

## **Ecological site R023XY022NV WELL DRAINED FAN 12-14 P.Z.**

Last updated: 4/10/2025  
Accessed: 12/19/2025

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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.

### **Ecological site concept**

Currently there is only a draft of the initial concept for this ecological site. The initial concept for this site places it within the Loamy 10-20 PZ Mountain Big Sagebrush and Bluebunch Wheatgrass Ecological Site Group. To view the General STM and other information available for this ESG please go to <https://edit.jornada.nmsu.edu/catalogs/esg/023X/R023XY905NV>

This site is slightly less productive with 1100 lbs/ac in normal years. Slopes typically range from 2 to 15 percent. Soils are medium textured with moderate to high available water holding capacity. Potential for sheet and rill erosion is moderate. Unlike the modal site, antelope bitterbrush codominates with basin big sagebrush and/or mountain big sagebrush. This site has four states (no tree state).

### **Associated sites**

R023XY020NV	<b>LOAMY 10-12 P.Z.</b>
R023XY031NV	<b>CLAYPAN 10-14 P.Z.</b>

### **Similar sites**

R023XY007NV	<b>LOAMY 14-16 P.Z.</b> FEID-PSSPS codominant; ARTRV only sagebrush spp.
R023XY039NV	<b>LOAMY SLOPE 10-14 P.Z.</b> PSSPS dominant grass; less productive site
R023XY098NV	<b>DEEP LOAMY 10-12 P.Z.</b> PERA4 codominant shrub

R023XY041NV	<b>LOAMY 12-14 P.Z.</b> PSSPS-LECIE4 codominant grasses
R023XY020NV	<b>LOAMY 10-12 P.Z.</b> PSSPS-ACTH7 codominant; less productive site

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Purshia tridentata</i> (2) <i>Artemisia tridentata</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>

## Physiographic features

This site occurs on stream terraces cut into interplateau basins. Slopes range from 2 to 4 percent. Elevations are 5620 to 5680 feet.

**Table 2. Representative physiographic features**

Landforms	(1) Stream terrace
Elevation	5,620–5,680 ft
Slope	2–4%
Aspect	Aspect is not a significant factor

## Climatic features

The climate associated with this site is semiarid and characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 12 to 14 inches. Mean annual air temperature is 43° to 47° F. The average growing season is about 50 to 90 days.

Nevada's climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms, heavy snowfall in the higher mountains, and great location variations with elevation. Three basic geographical factors largely influence Nevada's climate: continentality, latitude, and elevation. Continentality is the most important factor. The strong continental effect is expressed in the form of both dryness and large temperature variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, with the result that the lowlands of Nevada are largely desert or steppes. The temperature regime is also affected by the blocking of the inland-

moving maritime air. Nevada sheltered from maritime winds, has a continental climate with well-developed seasons and the terrain responds quickly to changes in solar heating. Nevada lies within the mid-latitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs. To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with scattered thundershowers. The eastern portion of the state receives significant summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).

Average annual precipitation is 16 to over 20 inches. Mean annual air temperature is 41 to 44 degrees F. The average growing season is about 50 to 70 days.

