

# Ecological site R023XY001NV CHURNING CLAY

Last updated: 4/10/2025

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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 Cobbly Mod Deep Clay 10-14 PZ Low or Lahontan Sagebrush and Sandberg bluegrass 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/R023XY904NV>

This site is slightly less productive at 225 lbs/ac in normal years. Similar to the modal site, the soils are characterized by dark, reddish-brown, clay surface soils but are without large stones and cobbles. They are subject to extreme swelling and shrinking. This continuous active soil movement damages the root system of many plants. Annual plants as well as rabbitbrush and squirreltail are the primary species capable of surviving these soil conditions. Pedestalling of plants is common due to the high shrink-swell characteristics of the clay soils. The plant community is dominated by Washoe rubber rabbitbrush (*Ericameria nauseosa* (Pall. ex Pursh) G.L. Nesom & Baird ssp. *nauseosa* var. *washoensis*), bottlebrush squirreltail, Sandberg bluegrass and low sagebrush.

During our site visits for this project we were unable to determine if Churning Clay is a unique ecological site or if it is a Very Cobbly Claypan site with highly disturbed vegetation and soil structure. The Eroded State of the Very Cobbly Claypan site is close in characteristics to this ecological site: it lacks a silty surface soil and is dominated by rubber rabbitbrush. Churning Clay currently is a stand-alone ecological site, so we have created a separate STM for it. This site has four stable states.

## Associated sites

R023XY021NV	<b>SCABLAND 10-14 P.Z.</b>
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R023XY031NV	<b>CLAYPAN 10-14 P.Z.</b>
R023XY033NV	<b>CLAYEY 10-14 P.Z.</b>
R023XY044NV	<b>VERY COBBLY CLAYPAN</b>

## Similar sites

R023XY044NV	<b>VERY COBBLY CLAYPAN</b> ARAR8 dominant shrub
R023XY021NV	<b>SCABLAND 10-14 P.Z.</b> ARAR8 dominant shrub; different physiographic setting
R023XY033NV	<b>CLAYEY 10-14 P.Z.</b> ARTRT dominant shrub

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Ericameria nauseosa ssp. nauseosa var. washoensis</i>
Herbaceous	(1) <i>Elymus elymoides</i> (2) <i>Poa secunda</i>

## Physiographic features

This site typically occurs in depressions within basalt flow tablelands. The site also occurs in localized areas on plateau summits and piedmont slopes. Slopes can range from 0 to 15 percent, but slope gradients of 0 to 8 percent are typical. Elevations are 4300 to 6200 feet.

**Table 2. Representative physiographic features**

Landforms	(1) Plateau (2) Depression
Elevation	4,300–6,200 ft
Slope	0–15%
Aspect	Aspect is not a significant factor

## Climatic features

The climate associated with this site is semiarid and characterized by cold, moist winters and warm, dry summers. Average annual precipitation is 10 to 14 inches. Mean annual air temperature is 45 to 52 degrees F. The average growing season is about 80 to 110 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.

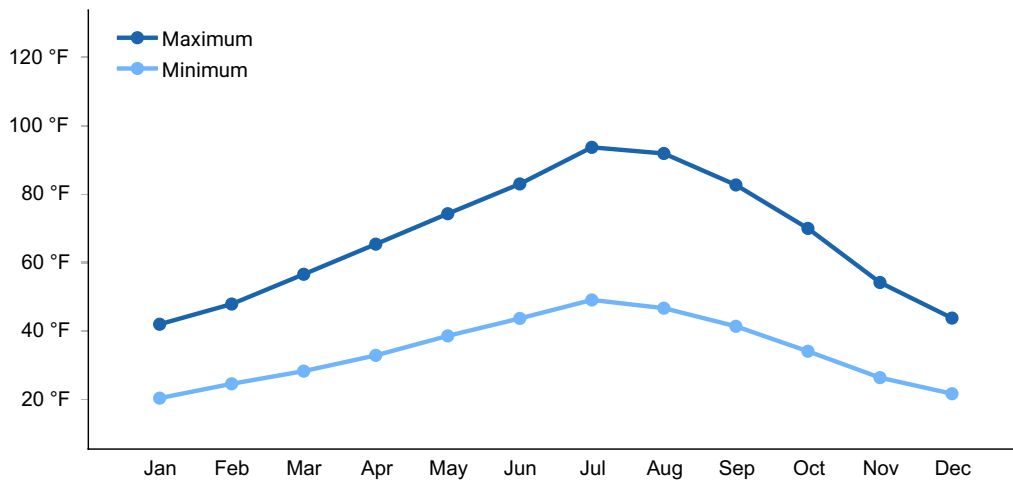
Mean annual precipitation at the Bear Creek, Nevada SNOTEL station (170501020301) is 37.69 inches.

