USDA Natural Resources Conservation Service

Ecological site R027XY029NV
GRAVELLY FAN 8-10 P.Z.

Last updated: 6/03/2024
Accessed: 05/11/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 027X–Fallon-Lovelock Area

Physiography
Found in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus this area is characterized by isolated uplifted fault block mountain ranges trending north to south that are separated by broad, hydrologically closed basins. The entire area occurs in the rain-shadow of the Sierra Nevada mountains and is influenced by Pleistocene Lake Lahontan which reached its most recent high stand about 12,000 years ago. There is substantial evidence suggesting the western Great Basin has been the site of pluvial-interpluvial cycles for at least the past two million years.
The mountains and valleys are dissected by the Humboldt, Truckee, Carson, and Walker Rivers and their tributaries, all of which terminate within MLRA 27. Extensive playas can be found throughout this area and are the result of drying of ancient Lake Lahontan. Elevation generally ranges from 3,300 to 5,900 feet (1,005 to 1,800 meters) in valleys, but on some mountain peaks it is more than 7,870 feet (2,400 meters).

Geology
Landforms and soils of this MLRA have been heavily influenced by fluctuating lake level over the last 40,000 years. There is a level line evident on the higher slopes marking the former extent of glacial Lake Lahontan. Almost half of this area has surface deposits of alluvial valley fill influenced by lacustrine sediment. The rest has andesite and basalt rocks of different ages. Mesozoic and Tertiary intrusives are concentrated along the western border of the area, and Lower Volcanic Rocks (17 to 43 million years old) are common on the eastern side of the area. Also, some scattered outcrops of Mesozoic sedimentary and volcanic rocks and tuffaceous sedimentary rocks are in the mountains within the interior of this MLRA.

Climate
The average annual precipitation is 5 to 10 inches (125 to 255 millimeters) in most of the area but is as much as 19 inches (485 millimeters) on high mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The amount of precipitation is very low from summer to midautumn. The precipitation in winter occurs mainly as snow. The average annual temperature is 43 to 54 degrees F (6 to 12 degrees C). The freeze-free period averages 155 days and ranges from 110 to 195 days, decreasing in length with elevation.

Water
The amount of precipitation is very low, and water for irrigation is obtained principally from diversions on the four large rivers in the area and from water stored in the Lahontan, Rye Patch, and Weber Reservoirs. Pyramid Lake and Walker Lakes are terminal lakes for the Truckee and Walker Rivers, respectively. Much of the annual flow of both rivers is diverted for irrigation, causing lake levels to fall and levels of dissolved salts to increase causing problems for the native Lahontan cutthroat trout.

Soils
The dominant soil orders are Aridisols and Entisols. The soils in the area are predominantly a mesic temperature

regime, aridic moisture regime, and have a mixed mineralogy. They are generally well drained, loamy or sandy, commonly skeletal, and shallow to very deep. Accumulation of salts, tufa deposits, and eolian sediments with soluble salts over lacustrine deposits influence most of the soils in the basin landforms of this MLRA. Soils on bedrock-controlled landforms are typically comprised of volcanic or tuffaceous sedimentary colluvium over residuum.

Biological Resources
This area supports extensive areas of salt-desert shrub vegetation. Shadscale and Bailey's greasewood are widespread, occurring both individually and together. Grasses are generally sparse, although Indian ricegrass is prominent, especially on the sandy soils. Fourwing saltbush, winterfat, spiny hopsage, wolfberry, ephedra, dalea, and bud sagebrush are common shrubs. Basin wildrye, creeping wildrye, alkali sacaton, saltgrass, black greasewood, rubber rabbitbrush, and big saltbush are important plants on saline bottom lands and terraces. A few marsh areas support cattail, bulrushes, sedges, and rushes. Big sagebrush, along with scattered Utah juniper and singleleaf pinyon, is associated with Thurber needlegrass, desert needlegrass, Sandberg bluegrass, and squirreltail on the higher elevation piedmont slopes and mountains.

Ecological site concept

The Gravelly Fan 8-10 P.Z. site occurs on drainageways and channels. Slopes are less than 15 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 4500 to 6000 feet. Soils are very deep, well drained and formed in mixed alluvium. Surface soils are moderately coarse textured with high amounts of gravels.

