

Ecological site R043CY805OR Mountain Rockland (JUOC/CELE3/FEID)

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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): 043C—Blue and Seven Devils Mountains

This MLRA covers the Blue and Seven Devils Mountains of Oregon, Washington and Idaho. The area is characterized by thrust and block-faulted mountains and deep canyons composed of sedimentary, metasedimentary, and volcanic rocks. Elevations range from 1,300 to 9,800 feet (395 to 2,990 meters). The climate is characterized by cold, wet winters and cool, dry summers. Annual precipitation, mostly in the form of snow, averages 12 to 43 inches (305 to 1,090 millimeters) yet ranges as high as 82 inches (2,085 millimeters) at upper elevations. Soil temperature regimes are predominately Frigid to Cryic and soil moisture regimes are predominately Xeric to Udic. Mollisols and Andisols are the dominant soil orders. Ecologically, forests dominate but shrub and grass communities may occur on south aspects and lower elevations as well as in alpine meadow environments. Forest composition follows moisture, temperature and elevational gradients and typically ranges from ponderosa pine and Douglas-fir plant associations at lower elevations, grand fir at middle elevations and subalpine fir and Engelmann spruce at upper elevations. Historical fire regimes associated with these forest types range from frequent surface fires in ponderosa pine - Douglas Fir forest types to mixed and stand replacing fire regimes in grand fir and subalpine fir types. A large percentage of the MLRA is federally owned and managed by the U.S. Forest Service for multiple uses.

Classification relationships

Plant Assoc. of Blue and Ochoco Mountains (R6 E TP-036-92)
western juniper/mountain mahogany - CJS4
western juniper/mountain mahogany/elk sedge - CJS42
mountain mahogany/elk sedge - SD40
mountain mahogany/Idaho fescue-bluebunch wheatgrass - SD4111

Ecological site concept

This is a shrub site dominated by curl-leaf mountain mahogany (*Cercocarpus ledifolius*), antelope bitterbrush (*Purshia tridentate*) and Idaho fescue (*Festuca idahoensis*) in its reference phase. Ponderosa pine (*Pinus ponderosa*), Western juniper (*Juniperus occidentalis*), mountain big sagebrush (*Artemisia tridentate* ssp. *vaseyana*), wax currant (*Ribes cereum*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) are prominent. 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, livestock grazing pressures and fire suppression.

On ridges, shoulders or upper mountainslopes, western juniper and ponderosa pine may form an open forest savannah with understory of curl-leaf mountain mahogany, antelope bitterbrush, and perennial bunchgrasses (FEID/PSSPS/POSE/CAGE). This community typically forms on moderate to steep slopes at mid-elevations. Soils are typically skeletal (>35% coarse fragments), shallow to deep, and are developed from colluvium and/or residuum derived from rhyolitic tuff, andesite, basalt or sedimentary sources. In areas of the southern Blue Mountains, it may

be associated with ultramafic geologies (serpentine, peridotite, etc)

This is a provisional ecological site that groups characteristics at a broad scale with little to no field verification and is subject to extensive review and revision before final approval. All data herein was developed using existing information and literature and should be considered provisional and contingent upon field validation prior to use in conservation planning.

Associated sites

R043CY807OR	Scabland (PSSPS-POSE-DAUN) Adjacent scabland areas with very shallow to shallow soils
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Similar sites

R043CY804OR	Cool Mountain Bunchgrass (ARTRV/FEID) Lower large coarse fragment content, deeper soils with less cobbles and stones on the surface
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Table 1. Dominant plant species

Tree	(1) <i>Juniperus occidentalis</i> (2) <i>Pinus ponderosa</i>
Shrub	(1) <i>Cercocarpus ledifolius</i> (2) <i>Purshia tridentata</i>
Herbaceous	(1) <i>Festuca idahoensis</i> (2) <i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>

Physiographic features

This site typically occurs on rhyolitic tuffs, andesites, or basalts of the southern Blue and Ochoco Mountains. This site is typically located at moderate elevations from 4,100 to 5,175 ft (1,250 to 1,575 m) but may range from 3,500 to 6,000 feet (1,000 to 1,800 meters) on ridges, shoulders, and upper mountain backslopes. Slopes are typically 10 to 30% but range from 0 to 60%. This site occurs on all aspects. This site does not experience ponding or flooding and no water table is present within the upper two meters of soil.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Ridge (2) Mountains > Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,250–1,577 m
Slope	10–30%
Ponding depth	0 cm
Water table depth	254 cm
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	1,067–1,829 m
Slope	0–60%
Ponding depth	Not specified

Water table depth	Not specified
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Climatic features

Annual precipitation is 17 - 25 inches (430 to 635 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 but resulting precipitation does not generally have a significant effect on soil moisture. The soil temperature regime is frigid or mesic near frigid, and the soil moisture regime is xeric. Average annual air temperature is 43 F (6 degrees C). The frost-free period ranges from less than 40 to 100 days. Climate graphs are populated from the closest available weather stations and are included to represent general trends rather than representative values.

