

## Ecological site R012XY037ID Ceanothus Thicket 16-22 PZ CEVE

Last updated: 9/22/2020  
Accessed: 04/18/2024

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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): 012X–Lost River Valleys and Mountains

Land Resource Region: B (Northwestern Wheat and Range)  
MLRA: 12 (Lost River Valleys and Mountains)

EPA EcoRegion: Level III (Middle Rockies)

### LRU notes

012X-Lost River Valleys and Mountains

Precipitation or Climate Zone: 16-22" P.Z.  
<https://soils.usda.gov/survey/geography/mlra/index.html>

### Ecological site concept

Site receives additional water. These areas are snow drift areas that retain snow longer into the growing season

Soils are:

not saline or saline-sodic.

Shallow, with >35% gravels (<3") and cobbles (3-10") cover. skeletal within 20" of soil surface, fragment percentage increasing with depth

Not strongly or violently effervescent in surface mineral 10".

textures usually range from sandy loam to silty loam in surface mineral 4".

Slope is < 30%.

Clay content is = <35% in surface mineral 4".

Site does not have an argillic horizon with > 35% clay

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Ceanothus velutinus</i>
Herbaceous	Not specified

### Physiographic features

This site occurs on convex hilltops and shoulder slopes of high elevation plateaus. Slopes range from 2-30 percent and elevation ranges from 6000-7500 feet (1800-2300 meters). The site occurs on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Plateau
Elevation	6,000–7,500 ft
Slope	2–30%

## Climatic features

MLRA 12 is dominated by dramatic changes in elevation which, in turn, influence local weather patterns. The intermontane valleys have elevations as low as 3800 feet, while the adjacent mountains may reach more than 12,600 feet. The average annual precipitation for the entire MLRA, based on 10 long term climate stations located throughout the MLRA, is approximately 9.38 inches. However, the dry valleys may have averages as low as 6 inches, while the upper peaks may have averages that exceed 46 inches per year.

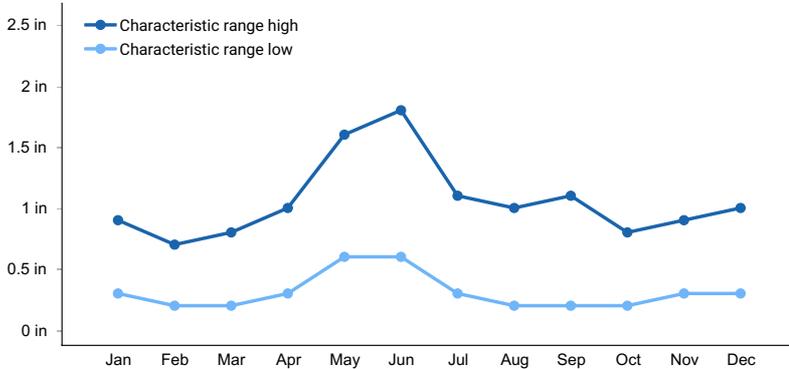
Temperatures vary considerably over the year. The average annual temperature is 42.25 degrees F. The average low is 27.4 degrees while the average high temperature is 57 degrees.

In the summer the sun shines 78% of the time, but drops to 40% in the winter. The prevailing wind is location-dependent, and generally flows parallel to the orientation of the dominant valleys. In the summer localized afternoon upslope winds and evening downslope winds are common. The average windspeed is greatest in the spring and early summer.

