USDA Natural Resources
Conservation Service

Ecological site R028AY032NV
DROUGHTY SODIC LOAM

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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): 028A–Ancient Lake Bonneville

MLRA 28A occurs in Utah (82%), Nevada (16%), and Idaho (2%). It makes up about 36,775 square miles. A large area west and southwest of Great Salt Lake is a salty playa. This area is the farthest eastern extent of the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. They are not well dissected because of low rainfall in the MLRA. Most of the valleys are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 ft. in the basins and from 6,560 to 11,150 ft. in the mountains. Most of this area has alluvial valley fill and playa lakebed deposits at the surface. Great Salt Lake is all that remains of glacial Lake Bonneville. A level line on some mountain slopes indicates the former extent of this glacial lake. Most of the mountains in the interior of this area consist of tilted blocks of marine sediments from Cambrian to Mississippian age. Scattered outcrops of Tertiary continental sediments and volcanic rocks are throughout the area. The average annual precipitation is 5 to 12 ins. in the valleys and is as much as 49 ins. in the mountains. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The driest period is from midsummer to early autumn. Precipitation in winter typically occurs as snow. The average annual temperature is 39 to 53 °F. The freeze-free period averages 165 days and ranges from 110 to 215 days, decreasing in length with elevation. The dominant soil orders in this MLRA are Aridisols, Entisols, and Mollisols. The soils in the area dominantly have a mesic or frigid soil temperature regime, an aridic or xeric soil moisture regime, and mixed mineralogy. They generally are well drained, loamy or loamy-skeletal, and very deep.

Ecological site concept

This site occurs on inset fans, fan skirts and alluvial flats adjacent to fan skirts. Slope gradients of 4 to 8 percent are most typical. Elevations are 4800 to 6000 feet.

The climate associated with this site is semiarid, characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 6 to 10 inches. Mean annual air temperature is 45 to 50 degrees F. The average growing season is about 100 to 120 days.

The soils associated with this site are deep and well drained. Permeability is moderate and runoff is medium. Soils are moderately alkaline to very strongly alkaline and calcareous throughout. Potential for sheet and rill erosion is slight.

The reference state is dominated by spiny hopsage and black greasewood. Bottlebrush squirreltail and Indian ricegrass are commonly associated species on this site. Production ranges from 600 to 1000 pounds per acre.

Associated sites

R028AY011NV	**SODIC DUNE**
R028AY015NV	**LOAMY 8-10 P.Z.**
R028AY024NV	**SODIC TERRACE 5-8 P.Z.**
R028AY030NV	**SILTY 8-10 P.Z.**
R028AY033NV	**SALINE TERRACE 8-10 P.Z.**

Similar sites

R028AY028NV	**DROUGHTY LOAM 8-10 P.Z.** ARTRW dominant shrub; SAVE4 rare
R028BY052NV	**DROUGHTY LOAM 8-10 P.Z.** ARTRW-GRSP codominant shrubs
R028BY078NV	**DROUGHTY LOAM 5-8 P.Z.** PLJA rare to absent
R028AY047NV	**DROUGHTY CALCAREOUS LOAM 8-10 P.Z. (burned phase)** ARNO4-GRSP codominant shrubs
R028AY006NV	**DROUGHTY LOAM 5-8 P.Z.** GRSP-ATCO-KRLA2 codominant shrubs; ACHY-HECO26 codominant grasses

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Grayia spinosa* (2) *Sarcobatus vermiculatus*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

This site occurs on inset fans, fan skirts and alluvial flats adjacent to fan skirts. Slope gradients of 4 to 8 percent are most typical. Elevations are 4800 to 6000 feet.

Table 2. Representative physiographic features

Landforms	(1) Inset fan

Climatic features

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 8 to 10 inches. Mean annual air temperature is 45 to 50 degrees F. The average growing season is 100 to 120 days.

Mean annual preciptiation at OASIS, NEVADA (265722) Climate station is 8.58 inches.

Monthly mean precipitation is:
January 0.65; February 0.58; March 0.69;
April 0.96; May 1.23; June 0.94; July 0.46;
August 0.62; September 0.47; October 0.76;
November 0.63; December 0.59.

Table 3. Representative climatic features

Frost-free period (average)	
Freeze-free period (average)	110 days
Precipitation total (average)	203 mm

