USDA Natural Resources
Conservation Service

Ecological site R023XY017NV
CLAYPAN 14-16 P.Z.

Last updated: 4/10/2025
Accessed: 05/21/2025

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 Shallow and Mod Deep >12” PZ Low and Lahontan sagebrush and Idaho fescue 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/R023XY902OR

The Claypan 14-16” (023XY017NV) ecological site is the modal site for this group as it has the most acres mapped. This site occurs on summits and sideslopes of mountains and higher elevation plateaus on all aspects. Slopes range from 2 to 30 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 6500 to 8000 feet. Average annual precipitation is 14 to over 16 inches. These soils normally have a high percentage of gravels and cobbles on the surface which occupy plant growing space yet help to reduce evaporation and conserve soil moisture. Depth to a fine textured subsoil ranges from 5 to 10 inches. The subsoils swell on wetting, and shrink and crack upon drying. Swelling of the subsoil with wetting in the early spring results in poor soil aeration, forming a perched water table near the surface. Infiltration of water is restricted once these soils are saturated and the site is subject to loss of water by runoff. Loss of the surface layer results in decreased productivity of the plant community. The surface layer has a low available water capacity due to its limited thickness. Because of the higher elevations where this site occurs, the soils are cool and plant growth is not initiated until mid- to late spring. Pedestalling of some grass plants is common during the winter due to frost heaving. The dominant plants on this site are low sagebrush, Idaho fescue, and bluebunch wheatgrass. Thurber’s needlegrass may be a significant component along with several perennial forbs. This site’s annual production is 700 lbs/ac in normal years but can range from 500 to 900 lbs/ac.

Associated sites

R023XY007NV	**LOAMY 14-16 P.Z.**
R023XY008NV	**MOUNTAIN RIDGE**
R023XY016NV	**SOUTH SLOPE 12-16 P.Z.**
R023XY041NV	**LOAMY 12-14 P.Z.**

Similar sites

R023XY021NV	**SCABLAND 10-14 P.Z.** POSE dominant grass; less productive site
R023XY014NV	**SHALLOW LOAM 14+ P.Z.** FEID dominant grass
R023XY044NV	**VERY COBBLY CLAYPAN** POSE dominant grass; less productive site; many cobbles on surface
R023XY079NV	**ASHY CLAYPAN (COOL) 10-14 P.Z.** FEID dominant grass; high amounts of volcanic ash in soil
R023XY031NV	**CLAYPAN 10-14 P.Z.** ACTH7-PSSPS codominant
R023XY059NV	**GRAVELLY CLAYPAN 10-12 P.Z.** ACTH7 dominant grass; less productive site
R023XY078NV	**ASHY CLAYPAN 10-14 P.Z.** more productive site; high amounts of volcanic ash in soil
R023XY008NV	**MOUNTAIN RIDGE** FEID dominant grass; less productive site
R023XY060NV	**COBBLY CLAYPAN 8-12 P.Z.** less productive site; extremely cobbly surface

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula*
Herbaceous	(1) *Festuca idahoensis* (2) *Pseudoroegneria spicata ssp. spicata*

Physiographic features

This site occurs on summits and sideslopes of mountains, hills, and higher elevation plateaus on all aspects. Slopes range from 2 to 30 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 4900 to 7200 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill (3) Plateau
Elevation	4,900–7,200 ft
Slope	2–30%
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 14 to over 16 inches. Mean annual air temperature is 42 to 45 degrees F. The average growing season is about 70 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 precipitaion 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)	80 days
Freeze-free period (average)	
Precipitation total (average)	15 in