Table 4. Representative climatic features

Frost-free period (characteristic range)	40-100 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	432-635 mm
Frost-free period (average)	80 days
Freeze-free period (average)	
Precipitation total (average)	508 mm

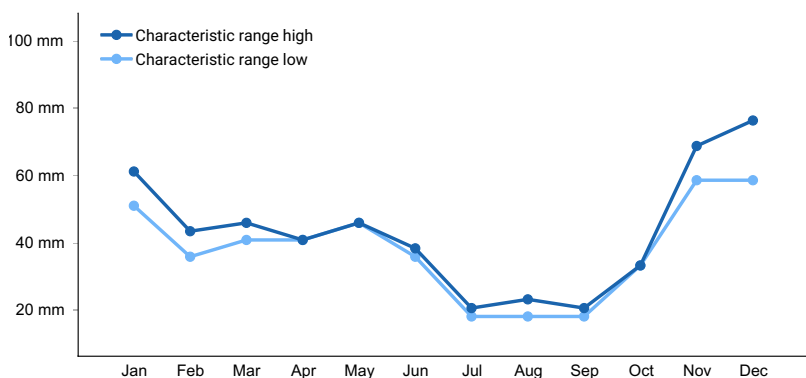


Figure 1. Monthly precipitation range

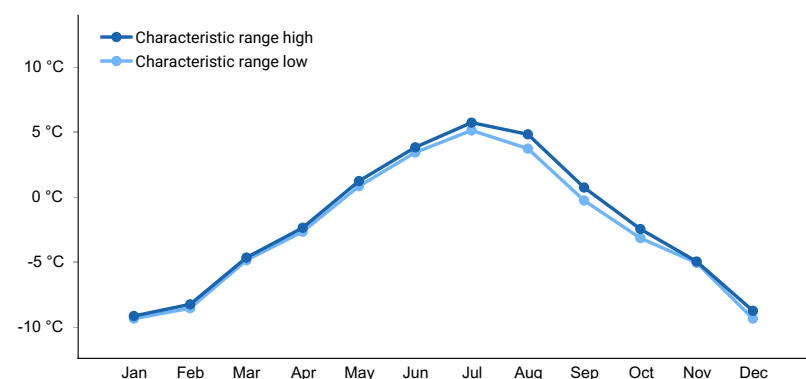


Figure 2. Monthly minimum temperature range

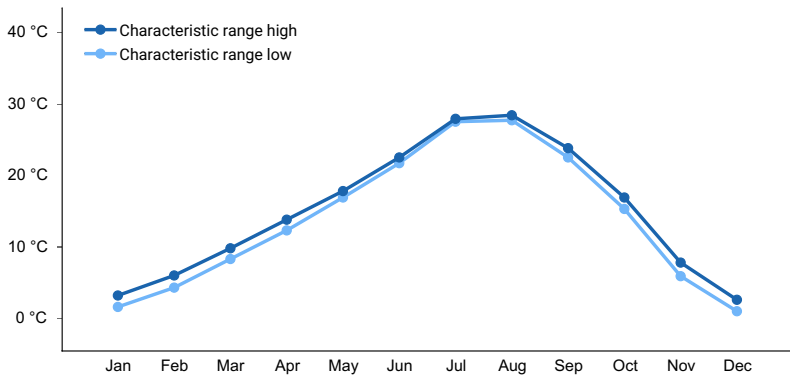


Figure 3. Monthly maximum temperature range

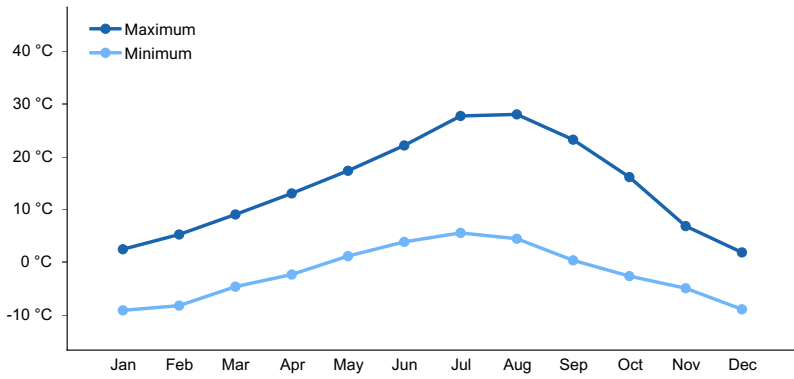


Figure 4. Monthly average minimum and maximum temperature

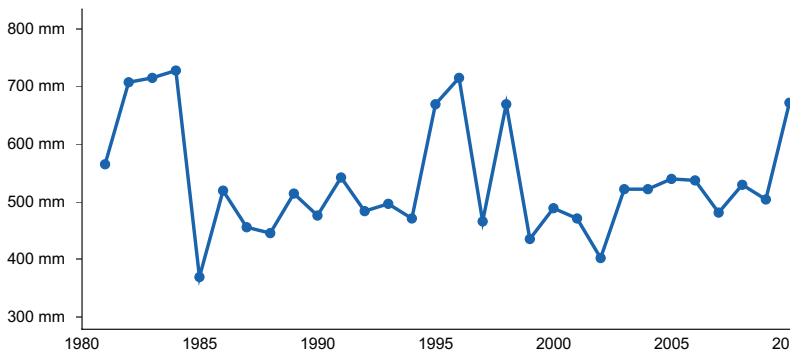


Figure 5. Annual precipitation pattern

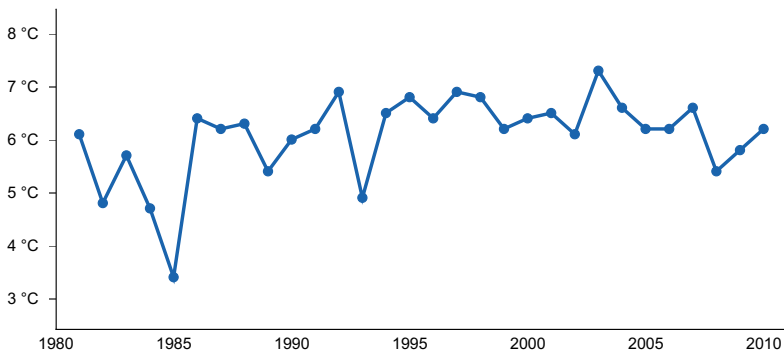


Figure 6. Annual average temperature pattern

Climate stations used

- (1) AUSTIN 3 S [USC00350356], Prairie City, OR
- (2) UKIAH [USC00358726], Pilot Rock, OR

Influencing water features

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

Soil features

The soils of this site are well drained and typically formed in colluvium and/or residuum derived from rhyolitic tuff, andesite, or basalt. In areas of the southern Blue Mountains, this site may be associated with ultramafic geologies (serpentine, peridotite, etc.). These soils typically have higher salts (magnesium) of which curl-leaf mountain mahogany is very tolerant of. Soils are typically shallow to moderately deep with significant coarse fragments. Areas of rock outcrop or rubbleland may occur adjacent. Typically, the