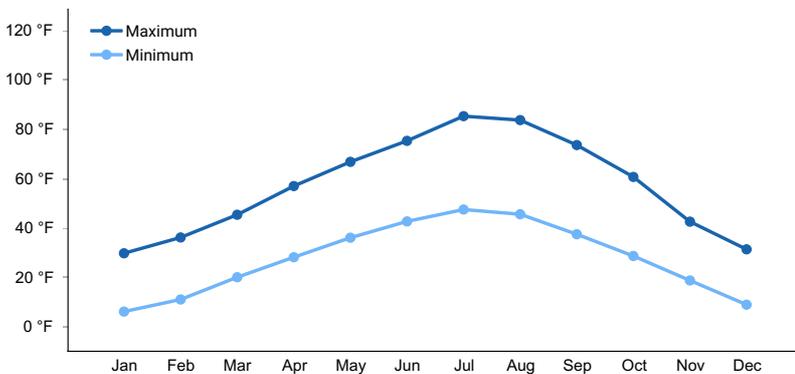
The frost free period ranges from 102 to 107 days while the freeze free period ranges from 134 to 139 days across the MLRA.

**Table 3. Representative climatic features**

Frost-free period (average)	107 days
Freeze-free period (average)	139 days
Precipitation total (average)	11 in



**Figure 1. Monthly precipitation range**



**Figure 2. Monthly average minimum and maximum temperature**

## Influencing water features

This site is not influenced by adjacent wetlands, streams or run on.

## Soil features

The soils on this site are loams. The surface layer is gravelly loam about 10 inches thick. The subsoil is usually very cobbly loam or very cobbly clay loam to a depth of about 25 inches on very flaggy to extremely flaggy loam or sandy loam to 40-60 inches. The available water holding capacity (AWC) is low to moderate and permeability is moderately slow to moderate. Often the soils contain boulders. Most soils are acid.

## Ecological dynamics

The dominant visual aspect is snowbrush ceanothus. Composition by weight is approximately 5-10 percent grasses, 5 to 10 percent forbs and 80 to 85 percent shrubs.

During the last few thousand years, this site has evolved in an arid climate characterized by dry summers and cold, wet winters. Herbivory has historically occurred on this site at low levels of utilization. Herbivores include mule deer, Rocky Mountain elk, moose, and lagomorphs.

Fire has historically occurred on the site at intervals of 20-40 years. If the fire frequency becomes much longer than normal, this site could become dominated in the overstory by Douglas fir.

The Historic Climax Plant Community (HCPC), the Reference State (State 1), moves through many phases depending on the natural and man-made forces that impact the community over time. State 1, described later, indicates some of these phases. The Reference Plant Community Phase is Phase A. This plant community is dominated by snowbrush ceanothus with minor amounts of grasses and forbs in the understory. Major understory species include mountain brome, slender wheatgrass, Columbia needlegrass, field mint and mountain big sagebrush. The plant species composition of Phase A is listed later under "Reference Plant Community Phase Plant Species Composition".

Total annual production is 1250 pounds per acre (1400 kilograms per hectare) in a normal year. Production in a favorable year is 1750 pounds per acre (1960 kilograms per hectare). Production in an unfavorable year is 750 pounds per acre (840 kilograms per hectare). Structurally, tall shrubs are very dominant, followed by cool season deep-rooted perennial bunchgrasses being about equal to perennial forbs.

### FUNCTION:

This site is well suited for deer, elk, moose, raptors and other wildlife in summer and early fall. It is used by livestock in the summer but is not well suited to domestic grazing due to low amounts of grass and forbs and low palatability of the shrubs. The site has high value of hunting, hiking and horseback riding.

Due to the relatively high rainfall, elevation and favorable cool-season growing conditions, it is fairly resistant to disturbances that can potentially degrade the site.

Due to the relatively high production and deep soils, infiltration is normally high and runoff moderately low. Runoff, when it does occur is non-erosive except during high intensity convection storms. Snow accumulates on the site due to high elevation and presence of tall shrubs.

### Impacts on the Plant Community.

#### Influence of fire:

In the absence of normal fire frequency, shrubs, particularly mountain big sagebrush, can gradually increase. Snowbrush ceanothus dies out or becomes decadent. Rocky Mountain juniper or Douglas fir can invade the site if a seed source is in the proximity. Grasses and forbs decrease as shrubs increase. With the continued absence of fire, juniper can displace most of the shrubs and other understory species. See "Influence of juniper invasion" below. Douglas fir can also gradually invade the site. These trees are usually stunted, irregular or poorly shaped.