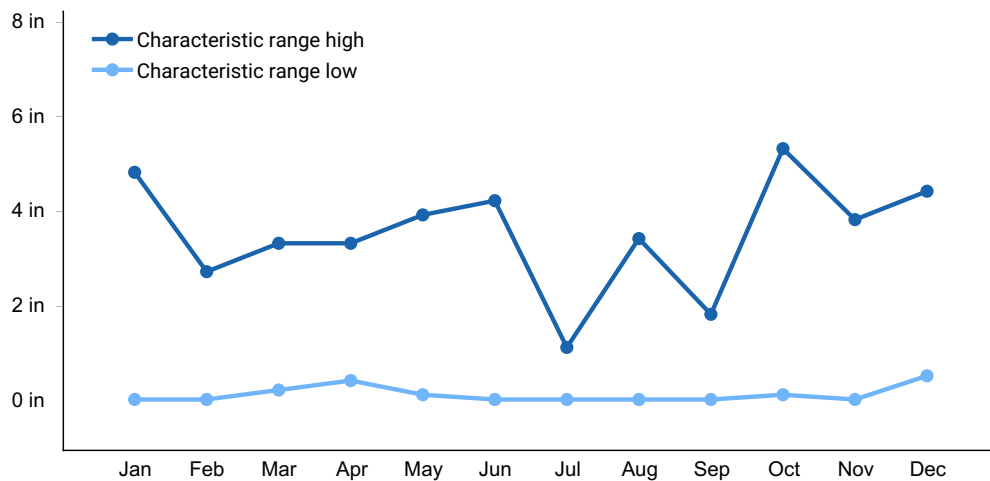
Mean annual precipitation at the Bear Creek, Nevada SNOTEL station (170501020301) is 37.69 inches.

monthly mean precipitation is:

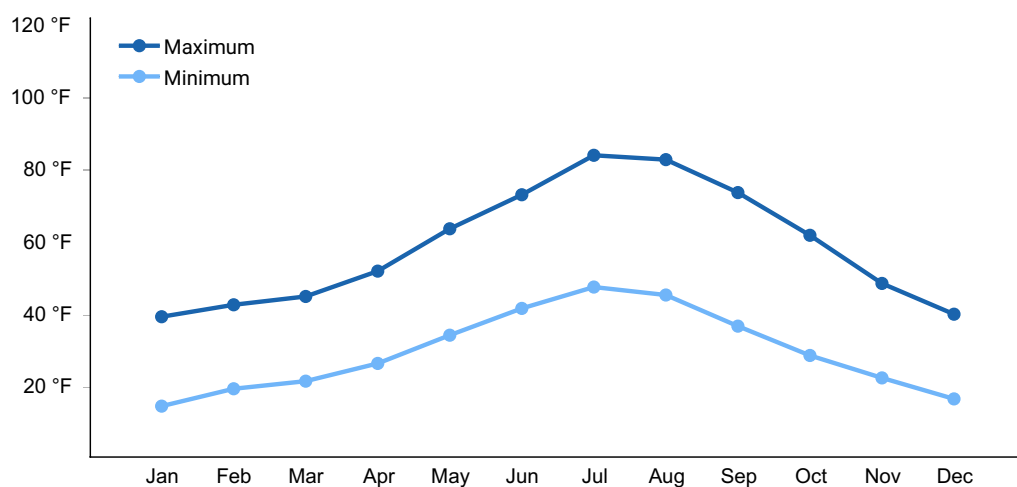
January 3.84; February 3.75; March 4.38; April 4.9;  
May 3.99; June 2.82; July .95; August 1.66;  
September 1.22; October 2.12;  
November 3.67; December 4.38.

**Table 3. Representative climatic features**

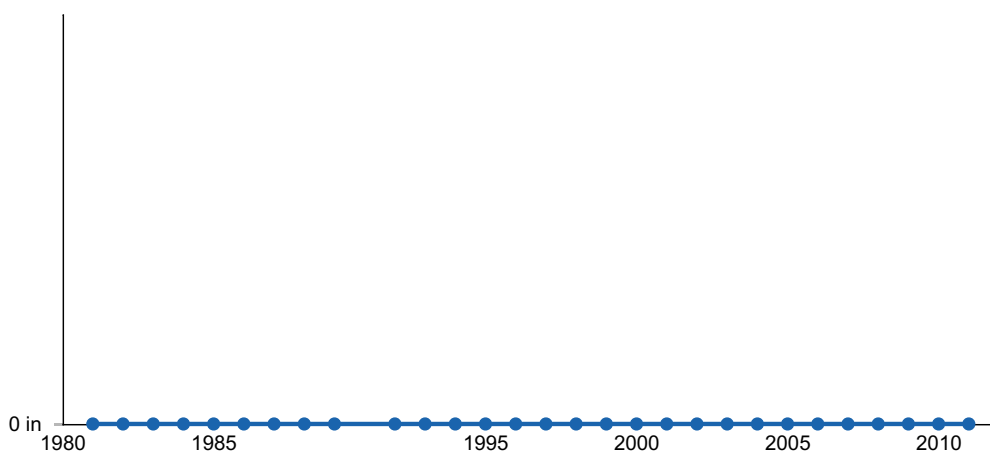
Frost-free period (average)	70 days
Freeze-free period (average)	
Precipitation total (average)	13 in



