# Ecological site R043CY808OR
# Claypan (ARAR8/FEID-PSSPS)

Last updated: 9/08/2023
Accessed: 05/06/2024

## 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): 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 Engelman 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/low sagebrush - CJS1
Low sagebrush/Idaho fescue-bluebunch wheatgrass - SD1911
Low sagebrush/Sandberg bluegrass - SD9221

USDA Forest Service Ecological Sub-region
M332 “Blue Mountains”

U.S. National Vegetation Classification Standard (NVCS)
Group:G308. Intermountain Low & Black Sagebrush Steppe & Shrubland
Alliance:A3219. Artemisia arbuscula ssp. arbuscula Steppe & Shrubland Alliance
Association(s):
Artemisia arbuscula ssp. arbuscula / Festuca idahoensis Shrub Grassland
Artemisia arbuscula ssp. arbuscula / Pseudoroegneria spicata Shrub Grassland

## Ecological site concept

This site occurs predominantly on hills, mountain plateaus and ridges with soils that have a root restrictive layer at less than 20 inches (e.g. abrupt textural change or bedrock). Most commonly an abrupt textural change from loamy to clayey textures occurs in the upper 7 inches. In the reference state, the site is characterized by low sagebrush (Artemisia arbuscula), Idaho fescue (Festuca idahoensis), and bluebunch wheatgrass (Pseudoroegneria spicata).

Historically, plant community dynamics were driven primarily by disturbances such as localized fire and drought. This site is susceptible to western juniper (Juniperus occidentalis) encroachment and/or annual grass invasion with disturbance outside the normal range of variability. Susceptibility to western juniper invasion is greater in the southern portion of the MRLA.

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

| | |
|---|---|
| R043CY804OR | **Cool Mountain Bunchgrass (ARTRV/FEID)**<br>Adjacent soils lacking well developed claypan layers |

## Similar sites

| | |
|---|---|
| R043CY807OR | **Scabland (PSSPS-POSE-DAUN)**<br>Soils lack an abrupt textural change to a claypan within the upper horizon |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Artemisia arbuscula* |
| Herbaceous | (1) *Festuca idahoensis*<br>(2) *Pseudoroegneria spicata* |

## Physiographic features

This site occurs predominantly on hills, mountain plateaus and ridges over hard igneous extrusive geologies (basalt, andesite, rhyolite, tuff, etc.). Slopes range from 0 to 20 %. Elevations are typically 4,250 to 5,500 ft (1,300 to 1,675 m) but may range from 4,000 ft to 6,500 ft (1,225 - 1,975 meters). 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 > Hillside or mountainside<br>(2) Mountains > Plateau<br>(3) Mountains > Ridge |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 4,250–5,500 ft |
| Slope | 0–20% |
| Ponding depth | 0 in |
| Water table depth | 100 in |
| 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 | 4,000–6,500 ft |
| Slope | Not specified |

| | |
|---|---|
| Ponding depth | Not specified |
| Water table depth | Not specified |

## Climatic features

The annual precipitation is typically 17 - 25 inches (420 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 and the soil moisture regime is xeric. Temperature extremes range from 90 to -20 degrees F (32 to -28 degrees C). The frost-free period ranges from less than 30 up to 90 days. The optimum growth period for plant growth is late April through June. 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) | 30-90 days |
| Freeze-free period (characteristic range) | |
| Precipitation total (characteristic range) | 17-25 in |
| Frost-free period (average) | 50 days |
| Freeze-free period (average) | |
| Precipitation total (average) | 21 in |