When fires become more frequent than historic levels (20-40 years), snowbrush ceanothus will maintain itself in the community or increase due to sprouting. Mountain big sagebrush is reduced significantly. With continued short fire frequency, mountain big sagebrush can be completely eliminated along with many of the desirable understory species such as mountain brome. These species will be replaced by Kentucky bluegrass and slender wheatgrass

along with a variety of annual and perennial forbs including noxious and invasive plants. Mountain snowberry will increase due to sprouting.

#### Influence of improper grazing management:

Season-long grazing and/or excessive utilization can be very detrimental to this site. This type of management leads to reduced vigor of the bunchgrasses. With reduced vigor, recruitment of these species declines. As these species decline, the plant community becomes susceptible to Rocky Mountain juniper invasion, an increase in mountain big sagebrush, snowbrush ceanothus and noxious and invasive plants.

Continued improper grazing management influences fire frequency by increasing fine fuels that carry fire.

Proper grazing management that addresses frequency, duration and intensity of grazing can also keep fine fuels from developing, thereby reducing fire frequency. This can lead to gradual increases in mountain big sagebrush, snowbrush ceanothus and/or Rocky Mountain juniper. A planned grazing system can be developed to intentionally accumulate fine fuels in preparation for a prescribed burn. A prescribed burn will help to maintain a snowbrush ceanothus plant community.

#### Weather influences:

Above normal precipitation in April, May and June can dramatically increase total annual production of the plant community. These weather patterns can also increase viable seed production of desirable species to provide for recruitment. Likewise, below normal precipitation during these spring months can significantly reduce total annual production and be detrimental to viable seed production. Overall plant composition is normally not affected when perennials have good vigor.

Below normal temperatures in the spring can have an adverse impact on total production regardless of the precipitation. An early, hard freeze can occasionally kill some plants.

Prolonged drought adversely affects this plant community in several ways. Vigor, recruitment and production are usually reduced. Mortality can occur. Prolonged drought can lead to a reduction in fire frequency.

#### Influence of insects and disease:

Outbreaks can affect vegetation health. An outbreak of a particular insect is usually influenced by weather but no specific data for this site is available. Mormon cricket and grasshopper outbreaks occur periodically. Outbreaks seldom cause plant mortality since defoliation of the plant occurs only once during the year of the outbreak. Snow mold can adversely affect the health of mountain big sagebrush.

#### Influence of noxious and invasive plants:

Many of these species add to the fine-fuel component and lead to increased fire frequency. Perennial and annual invasive species compete with desirable plants for moisture and nutrients. The result is reduced production and change in composition of the understory.

#### Influence of wildlife:

Big game animals use this site in the summer and fall. Their numbers are seldom high enough to adversely affect the plant community.

#### Watershed:

Decreased infiltration and increased runoff occur with the invasion of Rocky Mountain juniper. Juniper invasion can be triggered by lack of fire, poor grazing management and prolonged drought. The increased runoff also causes sheet and rill erosion. Abnormally short fire frequency also gives the same results, but to a lesser degree. The long-term effect is a transition to a different state.

#### Influence of juniper invasion:

The following discussion deals with Rocky Mountain juniper.

In plant communities that are invaded by juniper, the species has a competitive advantage for the following reasons:

- Juniper is very drought tolerant.
- It has the ability to extract soil moisture from a wide range of soil depths.
- Juniper has high evapo-transpiration rates.
- The species intercepts rain and snow before it reaches the soil surface.
- It has the ability to grow as long as there is soil moisture and the temperature is above freezing.
- Juniper has a relatively rapid growth rate and is long-lived. It can readily over-top shade intolerant species which leads to mortality.
- Nutrient cycling is reduced.
- As the canopy closes, juniper gains control of energy capture.

