallow rooted grass			67–168	
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	34–84	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	34–84	–
4	Other perennial grasses			56–202	
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	11–50	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	17–50	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	17–34	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	11–34	–
	western needlegrass	ACOC3	<i>Achnatherum occidentale</i>	0–34	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–34	–
	slender wheatgrass	ELTRT	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	0–22	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	0–22	–
Forb					
5	Dominant, perennial, forbs			146–224	
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	34–50	–
	parsnipflower buckwheat	ERHE2	<i>Eriogonum heracleoides</i>	34–50	–
	milkvetch	ASTRA	<i>Astragalus</i>	17–34	–
	desertparsley	LOMAT	<i>Lomatium</i>	17–34	–
	lupine	LUPIN	<i>Lupinus</i>	17–34	–
	phlox	PHLOX	<i>Phlox</i>	11–22	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	11–22	–
	fleabane	ERIGE2	<i>Erigeron</i>	11–22	–
6	Other forbs			34–135	
	hawksbeard	CREPI	<i>Crepis</i>	6–11	–
	stoneseed	LITHO3	<i>Lithospermum</i>	6–11	–

	stonecrop	SEDUM	<i>Sedum</i>	0–11	–
	deathcamas	ZIGAD	<i>Zigadenus</i>	2–6	–
	owl's-clover	ORTHO	<i>Orthocarpus</i>	0–6	–
	sagebrush buttercup	RAGL	<i>Ranunculus glaberrimus</i>	2–6	–
	woodland-star	LITHO2	<i>Lithophragma</i>	2–6	–
	agoseris	AGOSE	<i>Agoseris</i>	2–6	–
	onion	ALLIU	<i>Allium</i>	2–6	–
	pussytoes	ANTEN	<i>Antennaria</i>	2–6	–
	brodiaea	BRODI	<i>Brodiaea</i>	2–6	–
	mariposa lily	CALOC	<i>Calochortus</i>	2–6	–
	Indian paintbrush	CASTI2	<i>Castilleja</i>	2–6	–
	bastard toadflax	COMAN	<i>Comandra</i>	2–6	–
	bushy bird's beak	CORA5	<i>Cordylanthus ramosus</i>	0–6	–
Shrub/Vine					
7	Dominant, deciduous, sprouting shrub			252–336	
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	252–336	–
8	Sub-dominant, evergreen, non-sprouting shrubs			168–280	
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	50–135	–
	big sagebrush	ARTRX	<i>Artemisia tridentata ssp. xericensis</i>	34–84	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	34–84	–
	milkvetch	ASTRA	<i>Astragalus</i>	17–34	–
	buckwheat	ERIOG	<i>Eriogonum</i>	17–34	–
	desertparsley	LOMAT	<i>Lomatium</i>	17–34	–
	lupine	LUPIN	<i>Lupinus</i>	17–34	–
9	Common deciduous, sprouting shrub			34–84	
	wax currant	RICE	<i>Ribes cereum</i>	34–84	–
	western juniper	JUOC	<i>Juniperus occidentalis</i>	0–17	–
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	0–17	–
10	Other shrubs			56–280	
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	0–50	–
	wild crab apple	PERA4	<i>Peraphyllum ramosissimum</i>	0–50	–
	Woods' rose	ROWO	<i>Rosa woodsii</i>	0–34	–
	snowberry	SYMPH	<i>Symphoricarpos</i>	0–34	–
	threetip sagebrush	ARTR4	<i>Artemisia tripartita</i>	0–34	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	6–34	–
	littleleaf horsebrush	TEGL	<i>Tetradymia glabrata</i>	0–17	–
Tree					
11	Occasional evergreen tree			0–56	
	ponderosa pine	PIPO	<i>Pinus ponderosa</i>	0–56	–

Animal community

Livestock Grazing:

This site is suitable for livestock grazing use in the late spring, 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 Idaho fescue and antelope bitterbrush. Use levels on bitterbrush should be no more than one-third of the current year's annual growth. Spring/early summer use levels on Idaho fescue should be no more than 50 percent of the current year's growth. Idaho fescue can be severely damaged if heavily grazed during periods of flowering and seed formation before root reserves have accumulated and soil moisture is low. Deferred grazing or rest is recommended at least once every three years.

Wildlife Associated with the Site:

This site is commonly used by mule deer, elk, antelope, rabbits, rodents, upland birds and various predators. It is a preferred upland bird nesting and rearing site. Mule deer and elk make excellent use of the site for spring and late fall forage.

Hydrological functions

The soils of this site are typically in an upland topographic position. They have moderate high runoff potential and medium infiltration rates when the hydrologic cover is good. Under frozen ground conditions runoff potential is significantly increased. This occurs for extended periods when perennial bunchgrass cover is negligible. Hydrologic cover is good when the Idaho fescue and other moderate deep rooted bunchgrass components are greater than 70 percent of potential.

Other information

Juniper invasion is a major risk on this site. A preferred control measure is cutting followed by rest to improve vigor, density and seed production of existing antelope bitterbrush and deep rooted perennial bunchgrasses. Consider seeding following control measures if an inadequate stand of bunchgrass is present. Prescribed burning is an option; however prescriptions should be carefully designed as it takes numerous years for bitterbrush to recover even with an optimally designed prescribed grazing system.

References

. Fire Effects Information System. <http://www.fs.fed.us/database/feis/>.

Other references

Gucker, Corey L. 2006. *Cercocarpus ledifolius*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <https://www.fs.fed.us/database/feis/plants/tree/cerled/all.html> [2020, September 30].

Stringham, Tamzen, 2007. Final Report for USDA Ecological Site Description. Oregon State University, Corvallis, Oregon. Agreement No. 68-0436-4090.

USNVC [United States National Vegetation Classification]. 2020. United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [<http://usnvc.org/> accessed 9/25/2020]

Contributors

G. Kuehl, H. Barrett, A. Bahn
T. Bloomer And A. Bahn

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)	Jeff Repp and Bruce Frannsen
Contact for lead author	NRCS Oregon State Rangeland Management Specialist
Date	04/24/2003
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** 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):** 2-12%

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):** Moderate resistant to erosion: aggregate stability = 3-5

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** weak fine to medium granular to subangular blocky structure, dry color value 4-5, 8-16 inches thick; moderate SOM (1-4%)

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Significant ground cover (60-80%) and gentle slopes (2-12%) effectively 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
-

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: Evergreen shrubs > deciduous shrubs

Other: Forbs > other grasses > trees

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: 1800, Normal: 1500, Unfavorable: 1200 lbs/acre/year
-

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
-

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