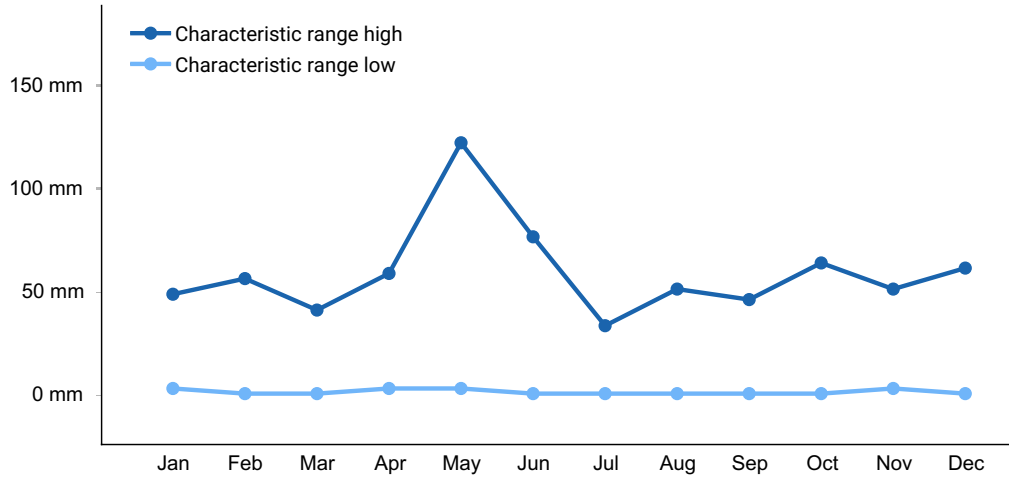

Figure 1. Monthly precipitation range

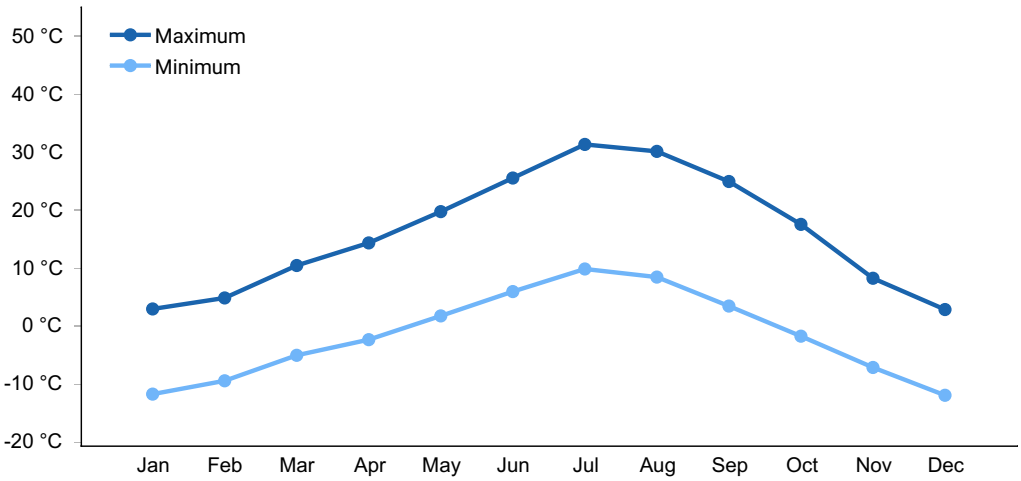

Figure 2. Monthly average minimum and maximum temperature

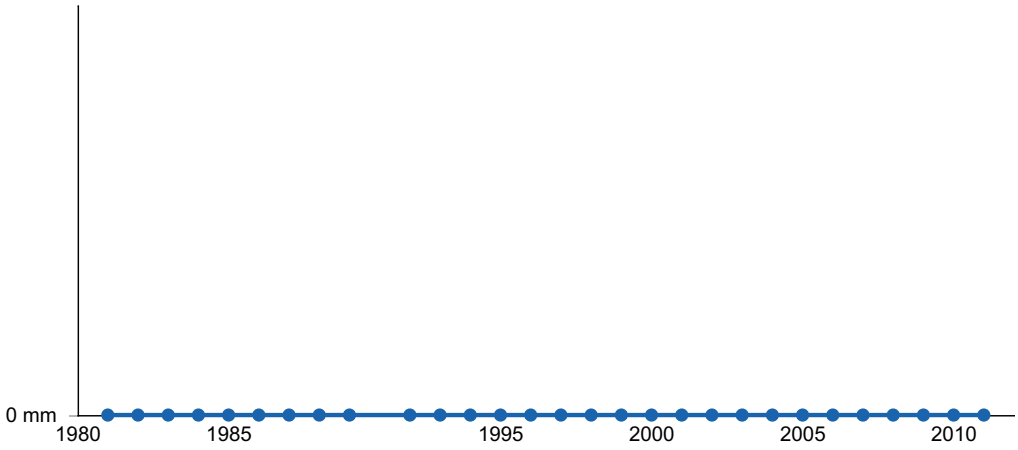

Figure 3. Annual precipitation pattern

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are deep and well drained. Permeability is moderate and runoff is medium. Soils are moderately alkaline to very strongly alkaline and calcareous throughout. Potential for sheet and rill erosion is slight.

The representative soil series is Mazuma, a Coarse-loamy, mixed, superactive, calcareous, mesic Typic Torriorthents. Diagnostic horizons include an Ochric epipedon from the soil surface to 18 cm, and a Identifiable secondary carbonates from 20 to 30 cm. Clay content in the particle control section averages 5 to 15 percent. Rock fragments have a few strata up to 25 percent gravel. Reaction is moderately alkaline through very strongly alkaline. Effervescence is slightly to violently effervescent depending on the horizon. Lithology consists of mixed rocks.