As juniper extracts water, other plants are unable to acquire sufficient water and nutrients to sustain growth and reproduction, thus reducing cover and biomass in the interspaces. After the canopy closes, there is sufficient soil moisture available for shallow-rooted, shade tolerant species to persist directly under the tree.

The following hydrological impacts occur on sites invaded by juniper:

- Infiltration in the interspaces is reduced.
- Run-off increases resulting in increased sheet and rill erosion with elevated sediment loads.
- Soil temperatures increase in the interspaces which results in accelerated drying of the soil surface.
- Increased bare ground in the interspaces.
- Soil moisture storage is reduced.

As bare ground and interconnectiveness of bare ground increases, flow rates are accelerated (reduction of flow sinuosity) and run-off out of the area increases.

Degradation of these systems can result in the formation of a feedback cycle in which greater juniper cover and density results in greater plant and soil disturbance between the canopies.

In summary, a closed juniper community takes control of the following ecological processes: (1) hydrology, (2) energy capture and (3) nutrient cycling. The changes are primarily driven by the hydrologic processes. The development of a closed juniper canopy always results in a transition across the threshold to a different state. Generally, when juniper canopy cover nears 20%, the plant community is approaching the threshold.

Plant Community and Sequence:

Transition pathways between common vegetation states and phases:

State 1.

Phase A to B. Develops in the absence of fire and improper grazing management. There is a Rocky Mountain juniper seed source present in the vicinity near the site.

Phase A to C. Results from a fire or prescribed burning.

Phase A to D. Results from improper grazing management and no fire. There is no Rocky Mountain juniper seed source present in the vicinity.

Phase B to C. Results from a wildfire or brush management.

Phase B to A. Occurs with prescribed grazing and brush management or prescribed burning.

Phase C to A. Results from prescribed grazing and no fire.

Phase D to A. Occurs with prescribed grazing.

Phase D to C. Occurs with fire or prescribed burning and prescribed grazing.

Phase C to D. Occurs with no fire and improper grazing management.

State 1 Phase C and D to State 2. Develops through frequent fire and improper grazing management. This site has crossed the threshold. It is economically impractical to return this state to State 1 with accelerated practices.

State 1, Phase B to State 3. Develops with no fire and improper grazing management from a juniper invaded phase of State 1. This site has crossed the threshold. It is economically impractical to return this state to State 1 with accelerated practices.