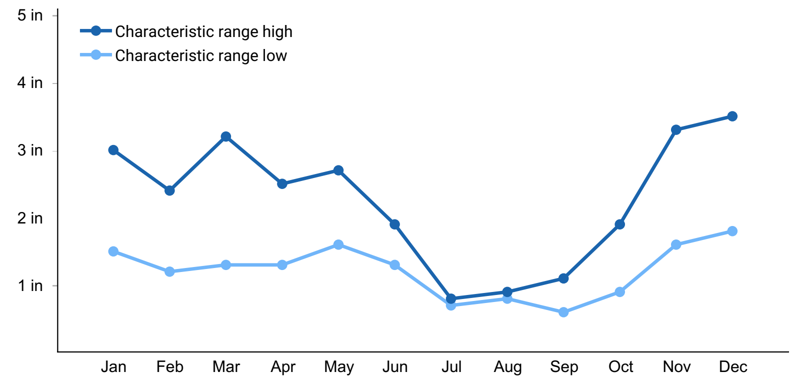



**Figure 1. Monthly precipitation range**

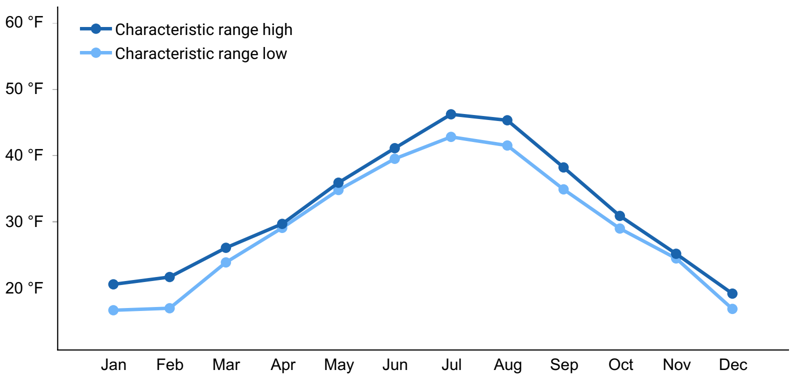



**Figure 2. Monthly minimum temperature range**

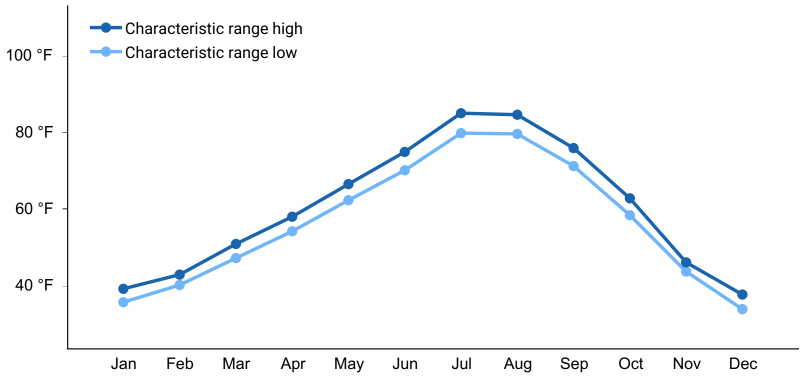



**Figure 3. Monthly maximum temperature range**

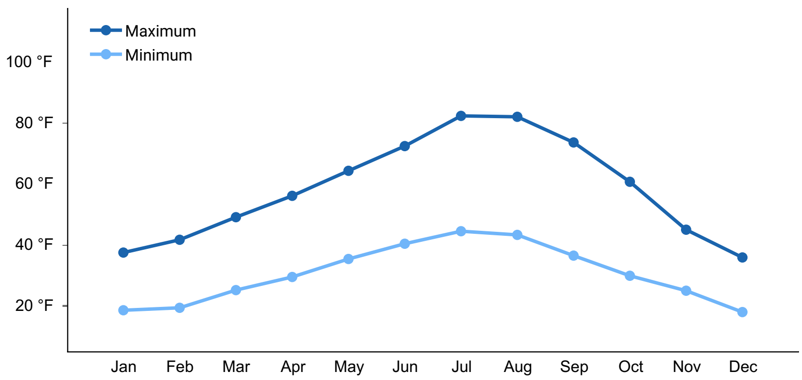



**Figure 4. Monthly average minimum and maximum temperature**

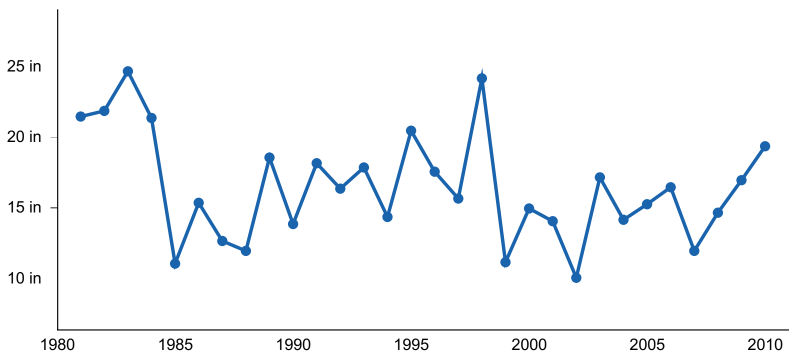



**Figure 5. Annual precipitation pattern**

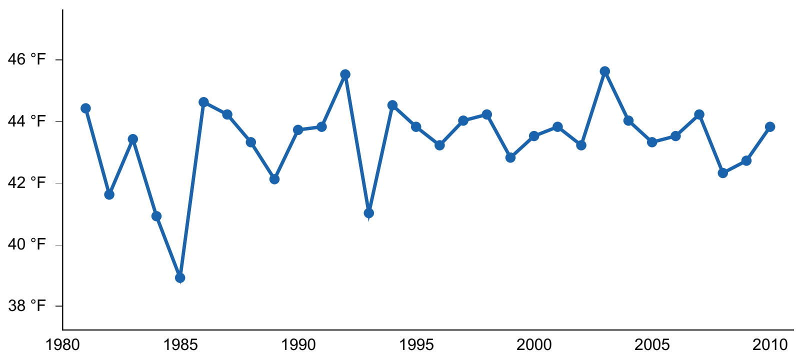



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) MEACHAM [USW00024152], Pendleton, OR
- (2) MASON DAM [USC00355258], Baker City, OR
- (3) BARNES STN [USC00350501], Prineville, OR

## Influencing water features

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

## Soil features

The soils of this site are typically very shallow to an abrupt textural change. Most commonly an abrupt textural change from loamy to clayey textures occurs in the upper 7 inches. These soils are formed from colluvium or residuum over volcanic rock, primarily basalt, rhyolite and andesite often with a minor influence of volcanic ash in the surface. Surface textures are typically sandy loam to loam. Subsurface textures are typically clay loam or clay with variable amounts of total coarse fragments from 0 to 70% by volume. The family particle size is typically loamy-skeletal but may occasionally be clayey-skeletal. The erosion potential is moderate to severe.

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Colluvium–volcanic rock<br>(2) Residuum–volcanic rock |