surface layer is loam or sandy loam. The subsoil ranges from sandy loam to clay. Total coarse fragments throughout the profile range from 15 to 90 percent by volume, typically averaging over 35%. See Fivebit and Anatone for modal series concepts. For ultramafic series concepts, see Overholt or Blackgulch.

Table 5. Representative soil features

Parent material	(1) Colluvium–volcanic rock (2) Residuum–volcanic rock (3) Colluvium–ultramafic rock (4) Residuum–ultramafic rock
Surface texture	(1) Very gravelly silt loam (2) Stony silt loam (3) Stony sandy loam (4) Very stony silt loam
Family particle size	(1) Clayey-skeletal (2) Loamy-skeletal
Drainage class	Well drained
Permeability class	Slow to rapid
Depth to restrictive layer	25–102 cm
Soil depth	25–102 cm
Surface fragment cover ≤3"	5–30%
Surface fragment cover >3"	30–70%
Available water capacity (0-101.6cm)	2.79–11.68 cm
Soil reaction (1:1 water) (0-101.6cm)	5.6–7
Subsurface fragment volume ≤3" (10.2-101.6cm)	5–30%
Subsurface fragment volume >3" (10.2-101.6cm)	25–60%

Ecological dynamics

The potential native plant community is dominated by mountain mahogany, antelope bitterbrush and Idaho fescue. Ponderosa pine, mountain big sagebrush, wax currant and bluebunch wheatgrass are prominent. Sandberg bluegrass, prairie junegrass, Thurber's needlegrass (*Achnatherum thurberianum*) and a variety of forbs are present. Mountain mahogany canopy cover ranges from 5 to over 20 percent. Canopy cover of scattered 80 year-old and older ponderosa pine ranges up to 10 percent.