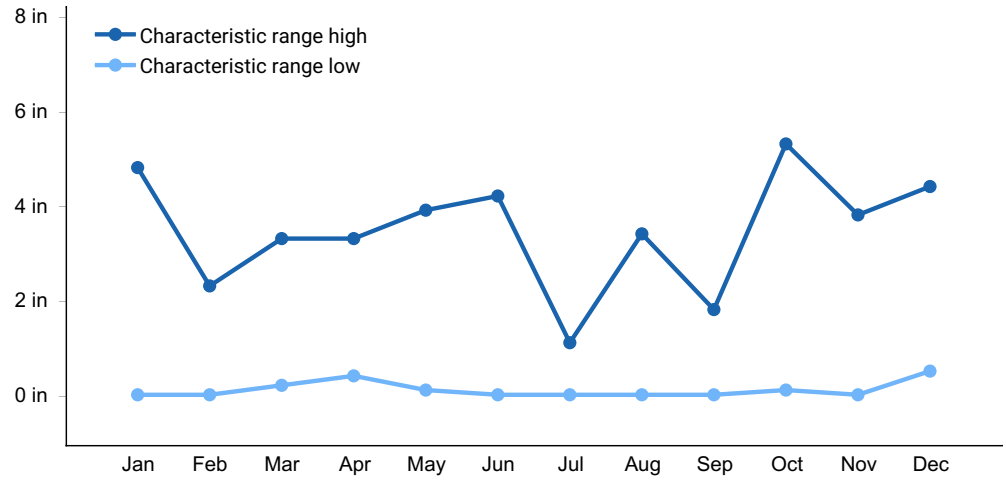


Figure 1. Monthly precipitation range

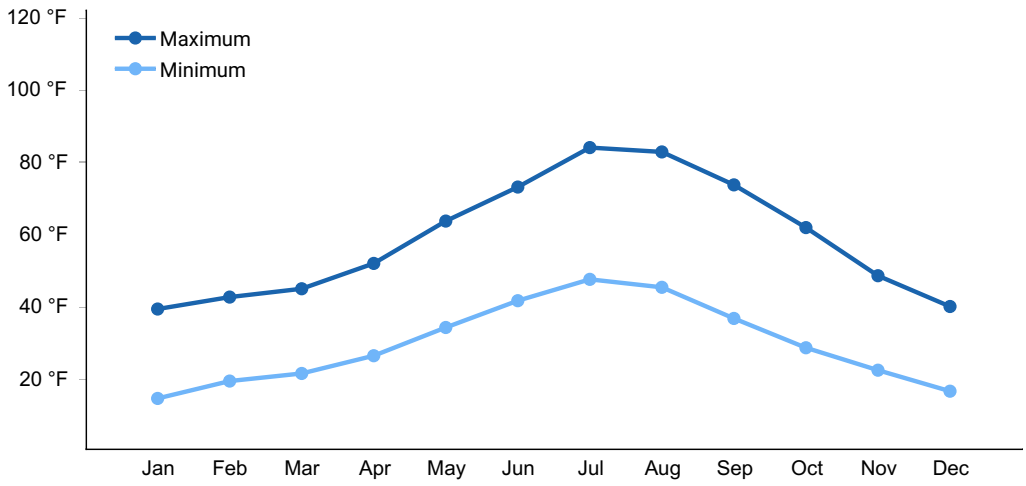


Figure 2. Monthly average minimum and maximum temperature

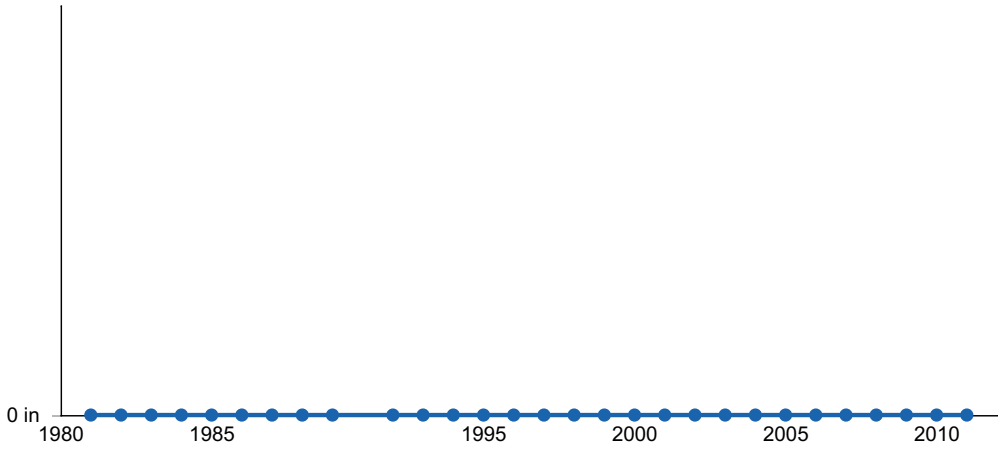


Figure 3. Annual precipitation pattern

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are shallow and well drained. Depth to a fine textured subsoil ranges from 5 to 10 inches. The subsoils swell on wetting and shrink and crack upon drying. Swelling of the subsoil with wetting in the early spring results in poor soil aeration, forming a perched water table near the surface. Infiltration of water is restricted once these soils are saturated and the site is subject to loss of water by runoff. Loss of the surface layer results in decreased productivity of the plant community. The surface layer has a very low to moderate available water capacity due to its limited thickness. These soils normally have a high percentage of gravels and cobbles on the surface which occupy plant growing space yet help to reduce evaporation and conserve soil moisture. Because of the higher elevations where this site occurs, the soils are cool and plant growth is not initiated until mid- to late spring. Pedestalling of some grass plants is common during the winter due to frost heaving. The soil moisture regime is aridic bordering on xeric and the temperature regime is frigid.
The soil series associated with this site include: Blizzard, Cotant, Gosumi, Ninemile, Prunie, Tinpan, Toney, and Walti.

A representative soil series is Ninemile, a clayey, smectitic, frigid Lithic Argixerolls. A mollic epipedon occurs from the soil surface to 30 cm and an argillic horizon occurs from 5 to 36 cm. Lithic contact is at 36 cm.

Table 4. Representative soil features

Parent material	(1) Colluvium–basalt (2) Residuum–basalt

Surface texture	(1) Extremely cobbly loam (2) Very stony loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	10–60 in
Surface fragment cover <=3"	10–45%
Surface fragment cover >3"	2–40%
Available water capacity (0-40in)	2–5.9 in
Calcium carbonate equivalent (0-40in)	0–5%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	4–20%
Subsurface fragment volume >3" (Depth not specified)	0–20%