| Surface texture | (1) Very cobbly loam<br>(2) Extremely cobbly loam<br>(3) Very stony sandy loam<br>(4) Extremely cobbly silt loam |
| Family particle size | (1) Loamy-skeletal<br>(2) Clayey-skeletal |
| Drainage class | Well drained |
| Permeability class | Moderate to slow |
| Depth to restrictive layer | 0–10 in |
| Soil depth | 0–80 in |
| Surface fragment cover <=3" | 10–70% |
| Surface fragment cover >3" | 10–60% |
| Available water capacity (0-40in) | 0.6–1.4 in |
| Soil reaction (1:1 water) (0-40in) | 6.4–7.4 |
| Subsurface fragment volume <=3" (4-60in) | 0–40% |
| Subsurface fragment volume >3" (4-60in) | 0–70% |

## Ecological dynamics

Range in Characteristics:

One-spike oatgrass (*Danthonia unispicata*) can be expected to be a greater percentage of the species composition in microsites that are intermittently ponded during the late winter and early spring and where the soil surface horizon is shallower. Sandberg bluegrass (*Poa secunda*) becomes a greater percentage of the species composition where the site occurs near the lower limits (12 inches) of the precipitation range and on the shallower soils. Total production is proportional to surface soil depth, decreasing as the surface soil layer becomes shallower.

Ecological Dynamics and Disturbance Response:

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

Periodic drought regularly influences sagebrush ecosystems and drought duration and severity as increased throughout the 20th century in much of the Intermountain West. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability with the soil profile (Bates et al. 2006).