**Figure 1. Monthly precipitation range**



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



**Figure 3. Annual precipitation pattern**

## Influencing water features

There are no influencing water features associated with this site.

## Soil features

The soils associated with this site have formed in mixed alluvium from volcanic rock sources. The soils are very deep, well drained, and often have gravel strata interspersed through the soil profile. Soils are medium textured with moderate to high available water holding capacity. Potential for sheet and rill erosion is moderate. The soils associated with this site are classified as Torrifluventic Haploxerolls.

**Table 4. Representative soil features**

Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	72–84 in
Available water capacity (0-40in)	0 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.1–7.3

## Ecological dynamics

Where management results in abusive grazing use by livestock and/or feral horses, mountain big sagebrush and rabbitbrush will increase at the expense of Thurber's needlegrass and bluebunch wheatgrass. Moderate to heavy sheep use of this site will decrease abundance of Thurber's needlegrass and bluegrasses. Heavy, early season, cattle or horse use will decrease bluebunch wheatgrass composition in the community. Although late summer-fall use by cattle can impact bitterbrush seedling establishment, cattle use at this time can be managed to maintain a growth form that makes leaf and stem production of bitterbrush more available to big game animals. In the absence of natural fire, western juniper readily invades this site. Cheatgrass and thistle are plant species most likely to invade this site.

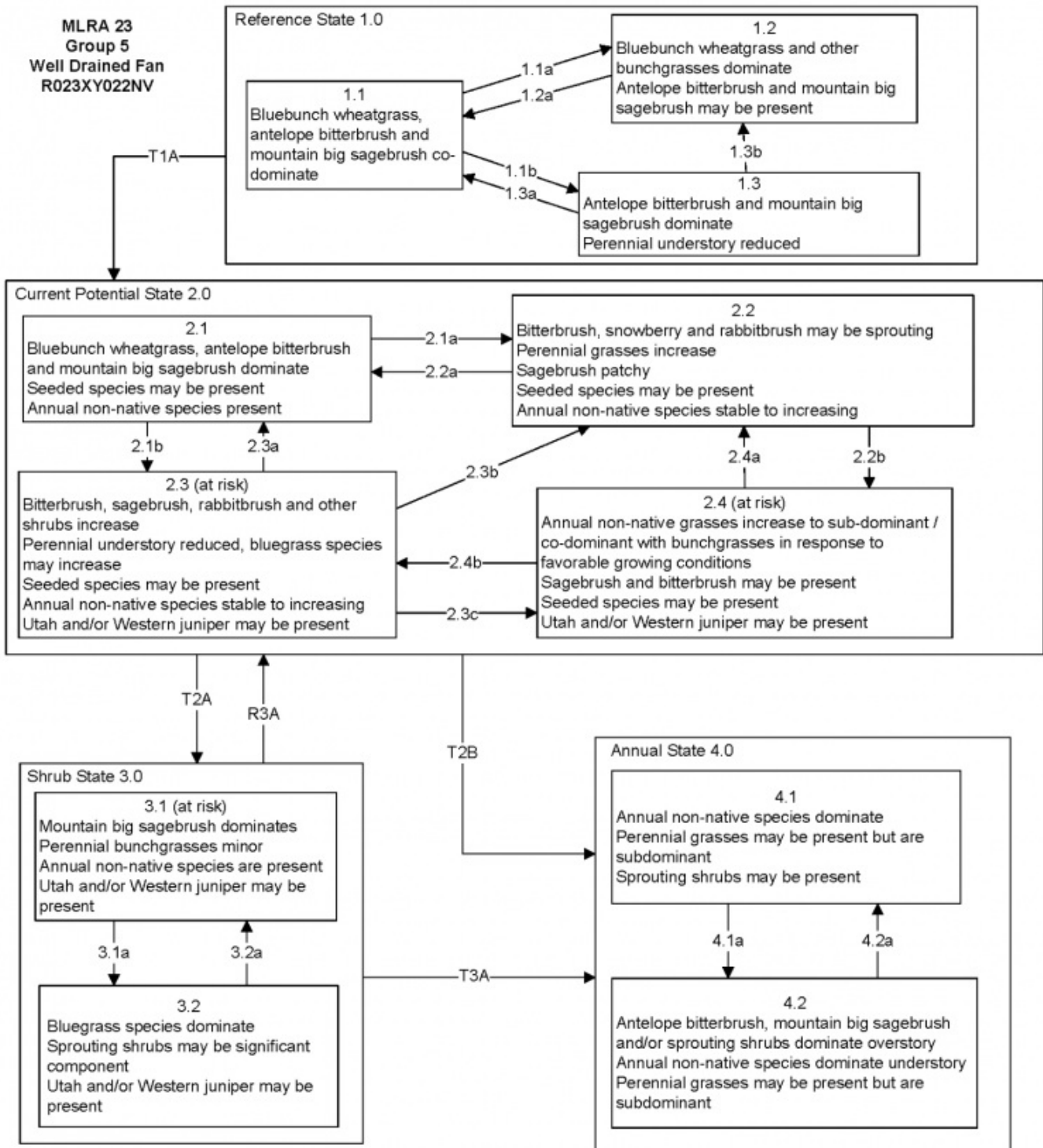
### Fire Ecology:

Presettlement fire return intervals for antelope bitterbrush communities range from 15 to 25 years. Season of burning and environmental conditions have a large impact on antelope bitterbrush ability to survive fire and sprout. Antelope bitterbrush is considered a

weak sprouter and is often killed by summer or fall fire. Antelope bitterbrush in some areas may sprout after light-severity spring fire. High fuel consumptions increase antelope bitterbrush mortality and therefore favors seedling establishment. Basin big sagebrush is readily killed when aboveground plant parts are charred by fire. Prolific seed production from nearby unburned plants coupled with high germination rates enables seedlings to establish rapidly following fire. Burning bluebunch wheatgrass may remove most of the aboveground biomass but does not usually result in plant mortality. Bluebunch wheatgrass is generally favored by burning. Burning stimulates flowering and seed production. However, season of burning affects mortality. Thurber's needlegrass is classified as moderately resistant, but depending on season of burn, phenology, and fire severity, this perennial bunchgrass is moderately to severely damaged by fire. Early season burning is more damaging to this needlegrass than late season burning. Canby's bluegrass is generally unharmed by fire. It produces little litter, and its small bunch size and sparse litter reduces the amount of heat transferred to perennating buds in the soil. Its rapid maturation in the spring also reduces fire damage, since it is dormant when most fires occur.

## **State and transition model**

MLRA 23  
Group 5  
Well Drained Fan  
R023XY022NV



**MLRA 23  
Group 5  
Well Drained Fan  
R023XY022NV  
KEY**

**Reference State 1.0 Community Phase Pathways**

- 1.1a: Low severity fire or Aroga moth infestation creates sagebrush/grass 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 such as fire and/or excessive herbivory and/or chronic drought may also decrease perennial understory.
- 1.2a: Time and lack of disturbance such as fire allows for regeneration of sagebrush.
- 1.3a: Low severity fire or Aroga moth infestation creates sagebrush/grass mosaic.
- 1.3b: High severity fire or severe Aroga moth infestation significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native annual species.