Range in Characteristics:

In the reference state, curl-leaf mountain mahogany canopy cover ranges from 5 to over 20 percent. A scattered overstory of mature 80 year-old and older ponderosa pine makes up to 10% of the canopy cover. Idaho fescue the dominant deep-rooted perennial bunchgrass increases on northerly exposures. Bluebunch wheatgrass increases on

slight south and west exposures. Total annual production tends to increase over fractured bedrock and at the upper end of the precipitation zone as well as presence of, antelope bitterbrush and wax currant.

Response to Disturbance - States:

If the condition of the site deteriorates as a result of disturbance, Idaho fescue initially decreases followed by a decrease in bluebunch wheatgrass and antelope bitterbrush. Sandberg bluegrass increases. Western juniper strongly invades and bare ground increases. Rhizomatous bluegrasses, cheatgrass (*Bromus tectorum*) and other annuals invade. With further deterioration and lack of fire, juniper dominates the site, out-competing mountain mahogany and other shrubs. The fire hazard increases as juniper ladder fuels build up and the site becomes extremely susceptible to fire. A mid-summer hot fire severely impacts mountain mahogany, bitterbrush, ponderosa pine and western juniper. While mountain mahogany may initially resprout following fire, it is usually killed (Gucker 2006). The overstory is eliminated and bare ground significantly increases. Excessive erosion reduces the site productivity and contributes to downstream sedimentation.

Juniper Response:

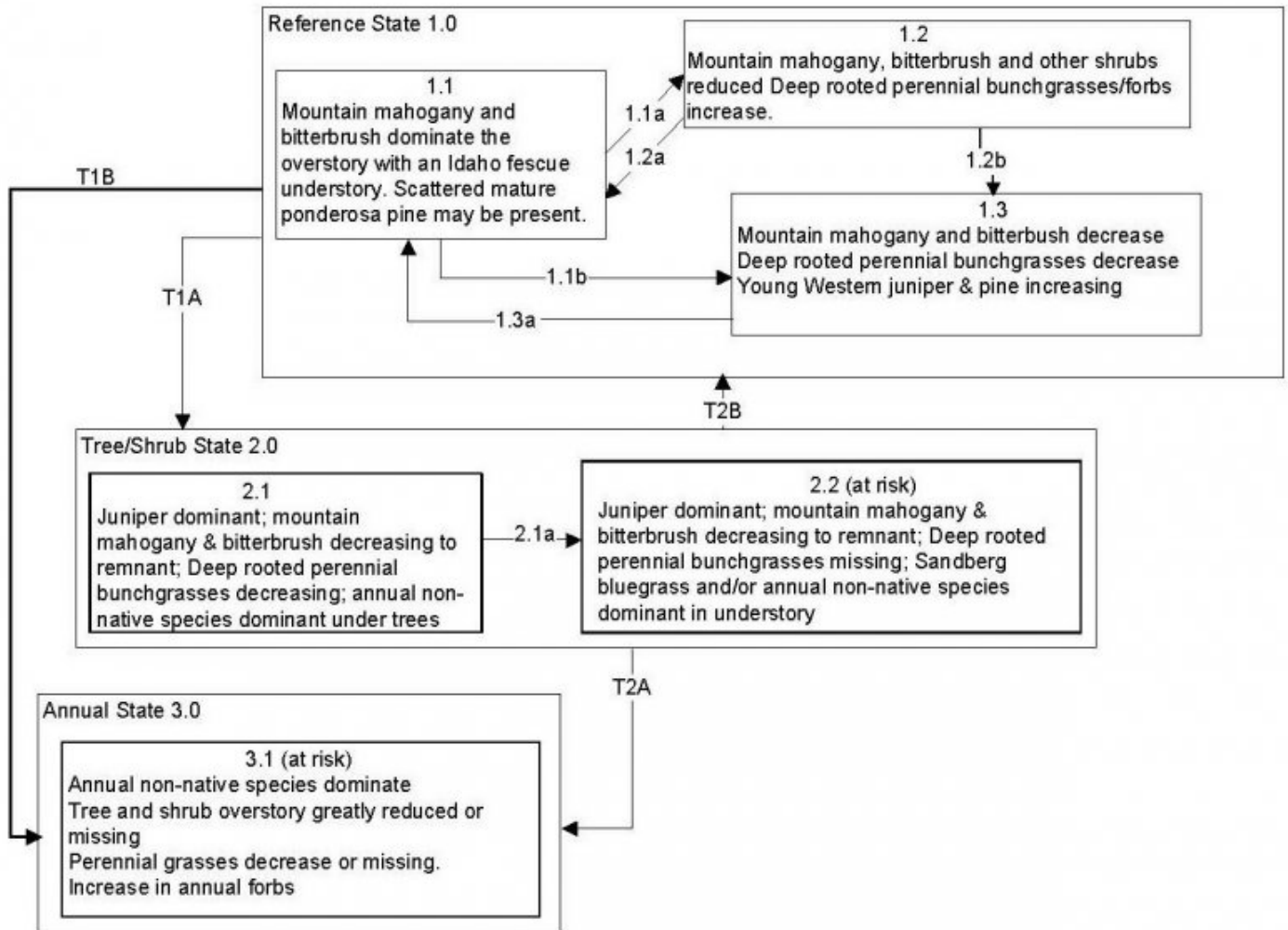
Fine fuel reduction from improper grazing and fire suppression has led to an increase in the historical fire return interval on many western rangelands. A reduction in fire frequency on these sites leads to an increase in juniper cover, a decrease in sagebrush cover followed by a decrease in herbaceous cover and understory diversity. Mountain mahogany has also been shown to increase with fire suppression yet may be susceptible to decline given grazing impacts (Gucker 2006). 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 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 improperly managed grazing and juniper invasion increases the rate of decline in ecological function and the probability of crossing a threshold becomes very likely.