The Great Basin sagebrush communities have high spatial and temporal variability in precipitation both among years and within growing seasons. Nutrient availability is typically low but increases with elevation and closely follows moisture availability. The invasibility of plant communities is often linked to resource availability. Disturbance can decrease resource uptake due to damage or mortality of the native species and depressed competition or can increase resource pools by the decomposition of dead plant material following disturbance. The invasion of sagebrush communities by cheatgrass (*Bromus tectorum*) has been linked to disturbances (fire, abusive grazing) that have resulted in fluctuations in resources (Chambers et al. 2007).

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

The species most likely to invade these sites are cheatgrass and medusahead (*Taeniatherum caput-medusae*); cool-season annual grasses that germinate in the fall, overwinter as seedlings, and initiate growth in the spring (Miller et al. 1999a). Expansion of these grasses creates seed reserves that can infest adjoining areas and cause changes to the fire regime. These grasses create fuel continuity in the understory, often resulting in increased fire frequency and more uniform burn patterns (less mosaic). Annual grasses can be successfully controlled with a combination of prescribed burning and application of pre-emergent herbicide. Revegetation of medusahead invaded rangelands has a higher likelihood of success when using introduced perennial bunchgrasses such as crested wheatgrass (Davies et al. 2015).

Fire Ecology:

Low sagebrush is killed by fire and does not sprout (Young 1983). Establishment after fire is from seed, generally blown in and not from the seed bank (Bradley et al. 1992). Fire risk is greatest following a wet, productive year when there is greater production of fine fuels (Beardall and Sylvester 1976). Historically fires were probably patchy due to the low productivity of these sites. Fine fuel loads generally average 100 to 400 pounds per acre (110- 450 kg/ha) but are occasionally as high as 600 pounds per acre (680 kg/ha) in low sagebrush habitat types (Bradley et al. 1992). Recovery time of low sagebrush following fire is variable (Young 1983). After fire, if regeneration conditions are favorable, low sagebrush recovers in 2 to 5 years, however on harsh sites where cover is low to begin with and/or erosion occurs after fire, recovery may require more than 10 years (Young 1983). Slow regeneration may subsequently worsen erosion (Blaisdell et al. 1982).

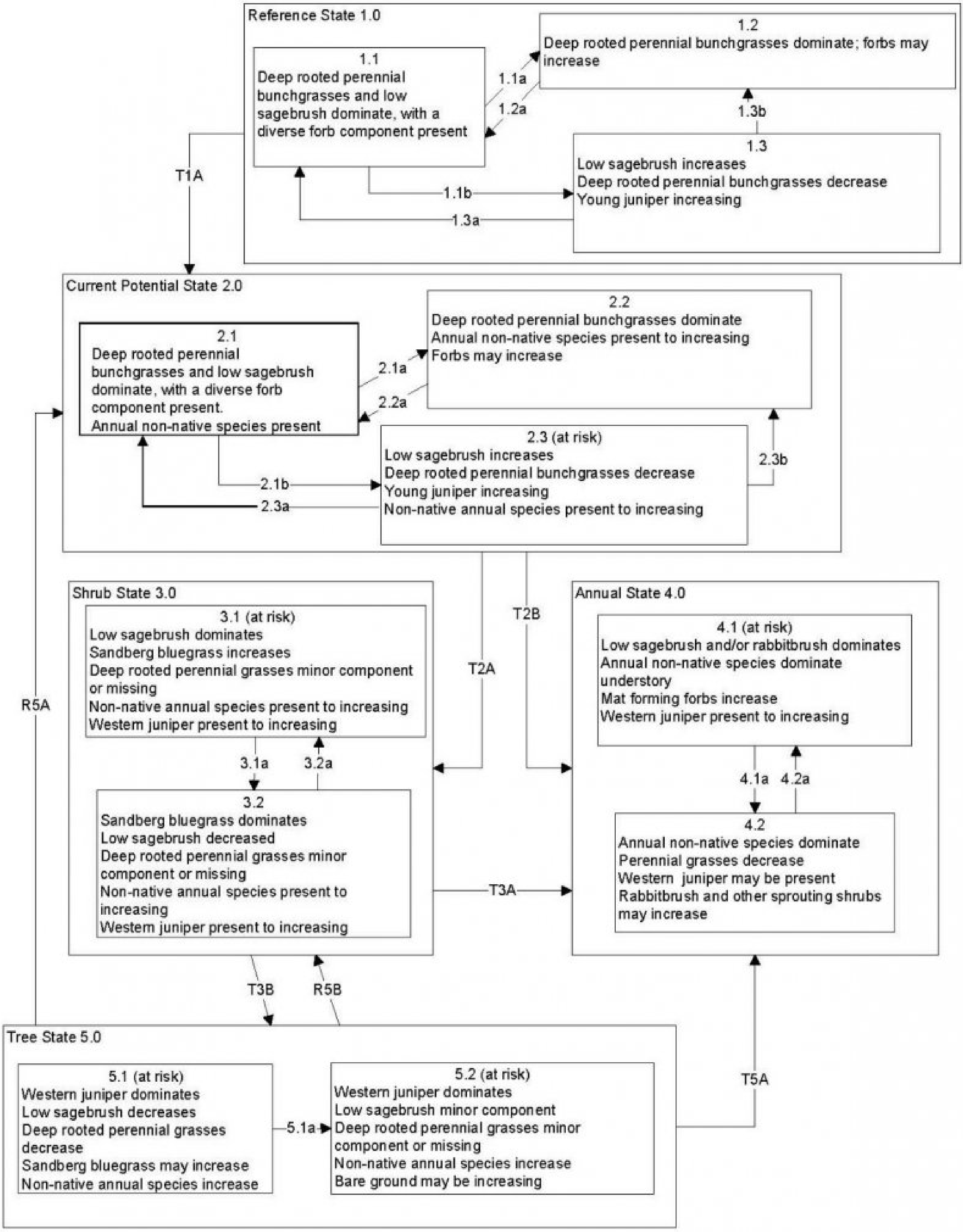
Fire will remove aboveground biomass from bluebunch wheatgrass but plant mortality is generally low (Robberecht and Defossé 1995) because the buds are underground (Conrad and Poulton 1966) or protected by foliage. Uresk et al. (1976) reported burning increased vegetative and reproductive vigor of bluebunch wheatgrass. Thus, while bluebunch wheatgrass may experience slight damage to fire, it is more susceptible in drought years (Young 1983). Plant response will vary depending on season, fire severity, fire intensity and post-fire soil moisture availability.