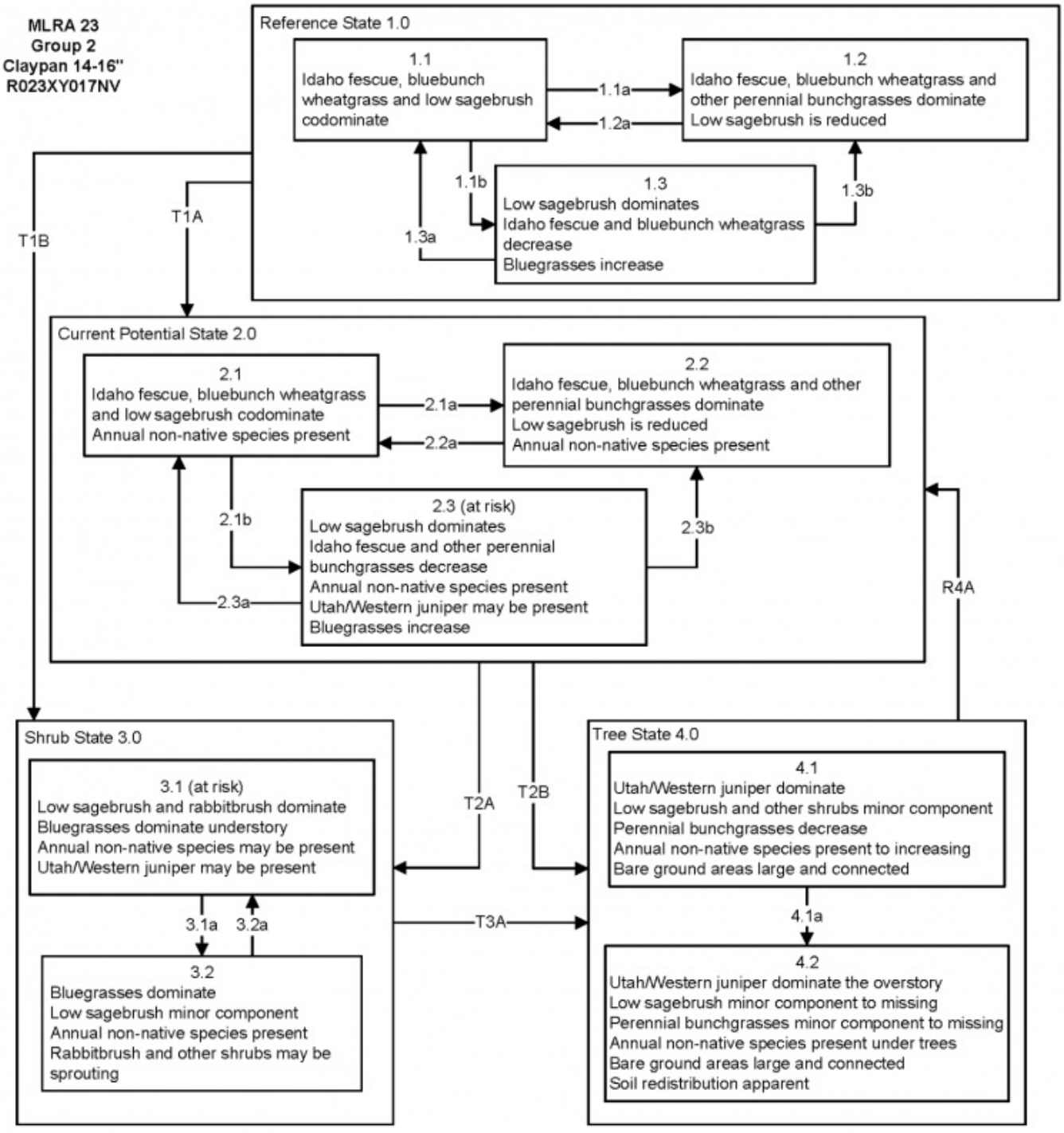
Ecological dynamics

This site responds differently to grazing use by different kinds of livestock. Spring use by sheep will decrease abundance of Idaho fescue, Thurber's needlegrass and bluegrasses, leaving the competitive advantage to bluebunch wheatgrass and shrubs. Where management results in abusive cattle use, low sagebrush, balsamroot and bluegrasses increase as bluebunch wheatgrass and Thurber needlegrass decrease.

Fire Ecology:
Prior to 1897, mean fire return intervals for low sagebrush communities have been estimated to be from 35 to over 100 years. Fire most often occurs during wet years with high forage production. Low sagebrush is very susceptible to fire damage. Low sagebrush is usually killed by fire and does not re-sprout. The recovery in burned areas is usually via small, light, wind-dispersed seed for all low sagebrush subspecies. Partially injured low sagebrush may re-grow from living branches, but sprouting does not occur. Idaho fescue grows in a dense, fine-leaved tuft. Fires tend to burn within the accumulated fine leaves at the base of the plant and may produce temperatures sufficient to kill some of the root crown. Mature Idaho fescue plants are commonly reported to be severely damaged by fire