monthly mean precipitation is:

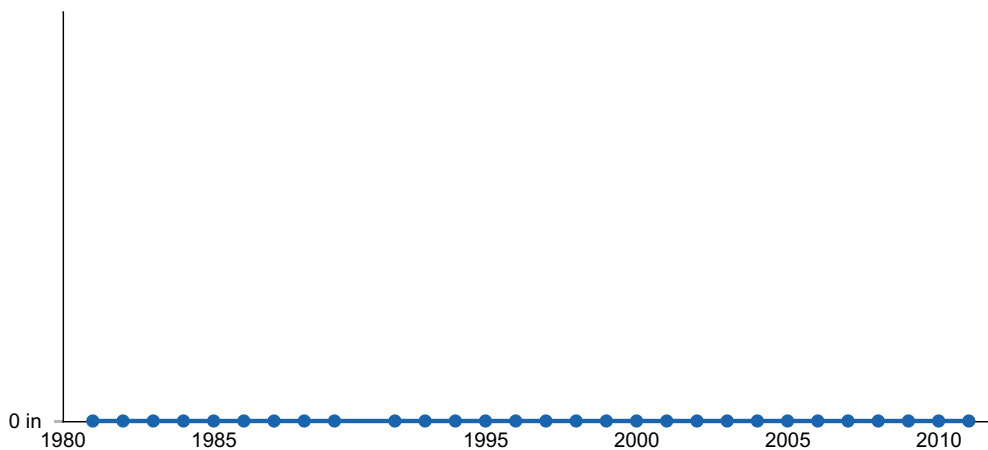
January 3.84; February 3.75; March 4.38; April 4.9;  
 May 3.99; June 2.82; July .95; August 1.66;  
 September 1.22; October 2.12;  
 November 3.67; December 4.38.

**Table 3. Representative climatic features**

Frost-free period (average)	95 days
Freeze-free period (average)	
Precipitation total (average)	12 in



**Figure 1. Monthly average minimum and maximum temperature**



**Figure 2. 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 to very deep and well drained. They are characterized by dark, reddish-brown, clay surface soils that are subject to extreme swelling and shrinking. When dry, the soils have wide cracks into which the granulated surface layers tend to slough. Upon wetting the cracks close, and because they have been partially filled with extra material, the ground surface is forced into a low, "hummocky" (gilgai) relief. This continual, active, soil movement damages the root system of many plants. The available water capacity is very low to moderate. Sheet and rill erosion potential is slight and overland flow patterns are typically not evident. Pedestalling of plants is common due to the high shrink-swell characteristics of the clay soils. Wind erosion potential is slight. The soils series associated with this site include: Karlo and Tunnison.

**Table 4. Representative soil features**

Surface texture	(1) Very cobbly clay (2) Cobbly clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	20–84 in
Surface fragment cover ≤3"	0–30%
Surface fragment cover >3"	0–43%
Available water capacity (0-40in)	2.9–5.5 in
Calcium carbonate equivalent (0-40in)	0–8%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	6.6–7.8
Subsurface fragment volume ≤3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

As ecological condition declines (particularly following wildfire), invasive plants such as annual grasses (including cheatgrass, other annual bromegrasses, and medusahead) and annual forbs such as tansy mustard often dominate the plant community. Due to the disruptive nature of these soils, species adapted to this site are primarily "pioneer" or early-seral plants.