**Current Potential State 2.0 Community Phase Pathways**

- 2.1a: Low severity fire or Aroga moth infestation creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush and leads to early/mid-seral community, dominated by grasses and forbs: non-native annual species present.
- 2.1b: Time and lack of disturbance such as fire and/or inappropriate grazing management and/or chronic drought facilitate an increased shrub overstory and decreased bunchgrass understory.
- 2.2a: Time and lack of disturbance allows for sagebrush reestablishment.
- 2.2b: Fall and spring growing conditions that favors the germination and production of non-native, annual grasses. Pathway typically occurs 3 to 5 years post-fire and 2.4 may be a transitory plant community.
- 2.3a: Low severity fire and/or Aroga moth infestation creates sagebrush/ bunchgrass mosaic. Brush management with minimal soil disturbance.
- 2.3b: High severity fire significantly reduces sagebrush and leads to early/mid-seral community. Brush management with minimal soil disturbance reduces sagebrush.
- 2.3c: Fall and spring growing season conditions that favors the germination and production of non-native annual grasses. 2.4 may be a transitory plant community.
- 2.4a: Fall and spring growing season conditions favoring perennial bunchgrass production and reduced cheatgrass production.
- 2.4b: Fall and spring growing season conditions unfavorable to cheatgrass production.

Transition T2A: Time and lack of disturbance such as fire combined with inappropriate grazing management (3.1).

Transition T2B: Multiple fires (4.1), inappropriate grazing management in the presence of annual non-native species (4.2).

**Shrub State 3.0 Community Phase Pathways**

- 3.1a: Fire and/or brush management with minimal soil disturbance.
- 3.2a: Time and lack of disturbance (not likely to occur).

Transition T3A: Catastrophic fire and/or soil disturbing vegetation and seeding treatments that fail (4.1). Inappropriate grazing management in the presence of annual non-native species (4.2).

Restoration R3A: Shrub removal/management with minimal soil disturbance coupled with seeding of desired species.

**Annual State 4.0 Community Phase Pathways**

- 4.1a: Time and lack of disturbance (unlikely to occur).
- 4.2a: Fire.

## **State 1 Reference Plant Community**



## Community 1.1

### Reference Plant Community

The reference plant community is dominated by bluebunch wheatgrass, antelope bitterbrush, and big sagebrush. Potential vegetative composition is about 60% grasses, 10% forbs, and 30% shrubs and trees. Approximate ground cover (basal and crown) is about 30 to 40 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	540	660	840
Shrub/Vine	252	308	392
Forb	90	110	140
Tree	18	22	28
<b>Total</b>	<b>900</b>	<b>1100</b>	<b>1400</b>

## Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Primary Perennial Grasses</b>			407–660	
	bluebunch wheatgrass	PSSPS	<i>Pseudoroegneria spicata</i> <i>ssp. spicata</i>	330–440	–
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	55–165	–
2	<b>Secondary Perennial Grasses/Grasslikes</b>			22–55	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	6–22	–
	sedge	CAREX	<i>Carex</i>	6–22	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	6–22	–
	Idaho fescue	FEID	<i>Festuca idahoensis</i>	6–22	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	6–22	–
	basin wildrye	LEC14	<i>Leymus cinereus</i>	6–22	–
<b>Forb</b>					
3	<b>Perennial</b>			55–165	
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	6–33	–

	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	6–33	–
	lupine	LUPIN	<i>Lupinus</i>	6–33	–
	phlox	PHLOX	<i>Phlox</i>	6–33	–
<b>Shrub/Vine</b>					
4	<b>Primary Shrub</b>			165–440	
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	110–220	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	28–110	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	27–110	–
5	<b>Secondary Shrub</b>			22–55	
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	11–22	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus</i> <i>viscidiflorus</i>	11–22	–
<b>Tree</b>					
6	<b>Evergreen</b>			6–22	
	western juniper	JUOC	<i>Juniperus occidentalis</i>	6–22	–