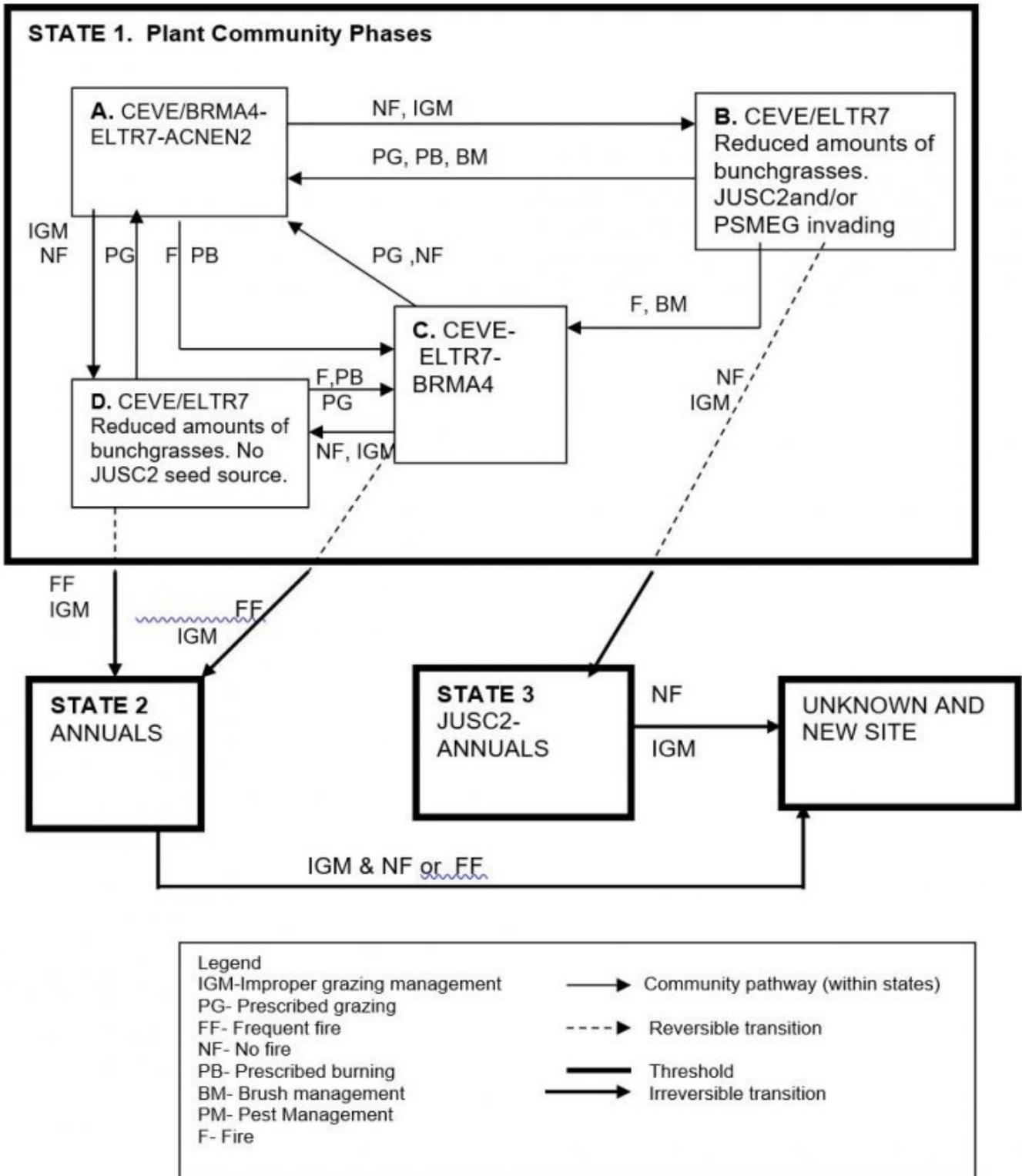
State 2 to unknown site. Excessive soil loss and changes in the hydrologic cycle caused by improper grazing management and no fire or frequent fire cause this state to cross the threshold and retrogress to a new site with reduced potential. It is economically impractical to return this state to State 1 with accelerated practices.

State 3 to unknown site. Continued lack of fire or improper grazing management cause this state to cross the threshold and retrogress to a new site with reduced potential due to significant soil loss and changes in hydrology. It is economically impractical to return this state to State 1 with accelerated practices.

Practice Limitations.

This site has limited value for livestock grazing due to low amounts of palatable species. This site is not recommended for rangeland seeding or other accelerating practices due the limited size of the site, low pH, and bouldery character of the soils.

## **State and transition model**



PLANT LEGEND STATES 1, 2, & 3  
 CEVE - Snowbrush ~~Ceanothus~~  
 JUSC2 - Rocky Mountain Juniper  
 PSMEG - Douglas Fir  
 BRMA4 - Mountain Brome  
 ELTR7 - Slender Wheatgrass  
 ACNEN2- Columbia Wheatgrass

**State 1**  
**State 1, Phase A. Reference Plant Community Phase.**

**Community 1.1**

## **State 1, Phase A. Reference Plant Community Phase.**

This plant community is dominated by snowbrush ceanothus with minor amounts of grasses and forbs in the understory. Major understory species include mountain brome, slender wheatgrass, Columbia needlegrass, field mint and mountain big sagebrush. Natural fire frequency is 20-40 years.