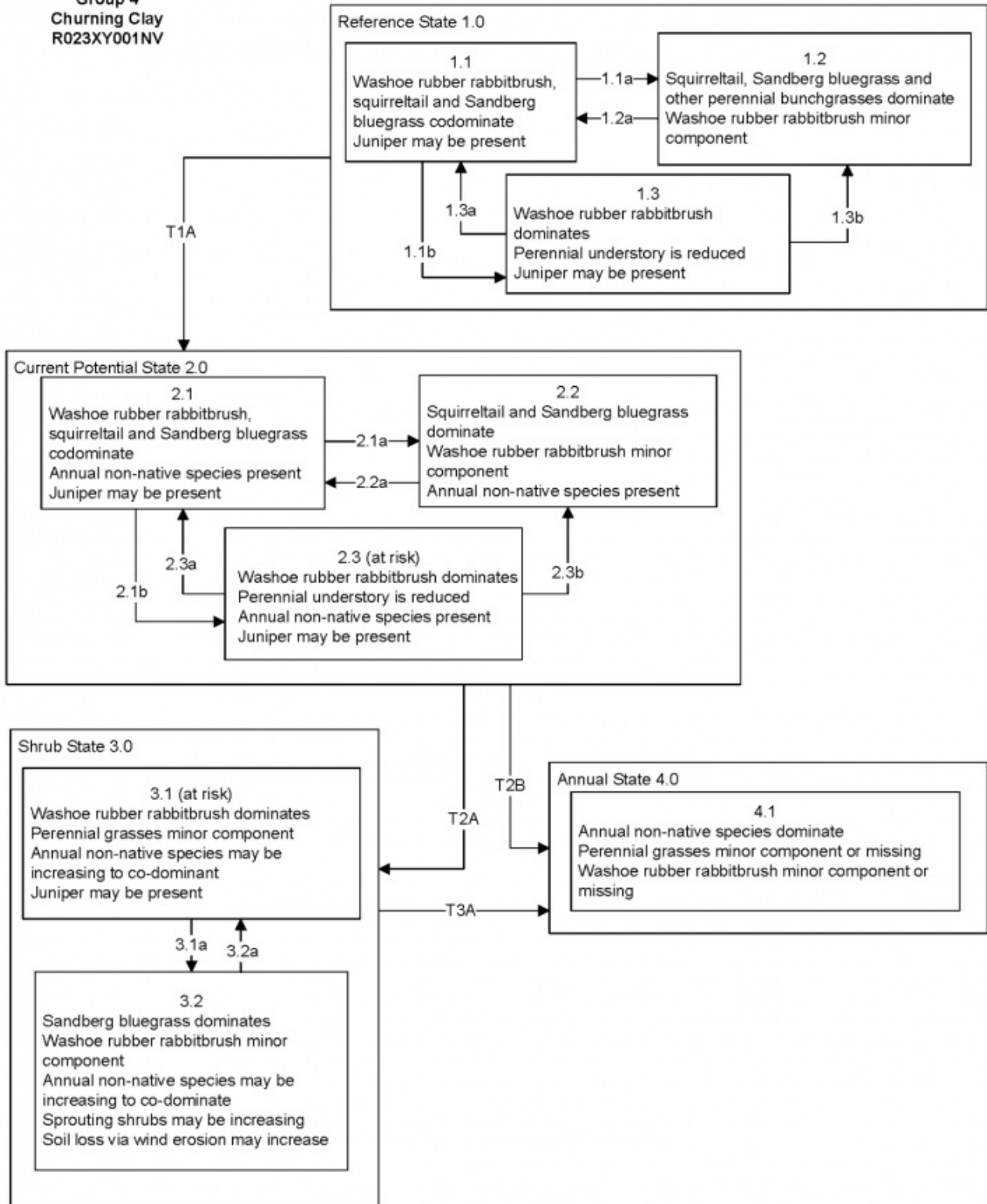
### Fire Ecology:

Rubber rabbitbrush is often top-killed by fire. Rubber rabbitbrush is a fire-adapted species that is typically unharmed or enhanced by fire. Recovery time is often rapid to very rapid. Rubber rabbitbrush is often one of the first species to colonize burned areas by sprouting or from off-site seed. 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. Bottlebrush

squirreltail's small size, coarse stems, and sparse leafy material aid in its tolerance of fire. Postfire regeneration occurs from surviving root crowns and from on- and off-site seed sources. Frequency of disturbance greatly influences postfire response of bottlebrush squirreltail. Undisturbed plants within a 6 to 9 year age class generally contain large amounts of dead material, increasing bottlebrush squirreltail's susceptibility to fire. Sandberg 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 4  
Churning Clay  
R023XY001NV



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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 or late fall/winter herbivory causing mechanical damage to sagebrush would reduce sagebrush overstory.

1.3b: High severity fire significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native species such as cheatgrass.

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 resulting in a mosaic pattern. Brush management with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.

2.3b: High severity fire significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T2A: Inappropriate grazing management (3.1). Fire or brush treatment; may be coupled with inappropriate grazing management (3.2).

Transition T2B: Inappropriate grazing management, soil disturbing treatments, fire or multiple fires.

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: Catastrophic fire.