Sandberg bluegrass (*Poa secunda*), a minor component of this ecological site, has been found to increase following fire likely due to its low stature and productivity (Daubenmire 1975). Sandberg bluegrass may retard reestablishment of deeper rooted bunchgrass.

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

Adapted from: Stringham, T.K. et al., 2016

### State and transition model




(Adapted from Stringham, T.K. et al., 2016)

Reference State 1.0 Community Pathways
1.1a: Low severity fire creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid seral community, dominated by grasses and forbs.
1.1b: Time and lack of disturbance. Excessive herbivory and/or long-term drought may also reduce perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: Low severity fire creates sagebrush/grass mosaic.
1.3b: Moderate severity fire significantly reduces sagebrush cover and leads to early/mid seral community, dominated by grasses and forbs.

Transition T1A: Introduction of non-native species

Current Potential State 2.0 Community Pathways
2.1a: Low severity fire creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid seral community, dominated by grasses and forbs.
2.1b: Time and lack of disturbance. Inappropriate grazing management and/or long-term drought may also reduce perennial understory.
2.2a: Time and lack of disturbance allows for shrub regeneration.
2.3a: Low severity fire creates sagebrush/grass mosaic. Brush treatments with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush would reduce the shrub overstory.
2.3b:Moderate severity fire significantly reduces sagebrush cover and leads to early/mid seral community, dominated by grasses and forbs.

Transition T2A: Grazing management favoring shrubs and/or severe drought will reduce the perennial bunchgrasses in the understory (3.1)
Transition T2B: Catastrophic fire and/or soil disturbing treatments such as drill seeding, roller chopper, Lawson aerator etc. Probability of success of seeding on this site is low (4.2). Inappropriate grazing management in the presence of non-native annual species, may be combin with higher than normal spring precipitation (4.1).

Shrub State 3.0 Community Pathways
3.1a: Fire.
3.2a: Time without disturbance.