## **State 2 State 1, Phase B.**

### **Community 2.1 State 1, Phase B.**

This plant community is dominated in the overstory by snowbrush ceanothus with some Rocky Mountain juniper seedlings and saplings invading. Slender wheatgrass is the dominant understory species with reduced amounts of mountain brome. All perennial grasses are in low vigor. A Rocky Mountain juniper seed source is present in nearby sites. Some Kentucky bluegrass may have invaded the site. Douglas fir can also invade and increase on the site in the absence of normal fire frequency and a seed source nearby. This state has developed due to fire frequency being much longer than normal and improper grazing management.

## **State 3 State 1, Phase C.**

### **Community 3.1 State 1, Phase C.**

This plant community is dominated by snowbrush ceanothus with some slender wheatgrass and mountain brome. Letterman and Columbia needlegrass have decreased and may have died out due to fire. There are a few other shrubs that have resprouted in addition to snowbrush ceanothus. Kentucky bluegrass may have invaded the site. The community is a result of recent wildfire or prescribed burning.

## **State 4 State 1, Phase D**

### **Community 4.1 State 1, Phase D**

This plant community is dominated by snowbrush ceanothus in the overstory with significantly reduced amounts of mountain brome and in reduced vigor. Other bunchgrasses have been reduced and are in low vigor. Mountain big sagebrush may have increased. There is no Rocky Mountain juniper seed source in the proximity. Some Kentucky bluegrass may have invaded the site. This plant community has developed due to improper grazing management and no fire.

## **State 5 State 2.**

### **Community 5.1 State 2.**

This plant community is dominated by annuals and some perennial forbs. There may be a variety of invasive forbs and some noxious plants may have invaded the site. Some soil loss has occurred. The community has developed due to frequent fire and continued improper grazing management. This site has crossed the threshold. It is economically impractical to return this state to State 1 with accelerated practices.

## **State 6 State 3**

## **Community 6.1**

### **State 3**

This plant community is dominated by Rocky Mountain juniper with annuals in the understory. There is a Rocky Mountain juniper seed source in the proximity. There are few shrubs present due to competition from junipers. Some deep-rooted perennials may be present under the junipers. Generally, shrub cover is below 10-15%, bare ground is above 25-30% and juniper cover is greater than 20% when the plant community crosses the threshold. Some soil loss has occurred. This plant community has developed due to the lack of fire and continued improper grazing management. This site has crossed the threshold. It is economically impractical to return this community to State 1 with accelerated practices.

### **State 7**

#### **Unknown new site**

### **Community 7.1**

#### **Unknown new site**

This plant community has gone over the threshold to a new site. Site potential has been reduced. Significant soil loss has occurred. Infiltration has been reduced and run-off has become more rapid. This state has developed due to continued improper grazing management and no fire or frequent fires from State 2 or the continued absence of fire and improper grazing management from State 3 where a juniper seed source is present.

## **Additional community tables**

### **Animal community**

Wildlife Interpretations.

Animal Community – Wildlife Interpretations

This plant community is dominated by ceanothus offering excellent forage and cover habitat for small mammals, birds, and large mammals. Mule deer, elk, and moose are the large herbivores using the site. The plant community provides seasonal habitat for resident and migratory animals including western toad, shrews, ground squirrels, mice, coyote, red fox, and badger. Merriam's shrew is an area sensitive species. Encroachment of noxious and invasive plant species (Kentucky bluegrass and juniper) in isolated areas can replace native plant species which provide critical feed, brood-rearing, and nesting cover for a variety of native wildlife. Water features are sparse provided by artificial water catchments and springs.

State 1 Phase 1.1 – Snowbrush Ceanothus/ Mountain Brome/ Slender Wheatgrass/ Columbia Wheatgrass Reference Plant Community (RPC) This plant community provides a diversity of grasses, forbs, and shrubs used throughout the growing season by native insect communities that assist in pollination. Reptiles may use this plant community for escape cover. Amphibians (western toad and northern leopard frog) may be associated with springs and isolated water bodies adjacent to this plant community. Development of spring sites that collect all available water would exclude amphibian use on these sites. The diverse vertical structure offers habitat for many bird species including mountain bluebird, rock wren, grouse, and flycatchers. The plant community provides important forage for large mammals including mule deer, elk, and moose in the spring, summer, fall, and winter. Ceanothus is a favorable winter browse for large mammals. The site provides thermal cover and young of year cover for mule deer and elk. A small mammal population including deer mouse, woodrat, golden-mantled ground squirrels, Wyoming ground squirrel, Merriam's shrew, and Idaho pocket gopher would utilize this site and adjacent open areas.