Table 4. Representative soil features

Surface texture	(1) Clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	147–155 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Calcium carbonate equivalent (0-101.6cm)	0%

Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	13–100
Soil reaction (1:1 water) (0-101.6cm)	8.6–9.2
Subsurface fragment volume <=3" (Depth not specified)	22–25%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

As ecological condition deteriorates, black greasewood and shadscale increase, while Indian ricegrass and bottlebrush squirreltail decrease. Mustards, cheatgrass and halogeton are species likely to invade this site.

Fire Ecology:
Fires in spiny hopsage sites generally occur in late summer when plants are dormant, and sprouting generally does not occur until the following spring. Spiny hopsage is considered to be somewhat fire tolerant and often survives fires that kill sagebrush. Mature spiny hopsage generally sprout after being burned. Spiny hopsage is reported to be least susceptible to fire during summer dormancy. Black greasewood may be killed by severe fires, but it commonly sprouts soon after low to moderate-severity fire. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. 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.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities

1.1. Plant Community

State 1
Reference State

Community 1.1
Plant Community

This plant community is dominated by spiny hopsage and black greasewood. Bottlebrush squirreltail and Indian ricegrass are commonly associated species on this site. Potential vegetative composition is about 15% grasses, 5% forbs and 80% shrubs. Approximate ground cover (basal and crown) is 30 to 40 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	538	717	897
Grass/Grasslike	101	135	168
Forb	34	45	56
Total	**673**	**897**	**1121**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			108–179	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90–135	–
	squirreltail	ELEL5	*Elymus elymoides*	18–45	–
2	**Secondary Perennial Grasses**			11–45	
	needle and thread	HECO26	*Hesperostipa comata*	4–27	–
	James' galleta	PLJA	*Pleuraphis jamesii*	4–27	–
	alkali sacaton	SPAI	*Sporobolus airoides*	4–27	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	4–27	–
Forb					
3	**Perennial**			18–72	
	Forb, perennial	2FP	*Forb, perennial*	18–72	–
Shrub/Vine					
4	**Primary Shrubs**			493–762	
	spiny hopsage	GRSP	*Grayia spinosa*	359–538	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	135–224	–
5	**Secondary Shrubs**			18–90	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	9–27	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	9–27	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	9–27	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	9–27	–

Animal community

Livestock Interpretations:
Indian ricegrass is highly palatable to all classes of livestock in both green and cured condition. It supplies a source of green feed before most other native grasses have produced much new growth. 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. Spiny hopsage provides a palatable and nutritious food source for livestock, particularly during late winter through spring. Domestic sheep browse the succulent new growth of spiny hopsage in late winter and early spring. Black greasewood is an important winter browse plant for domestic sheep and cattle. It also receives light to moderate use by domestic sheep and cattle during spring and summer months. Black greasewood contains soluble sodium and potassium oxalates that may cause poisoning and death in domestic sheep and cattle if large amounts are consumed in a short time.

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:
Spiny hopsage provides a palatable and nutritious food source for big game animals. Spiny hopsage is used as forage to at least some extent by domestic goats, deer, pronghorn, and rabbits. Black greasewood is an important winter browse plant for big game animals and a food source for many other wildlife species. It also receives light to moderate use by mule deer and pronghorn during spring and summer months. Indian ricegrass is eaten by pronghorn in "moderate" amounts whenever available. In Nevada it is consumed by desert bighorns. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground. Bottlebrush squirreltail is a dietary component of several wildlife species. Bottlebrush squirreltail may provide forage for mule deer and pronghorn.

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 traditionally ground parched seeds of spiny hopsage to make pinole flour. The leaves, seeds and stems of black greasewood are edible. Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source.

Other information

Spiny hopsage has moderate potential for erosion control and low to high potential for long-term revegetation projects. It can improve forage, control wind erosion, and increase soil stability on gentle to moderate slopes. Spiny hopsage is suitable for highway plantings on dry sites in Nevada. Black greasewood is useful for stabilizing soil on wind-blown areas. It successfully revegetates processed oil shale and is commonly found on eroded areas and sites too saline for most plant species. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

Inventory data references

Site originally proposed as (028BY077NV) Droughty Sodic Loam 5-8" PZ

Type locality

Location 1: Elko County, NV	
Township/Range/Section	T37N R69E S34
General legal description	SW¼SE¼ Section 34, T37N. R69E. MDBM. Approximately 3½ miles south of Bar O Ranch in Pilot Valley, Elko County, Nevada.

Other references

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

Houghton, J.G., C.M. Sakamoto, and R.O. Gifford. 1975. Nevada's Weather and Climate, Special Publication 2. Nevada Bureau of Mines and Geology, Mackay School of Mines, University of Nevada, Reno, NV.

National Oceanic and Atmospheric Administration. 2004. The North American Monsoon. Reports to the Nation. National Weather Service, Climate Prediction Center. Available online: http://www.weather.gov/

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

Contributors

RK

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	12/22/2025
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

   _____

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

   _____

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

   _____

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

   _____

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

   _____

6. **Extent of wind scoured, blowouts and/or depositional areas:**

   _____

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

   _____

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most**

sites will show a range of values):

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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):**

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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):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