in all seasons. 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. Cusick’s bluegrass is unharmed to slightly harmed by light-severity fall fires. Cusick’s bluegrass regenerates after fire from seed and by tillering. 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 2
Claypan 14-16"
R023XY017NV
Reference State 1.0
1.1
Idaho fescue, bluebunch wheatgrass and low sagebrush codominate
1.1a
1.2a
1.2
Idaho fescue, bluebunch wheatgrass and other perennial bunchgrasses dominate
Low sagebrush is reduced
1.1b
1.3a
1.3
Low sagebrush dominates
Idaho fescue and bluebunch wheatgrass decrease
Bluegrasses increase
1.3b
T1A
T1B
Current Potential State 2.0
2.1
Idaho fescue, bluebunch wheatgrass and low sagebrush codominate
Annual non-native species present
2.1a
2.2a
2.2
Idaho fescue, bluebunch wheatgrass and other perennial bunchgrasses dominate
Low sagebrush is reduced
Annual non-native species present
2.1b
2.3a
2.3 (at risk)
Low sagebrush dominates
Idaho fescue and other perennial bunchgrasses decrease
Annual non-native species present
Utah/Western juniper may be present
Bluegrasses increase
2.3b
R4A
Shrub State 3.0
3.1 (at risk)
Low sagebrush and rabbitbrush dominate
Bluegrasses dominate understory
Annual non-native species may be present
Utah/Western juniper may be present
3.1a
3.2a
3.2
Bluegrasses dominate
Low sagebrush minor component
Annual non-native species present
Rabbitbrush and other shrubs may be sprouting
T2A
T2B
T3A
Tree State 4.0
4.1
Utah/Western juniper dominate
Low sagebrush and other shrubs minor component
Perennial bunchgrasses decrease
Annual non-native species present to increasing
Bare ground areas large and connected
4.1a
4.2
Utah/Western juniper dominate the overstory
Low sagebrush minor component to missing
Perennial bunchgrasses minor component to missing
Annual non-native species present under trees
Bare ground areas large and connected
Soil redistribution apparent

MLRA 23
Group 2
Claypan 14-16"
R023XY017NV
KEY

Reference State 1.0 Community Phase 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 such as fire or drought. Excessive herbivory would also reduce perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: Low severity fire and/or herbivory
1.3b: High severity fire significantly reduces sagebrush.

Transition T1A: Introduction of non-native species such as bulbous bluegrass, cheatgrass and thistles.
Transition T1B: Inappropriate grazing management (3.1). Fire or brush treatment; may be coupled with inappropriate grazing management (3.2).

Current Potential State 2.0 Community Phase 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; non-native annual species present.
2.1b: Time and lack of disturbance such fire or drought. Inappropriate grazing management may also reduce perennial understory.
2.2a: Time and lack of disturbance allows for shrub regeneration
2.3a: Low severity fire and/or late-fall/winter grazing management causing mechanical damage to sagebrush.
2.3b: High severity fire significantly reduces sagebrush. Brush management with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.

Transition T2A: Inappropriate grazing management (3.1). Fire or brush treatment; may be coupled with inappropriate grazing management (3.2).
Transition T2B: Time and lack of fire allows Utah juniper and pinyon pine to establish and overtop the sagebrush, dominating site resources; may be coupled with inappropriate grazing management.

Shrub State 3.0 Community Phase Pathways
3.1a: Fire or brush management (i.e. mowing) with minimal soil disturbance.
3.2a: Time and lack of disturbance (unlikely to occur)

Transition T3A: Time and lack of fire allows Utah/Western juniper to establish and dominate site resources; may be coupled with inappropriate grazing management that reduces perennial grass density and increases tree establishment.

Tree State 4.0
4.1a: Time without disturbance allows maturation of the tree community

Restoration R4A: Tree removal would decrease tree cover and allow for the understory to recover (4.1)

State 1
Reference State

Community 1.1
Community Phase

Community 1.2
Community Phase

Community 1.3
Community Phase

Pathway a
Community 1.1 to 1.2

Pathway b
Community 1.1 to 1.3

Pathway a
Community 1.2 to 1.1

Pathway a
Community 1.3 to 1.1

Pathway b
Community 1.3 to 1.2

State 2
Current Potential State

Community 2.1
Community Phase

Community 2.2
Community Phase

Community 2.3
Community Phase (at risk)

Pathway a
Community 2.1 to 2.2

Pathway b
Community 2.1 to 2.3

Pathway a
Community 2.2 to 2.1

Pathway a
Community 2.3 to 2.1

Pathway b
Community 2.3 to 2.2

State 3
Shrub State

Community 3.1
Community Phase (at risk)

Community 3.2
Community Phase (at risk)