Transition T3A: Catastrophic fire, multiple fires, and/or soil disturbing treatments (4.2), Inappropriate grazing management in the presence of non-native species, may be combined with higher than normal spring precipitation (4.1). Bare ground levels depend on variations in annual precipitation
Transition T3B: Time and lack of disturbance allows for maturation of the tree community.

Annual State 4.0 Community Pathways
4.1: Fire
4.2: Time without disturbance

Restoration R4A: Herbicide treatment may be coupled with seeding of desired species.

Tree State 5.0 Community Pathways
5.1: Time and lack of disturbance allows for maturation of the tree community

Transition T5A: Catastrophic fire (4.2)

Restoration R5A: Mechanical treatment of trees coupled with seeding of desired species success of seeding on this site is low. (likely from 5.1
Restoration R5B: Mechanical treatment of trees (likely from 5.1)

(Stringham et al., 2016)

### State 1
### Historical Reference state

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The reference state has 3 general community phases; a shrub-grass dominant phase, a perennial grass dominant phase and a shrub dominant phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These 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.

#### Dominant plant species

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

### Community 1.1

### Reference community phase

This is the is the reference plant community phase. It is dominated by low sagebrush, Idaho fescue, and bluebunch wheatgrass, with Sandberg bluegrass and one-spike danthonia being common. A variety of forbs including buckwheat (Erioganum spp., serrate balsamroot (Balsamorhiza saggitata), western yarrow (*Achillea millefolium*) and phlox (Phlox spp.) are present.

### Community 1.2

This phase is expressed with normal fire frequency when low sagebrush is significantly reduced and any juniper seedlings and saplings that may be present are eliminated. In this phase the density of low sagebrush and other shrubs are significantly reduced and the dominant visual aspect of the site is perennial grasses with few forbs and low sagebrush. Over time with the absence of fire and proper grazing the low sagebrush and other shrubs reestablish, annual forbs are reduced and the plant community pathway moves back toward the reference plant community.

### Community 1.3

This phase is dominated by low sagebrush with decreased amounts of perennial grasses and if juniper is present there is an increase in juniper seedlings and saplings.

### Pathway P1.1a
### Community 1.1 to 1.2

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

### Pathway P1.1b
### Community 1.1 to 1.3

Time and lack of disturbance, excessive herbivory and/or long-term drought

### Pathway P1.2a
### Community 1.2 to 1.1

Time and lack of disturbance allows for shrub regeneration.

### Pathway P1.3a
### Community 1.3 to 1.1

Low severity fire creates sagebrush/grass mosaic.

### Pathway P1.3b
### Community 1.3 to 1.2

Moderate severity fire significantly reduces sagebrush cover and leads to early/mid seral community, dominated by grasses and forbs.

### State 2
### Current potential state

This state is similar to the Reference State 1.0 with three similar community phases. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These 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. Positive feedbacks decrease ecosystem resilience and stability of the state. Processes and characteristics that contribute to positive feedbacks include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

**Dominant plant species**

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

## State 3
## Shrub state

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

**Dominant plant species**

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

## State 4
## Annual state

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

**Dominant plant species**

- little sagebrush (*Artemisia arbuscula*), shrub
- cheatgrass (*Bromus tectorum*), grass
- North Africa grass (*Ventenata dubia*), grass
- medusahead (*Taeniatherum caput-medusae*), grass

## State 5
## Woodland state

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

**Dominant plant species**

- western juniper (*Juniperus occidentalis*), tree

## Transition T1A
## State 1 to 2

Introduction of non-native species

## Transition T2A
## State 2 to 3

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

### Transition T2B
### State 2 to 4

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

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

### Transition T3A
### State 3 to 4

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

### Transition T3B
### State 3 to 5

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

### Restoration pathway R5A
### State 5 to 2

Mechanical treatment of trees coupled with seeding of desired species

**Context dependence.** Probability of seeding success on this site is low

### Restoration pathway R5B
### State 5 to 3

Mechanical treatment of trees

### Transition T5A
### State 5 to 4

Catastrophic fire

## Additional community tables

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### Contributors

Jennifer Moffitt - Original concept developed for 2020 PES initiative
Andrew Neary - Further concept development 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 | 05/06/2024 |
| Approved by | Kirt Walstad |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

### Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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

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

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

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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:**