Treatment Response:

This site responds positively to juniper removal if soil erosion is not significant. Seeding may be necessary if there are less than 1-2 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.

(Adapted from Stringham, 2007)

State and transition model



Reference State 1.0 Community Pathways

- 1.1a: Low severity fire
- 1.2a: Time without fire

Transition T1A: Disruption of the fire return interval, extending time without fire which allows for conifer expansion, especially western juniper

Transition T1B: Catastrophic fire in the presence of invasive annual grasses.

Tree/Shrub State 2.0 Community Pathways

- 2.1a: Time without fire

Transition T2A: Catastrophic fire in the presence of invasive annual grasses.

Transition T2B: Requires mechanical or chemical treatment of controlling brush or mechanical treatment of juniper along with treatment of non-native invasive species. Desired grasses and forbs may need to be seeded.

(Adapted from Stringham, 2007)

**State 1
Historical reference state**

The Reference State 1.0 is a representation of the natural range of variability. 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 are maintained by elements of ecosystem structure and function including 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. 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.

Dominant plant species

- curl-leaf mountain mahogany (*Cercocarpus ledifolius*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub
- Idaho fescue (*Festuca idahoensis*), grass

State 2

Tree/Shrub state

This state is characterized by a dominance of conifers and/or shrubs. Western juniper and/or ponderosa pine dominate the overstory. Mountain mahogany, bitterbrush and other shrubs are either co-dominant with trees, or declining on site. Deep rooted 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
- ponderosa pine (*Pinus ponderosa*), tree
- curl-leaf mountain mahogany (*Cercocarpus ledifolius*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub

State 3

Annual state

This state is characterized by the dominance of annual non-native species such as cheatgrass, medusahead (*Taeniatherum caput-medusae*), and North Africa grass (*Vventenata dubia*) in the understory. Shrubs may be present in the overstory, but are not controlling site function.

Dominant plant species

- cheatgrass (*Bromus tectorum*), grass
- medusahead (*Taeniatherum caput-medusae*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata* ssp. *spicata*), grass

Transition T1A

State 1 to 2

Disruption of the fire return interval, allowing for conifer expansion, especially western juniper

Transition T1B

State 1 to 3

Catastrophic fire in the presences of invasive annual grasses

Transition R2B

State 2 to 1

Mechanical or chemical treatment of dominant shrubs or juniper along with treatment of non-native invasive species. Desired grasses and forbs may need to be seeded.

Transition T2A

State 2 to 3

Catastrophic fire in the presences of invasive annual grasses

References

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

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

Andrew Neary - Further concept development for 2020 PES initiative
Jennifer Moffitt - Original concept developed for 2020 PES initiative

Approval

Kirt Walstad, 9/08/2023

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)	
Contact for lead author	
Date	05/19/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

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

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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:

Sub-dominant:

Other:

Additional:

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

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):**

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:**

17. **Perennial plant reproductive capability:**