Pathway a
Community 3.1 to 3.2

Pathway a
Community 3.2 to 3.1

State 4
Tree State

Not verified

Community 4.1
Community Phase

Community 4.2
Community Phase

Pathway a
Community 4.1 to 4.2

Transition A
State 1 to 2

Transition A

State 2 to 3

Transition B
State 2 to 4

Transition A
State 3 to 4

Restoration pathway A
State 4 to 2

Additional community tables

Animal community

Livestock Interpretations:
This site has limited value for grazing due to steep slopes and stoniness. Idaho fescue provides important forage for many types of domestic livestock. The foliage cures well and is preferred by livestock in late fall and winter. 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. Cusick's bluegrass makes up only a small proportion of the biomass of the sagebrush communities in which it lives, but it is often taken preferentially by cattle, especially early in the season. 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. Domestic sheep and to a much lesser degree cattle consume low sagebrush, particularly during the spring, fall and winter.

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:
Low sagebrush is considered a valuable browse plant during the spring, fall and winter months. In some areas it is of little value in winter due to heavy snow. Mule deer utilize and sometimes prefer low sagebrush, particularly in winter and early spring. 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. Idaho fescue provides important forge for several wildlife species. It is reported to be good forage for pronghorn, and deer in ranges of northern Nevada. 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. Deer, elk, and mountain goat also use Cusick's bluegrass early in the season. The value of Cusick's bluegrass as cover for small animals has been rated as poor to fair. 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.

Hydrological functions

Rills and pedestals are rare. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt. Occurrence of pedestals is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition. Water flow patterns are rare but can be expected in areas recently subjected to summer convection storms or rapid snowmelt, usually on steeper slopes. Perennial herbaceous plants (especially deep-rooted bunchgrasses [Idaho fescue & bluebunch wheatgrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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 hiking and has potential for upland and big game hunting.

Other information

Low sagebrush can be successfully transplanted or seeded in restoration.

Type locality

Location 1: Washoe County, NV	
Township/Range/Section	T45N R21E S9
UTM zone	N

UTM northing	281140
UTM easting	4634633
Latitude	41° 50′ 0″
Longitude	119° 38′ 8″
General legal description	South facing aspects of Bald Mountain. USF&WS Sheldon Wildlife Refuge. Washoe County, Nevada. This site also occurs in Humboldt County, Nevada.

Location 2: Washoe County, NV	
Township/Range/Section	T47N R21E S33
UTM zone	N
UTM northing	282060
UTM easting	4647768
Latitude	41° 57′ 6″
Longitude	119° 37′ 46″
General legal description	About 1 mile east of south end of Macy Flat, Washoe County, Nevada. This site also occurs in Humboldt 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

Approval

Kendra Moseley, 4/10/2025

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)	GK BRACKLEY
Contact for lead author	State Rangeland Management Specialist
Date	06/20/2006
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are none to rare. Rock fragments armor the surface.

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2. **Presence of water flow patterns:** Waterflow patterns are none to rare but can be expected in areas recently subjected to summer convection storms or rapid snowmelt, usually on steeper slopes.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare. Occurrence is usually limited to areas of waterflow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 40%

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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:** None

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during large rainfall events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 3 to 6 on most soil textures found on this site. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically thin to thick platy, subangular blocky or massive. Soil surface colors are dark and soils are typified by a mollic epipedon. Organic matter of the surface 2 to 4 inches is typically 1.25 to 3 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [Idaho fescue & bluebunch wheatgrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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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):** Compacted layers are none. Platy or massive sub-surface horizons or subsoil argillic horizons are not to be interpreted as compacted.

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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: Deep-rooted, cool season, perennial bunchgrasses

    Sub-dominant: low shrubs (low sagebrush)>deep-rooted, cool season, perennial forbs>shallow-rooted, cool season, perennial bunchgrasses>associated shrubs>fibrous, shallow-rooted, cool season, perennial and annual forbs

    Other: grass-like plants

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<10%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (± 25%) and litter depth is ± ½ inch.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through mid-June) ± 700 lbs/ac; Spring moisture significantly affects total 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:** Potential invaders include cheatgrass, snakeweed, annual mustards, medusahead, and western juniper.

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years