State 1 Phase 1.2 – Snowbrush Ceanothus / Slender Wheatgrass/ Rocky Mountain Juniper Plant Community: This plant community is the result of improper grazing management and no fire. Insect diversity may be lowered due to the reduction of forbs. Reptiles may use this plant community for escape cover. Amphibian habitat would be tied to permanent spring sites in the area. Bird species utilizing the site would be similar to State 1 Phase 1.1. As juniper increases, habitat for Brewer's sparrow, sage thrasher, and sage sparrow may increase. Mule deer, elk, and moose would still browse the ceanothus but as juniper encroaches, the quality of browse will be lowered. The site would still provide thermal cover and young of year cover for large mammals. A small mammal population including deer

mouse, woodrat, golden-mantled ground squirrels, Wyoming ground squirrel, Merriam's shrew, and Idaho pocket gopher would utilize this community.

**State 1 Phase 1.3- Snowbrush Ceanothus / Slender Wheatgrass/ Mountain Brome Plant Community:** This phase has developed due to fire. The plant community is similar to State 1 Phase 1.1 and would support a similar invertebrate community. The diverse vertical structure offers habitat for many bird species including mountain bluebird, rock wren, grouse, and flycatchers. The plant community provides important forage for large mammals including mule deer, elk, and moose in the spring, summer, fall, and winter. Ceanothus is a favorable winter browse for large mammals. The site provides thermal cover and young of year cover for mule deer and elk. A small mammal population including deer mouse, woodrat, golden-mantled ground squirrels, Wyoming ground squirrel, Merriam's shrew, and Idaho pocket gopher would utilize this site and adjacent open areas.

**State 1 Phase 1.2 – Snowbrush Ceanothus/ Mountain Big Sagebrush/ Slender Wheatgrass Plant Community:** This plant community is the result of improper grazing and no fire. An increase in canopy cover of mountain big sagebrush contributes to a sparse herbaceous understory. A reduced herbaceous understory results in lower diversity and numbers of insects. The reptile community will be similar to State 1 Phase 1.1. The reduced diversity of insects and understory cover may reduce quality of food and cover for reptile populations. As sagebrush increases, habitat for Brewer's sparrow, sage thrasher, and sage sparrow may increase. The plant community provides browse year round for mule deer, elk, and moose. The site will continue to provide thermal cover and young of year cover for large mammals. A small mammal population including golden-mantled ground squirrels, jackrabbits, deer mice, and Great Basin kangaroo rats may utilize this site and adjacent open areas.

**State 2 – Annuals Plant Community:** This state has developed due to improper grazing management and frequent fire. The loss of all shrubs and significant reduction of native forbs and grasses will reduce insect diversity on the site. The lack of flowering plants reduces use by pollinators like butterflies and moths. Quality of cover and food habitat for reptiles would decline with the loss of understory vegetation and shrubs. Hunting success by raptors may increase due to the poor cover provided for prey. Mule deer and elk may utilize the herbaceous vegetation in the early part of the year when the invasive annuals (cheatgrass) are more palatable. At other times of the year, large mammals would not regularly utilize these areas due to poor food and cover conditions.