## Animal community

### Livestock Interpretations:

This site is suitable for livestock grazing. Grazing management should be keyed to perennial grass production. Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for livestock. Although bluebunch wheatgrass can be a crucial source of forage, it is not necessarily the most highly preferred species. Thurber's needlegrass species begin growth early in the year and remain green throughout a relatively long growing season. This pattern of development enables animals to use Thurber's needlegrass when many other grasses are unavailable. Cattle prefer Thurber's needlegrass in early spring before fruits have developed as it becomes less palatable when mature. Thurber's needlegrasses are grazed in the fall only if the fruits are softened by rain. Canby's bluegrass is a widespread forage grass. It is one of the earliest grasses in the spring and is sought by domestic livestock and several wildlife species. Canby's bluegrass is a palatable species, but its production is closely tied to weather conditions. It produces little forage in drought years, making it a less dependable food source than other perennial bunchgrasses. Antelope bitterbrush is important browse for livestock. Domestic livestock and mule deer may compete for antelope bitterbrush in late summer, fall, and/or winter. Cattle prefer antelope bitterbrush from mid-May through June and again in September and October. Basin big sagebrush may serve as emergency food during severe winter weather, but it is not usually sought

out by livestock. Mountain big sagebrush is eaten by domestic livestock but has long been considered to be of low palatability, and a competitor to more desirable species.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year.

#### Wildlife Interpretations:

Pronghorn antelope, mule deer, elk, and bighorn sheep utilize antelope bitterbrush extensively. Mule deer use of antelope bitterbrush peaks in September, when antelope bitterbrush may compose 91 percent of the diet. Winter use is greatest during periods of deep snow. Antelope bitterbrush seed is a large part of the diets of rodents, especially deer mice and kangaroo rats. Basin big sagebrush is the least palatable of all the subspecies of big sagebrush. Basin big sagebrush is browsed by mule deer from fall to early spring, but is not preferred. Mountain big sagebrush is highly preferred and nutritious winter forage for mule deer and elk. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Meadows surrounded by sagebrush may be used as feeding and strutting grounds. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover. Sage-grouse prefer mountain big sagebrush and Wyoming big sagebrush communities to basin big sagebrush communities. Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for wildlife. Bluebunch wheatgrass does not generally provide sufficient cover for ungulates, however, mule deer are frequently found in bluebunch-dominated grasslands. Thurber needlegrass is valuable forage for wildlife. Canby's bluegrass is desirable for pronghorn antelope and mule deer in the spring and preferable in the spring, summer, and fall for elk and desirable as part of their winter range.

## Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

## Other products

Some Native American peoples used the bark of big sagebrush to make rope and baskets. Native Americans used big sagebrush leaves and branches for medicinal teas, and the leaves as a fumigant. Bark was woven into mats, bags and clothing.

## Other information

Antelope bitterbrush has been used extensively in land reclamation. Antelope bitterbrush

enhances succession by retaining soil and depositing organic material and in some habitats and with some ecotypes, by fixing nitrogen. Basin big sagebrush shows high potential for range restoration and soil stabilization. Basin big sagebrush grows rapidly and spreads readily from seed.

## Type locality

Location 1: Modoc County, CA	
Township/Range/Section	T42N R16E S18
UTM zone	N
UTM northing	733656
UTM easting	4598876
Latitude	41° 30' 26"
Longitude	120° 12' 1"
General legal description	Approximately 2 miles southwest of Cedarville, Deep Creek area, Modoc County, California. This site also occurs in Wahoe County, Nevada.

## Other references

Fire Effects Information System (Online; <http://www.fs.fed.us/database/feis/plants/>).

USDA-NRCS Plants Database (Online; <http://www.plants.usda.gov>).

## Contributors

BH/SW

T Stringham (UNR under contract with BLM)

## 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	12/19/2025
Approved by	Kendra Moseley
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:**

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

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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):**

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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:**
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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):**
- 

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):**
- 

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:**

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17. **Perennial plant reproductive capability:**

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