## State 1 Reference Plant Community

## Community 1.1 Reference Plant Community

The reference plant community is dominated by Washoe rubber rabbitbrush, bottlebrush squirreltail, Sandberg bluegrass and low sagebrush. Potential vegetative composition is about 30% grasses, 10% forbs and 60% shrubs. Approximate ground cover (basal and crown) is 20 to 35 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	90	135	210
Grass/Grasslike	45	68	105
Forb	15	22	35
<b>Total</b>	<b>150</b>	<b>225</b>	<b>350</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>			33–67	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	22–45	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	11–22	–
2	<b>Secondary Perennial Grasses</b>			5–18	
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	1–5	–
	mountain brome	BRMA4	<i>Bromus marginatus</i>	1–5	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	1–5	–
	bluebunch wheatgrass	PSSPS	<i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>	1–5	–
<b>Forb</b>					
3	<b>Perennial</b>			9–35	
	buckwheat	ERIOG	<i>Eriogonum</i>	2–11	–
	lupine	LUPIN	<i>Lupinus</i>	2–6	–
	western stoneseed	LIRU4	<i>Lithospermum ruderale</i>	1–5	–
	desertparsley	LOMAT	<i>Lomatium</i>	1–5	–
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	1–5	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	1–5	–
<b>Shrub/Vine</b>					
4	<b>Primary Shrubs</b>			73–135	
	rubber rabbitbrush	ERNAW	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>washoensis</i>	38–113	–
	little sagebrush	ARAR8	<i>Artemisia arbuscula</i>	5–22	–
5	<b>Secondary Shrubs</b>			5–18	
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	2–5	–

## Animal community

### Livestock Interpretations:

This site has limited value for livestock grazing, due to the low forage production. Bottlebrush squirreltail is very palatable winter forage for domestic sheep of Intermountain ranges. Domestic sheep relish the green foliage. Overall, bottlebrush squirreltail is considered moderately palatable to livestock. Sandberg 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. Sandberg 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. In general, livestock forage only lightly on rubber rabbitbrush during the summer, but winter use can be heavy in some locations. Fall use is variable, but flowers are often used by livestock. A few leaves and the more tender stems may also be used. 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:

Wildlife forage only lightly on rubber rabbitbrush during the summer, but winter use can be heavy in some locations. Fall use is variable, but flowers are often used by wildlife. A few leaves and the more tender stems may also be used. The forage value of rubber rabbitbrush varies greatly among subspecies and ecotypes. 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. Bottlebrush squirreltail is a dietary component of several wildlife species. Bottlebrush squirreltail may provide forage for mule deer and pronghorn. Sandberg 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 are none to rare. Rock fragments armor the surface. Water flow patterns are none to rare. Pedestals formed due to erosion are none to rare. Frost heaving and shrink-swell soil activity that affects shallow rooted plants are not indicators of soil erosion. Gullies are none to rare. Shallow-rooted perennial grass plants [i.e., bottlebrush squirreltail & Sandberg's bluegrass] and perennial forbs having thick tap roots slow runoff. Infiltration is

slow once the surface soil is wetted. 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 camping and hiking and has potential for upland and big game hunting.

## Other information

Low sagebrush can be successfully transplanted or seeded in restoration. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

## Type locality

Location 1: Lassen County, CA	
Township/Range/Section	T36N R17E S14
Latitude	40° 59' 10"
Longitude	119° 59' 54"
General legal description	SW 1/4, Approximately 1 mile west of Nevada stateline, Brine Springs field, Lassen County, California. This site is also found in Washoe and Humboldt Counties, 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)	Patti Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	02/05/2010
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:** Water flow patterns are none to rare.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals formed due to erosion are none to rare. Frost heaving and shrink-swell soil activity that affects shallow rooted plants are not indicators of soil erosion.

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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  $\pm$  20-30%.

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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 catastrophic events.

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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):** Soil stability values should be 4 to 6 on the heavy clay surface 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 very fine to medium granular. Soil surface colors are reddish browns and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically < 1 percent.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shallow-rooted perennial grass plants [i.e., bottlebrush squirreltail & Sandberg's bluegrass] and perennial forbs having thick tap roots slow runoff. Infiltration is slow once the surface soil is wetted. 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. Subangular blocky or prismatic structure of sub-surface horizons or heavy clay surface soils are not to be interpreted as compacted layers.
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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: Reference Plant Community: Low stature shrubs (Washoe rubber rabbitbrush & low sagebrush)

Sub-dominant: Shallow-rooted, cool season, perennial grasses > deep-rooted, cool season, perennial bunchgrasses > deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, annual and perennial forbs

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs is somewhat common and standing dead shrub canopy material may be as much as 15% of total woody canopy; some of the mature bunchgrasses (<10%) have dead centers.
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14. **Average percent litter cover (%) and depth ( in):** Between plant interspaces (<20%) and litter depth is <1/4 inch.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through May) ± 225 lbs/ac; Favorable production ± 350 lbs/ac and unfavorable ±150 lbs/ac
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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:** Potential invaders include cheatgrass and other annual brome grasses, medusahead, Russian thistle, and annual mustards.
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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years.
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