**State 3 – Rocky Mountain Juniper/ Annuals Plant Community:** This state has developed due to improper grazing management and no fire. The loss of native understory vegetation will reduce insect diversity on the site. Most reptilian species identified in State 1 Phase 1.1 are not supported with food, water, or cover. Birds using this site as resident or migratory habitat include Juniper titmouse, western bluebird, and Virginia's warbler. The Juniper titmouse relies heavily on juniper seeds for winter food. Hunting success by raptors may decrease due to a heavy overstory of juniper. The plant community supports limited seasonal habitat for mule deer and elk in the spring and fall. As juniper encroaches, the site will provide additional thermal cover and young of year cover for large mammals

#### Grazing Interpretations.

This site is used by livestock in the summer but is not well suited to domestic grazing due to low amounts of grass and forbs and the low palatability of the shrubs. The site has high value of hunting, hiking and horseback riding.

Estimated initial stocking rate will be determined with the landowner or decision-maker. They will be based on the inventory which includes species, composition, similarity index, production, past use history, season of use and seasonal preference. Calculations used to determine estimated initial stocking rate will be based on forage preference ratings.

### **Hydrological functions**

Soils on this site are in hydrologic group B. Due to the relatively high production and deep soils, infiltration is normally high and runoff moderately low. Runoff, when it does occur, is non-erosive except during high intensity convection storms. Snow accumulates on the site due to high elevation and presence of tall shrubs.

### **Recreational uses**

This site provides fair opportunities for big game hunting. Aesthetic value is derived from the landscape diversity of

the site.

## **Wood products**

None.

## **Other products**

None.

## **Inventory data references**

Information presented here has been derived from NRCS clipping and other inventory data. Also, field knowledge of range-trained personnel was used.

Those involved in developing this site description include

Dave Franzen, co-owner, Intermountain Rangeland Consultants, LLC

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Brendan Brazee, State Rangeland Management Specialist, NRCS, Idaho

Lee Brooks, Range Management Specialist, IASCD

Kristen May, Resource Soil Scientist, NRCS, Idaho

## **Other references**

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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**

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## **Approval**

Kendra Moseley, 9/22/2020

## **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)	
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Date	01/16/2008
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

- 1. Number and extent of rills:** Rills rarely occur on this site. If rills are present, they are most likely to occur on slopes greater than 15 percent and immediately following wildfire. Rills are most likely to occur on soils with surface textures of silt loam.

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- 2. Presence of water flow patterns:** Water flow patterns rarely occur on this site. When they occur, they are most likely to occur on slopes greater than 15 percent; are short, disrupted by cool season perennial grasses and tall shrubs and are not extensive.

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- 3. Number and height of erosional pedestals or terracettes:** Both are rare on this site. In areas where flow patterns and /or rills are present, a few pedestals may be expected.

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- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Data not available. On sites in mid-seral status, bare ground may range from 20-40 percent.

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

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- 6. Extent of wind scoured, blowouts and/or depositional areas:** Wind scoured, blowouts and/or depositional areas usually do not occur.

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- 7. Amount of litter movement (describe size and distance expected to travel):** Fine litter in the interspaces may move up to 2 feet following a significant run-off event. Terracettes and bunchgrass can trap fine litter. Coarse litter generally does not move.

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

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Bunchgrasses, especially deep-rooted, slow run-off and increase infiltration. Shrubs accumulate snow in the interspaces.
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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):** Compaction layer is not present.
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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:
- Sub-dominant:
- Other:
- Additional:
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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Snowbrush will become decadent in the absence of fire. Grass and forb mortality will occur as tall shrubs increase immediately following a wildfire.
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14. **Average percent litter cover (%) and depth ( in):** Annual litter cover in the interspaces will be 20-30 percent to a depth of <0.2. Under the mature shrubs litter is greater than 0.5 inches. Fine litter can accumulate on the terracettes.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production is 1250 lbs. per acre in a year with normal precipitation and temperatures. Perennial grasses produce 5-10 percent of the total, forbs 5-10 percent and shrubs 80-85 percent.
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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:** Invasive species includes Kentucky bluegrass, Rocky Mountain juniper, spotted and diffuse knapweed, leafy spurge and Canada thistle.
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17. **Perennial plant reproductive capability:** All functional groups have the potential to reproduce in most years.