Associated sites

R027XY007NV	**LOAMY SLOPE 8-10 P.Z.** ARTRW dominant shrub; ACTH7 dominant grass

Similar sites

R027XY091NV	**LOAMY FAN 10-12 P.Z.** LECI4 dominant grass; more productive site
R027XY045NV	**SANDY 8-10 P.Z.** ACHY dominant grass; GRSP & ATCA2 important shrubs, not codominant
R027XY008NV	**DROUGHTY LOAM 8-10 P.Z.** LECI4 minor grass, if present
R027XY092NV	**GRANITIC FAN 10-12 P.Z.** ACTH7 codominant grass; more productive site
R027XY067NV	**GRANITIC LOAM 8-10 P.Z.** ACSP12 dominant grass

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. tridentata* (2) *Grayia spinosa*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Leymus cinereus*

Physiographic features

The Gravelly Fan 8-10 P.Z. site occurs on drainageways and channels. Slopes range from 0 to 15 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 4500 to 6000 feet.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Channel
Runoff class	Very low
Flooding duration	Very brief (4 to 48 hours) to extremely brief (0.1 to 4 hours)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	4,500–6,000 ft
Slope	0–15%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is arid, characterized by cool, moist winters and hot, dry summers. Average annual precipitation is 8 to 10 inches. Mean annual air temperature is 45 to 55 degrees F. The average growing season is about 80 to 100 days.

Table 3. Representative climatic features

Frost-free period (average)	100 days
Freeze-free period (average)	
Precipitation total (average)	10 in

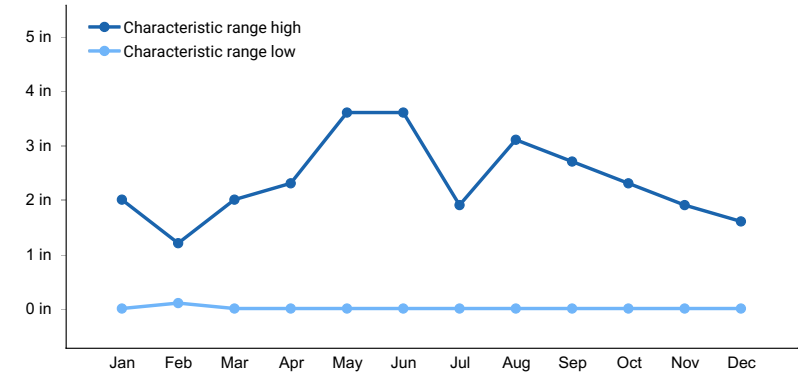


Figure 1. Monthly precipitation range

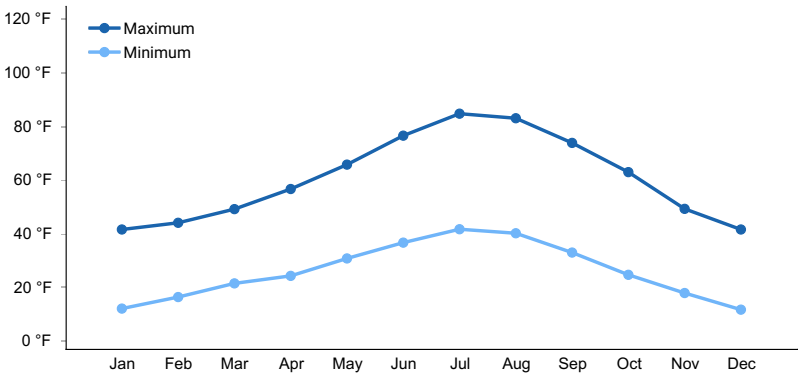


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

Site is influenced by adjacent ephemeral channels.

Soil features

Soils associated with this site are very deep, well drained and formed in mixed alluvium. Surface soils are moderately coarse textured and there are high amounts of gravels. The available water capacity is very low. Subsurface horizons are moderately to slightly alkaline. Surface runoff is very low. Potential for sheet and rill erosion is moderate. The soil series associated with this site include: Xeric Torriorthents.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Very gravelly loam (2) Gravelly loam (3) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	72–84 in
Surface fragment cover <=3"	10–46%
Surface fragment cover >3"	10–15%
Available water capacity (0-40in)	2.5–2.6 in
Calcium carbonate equivalent (0-40in)	0–5%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	10–46%
Subsurface fragment volume >3" (Depth not specified)	10–15%

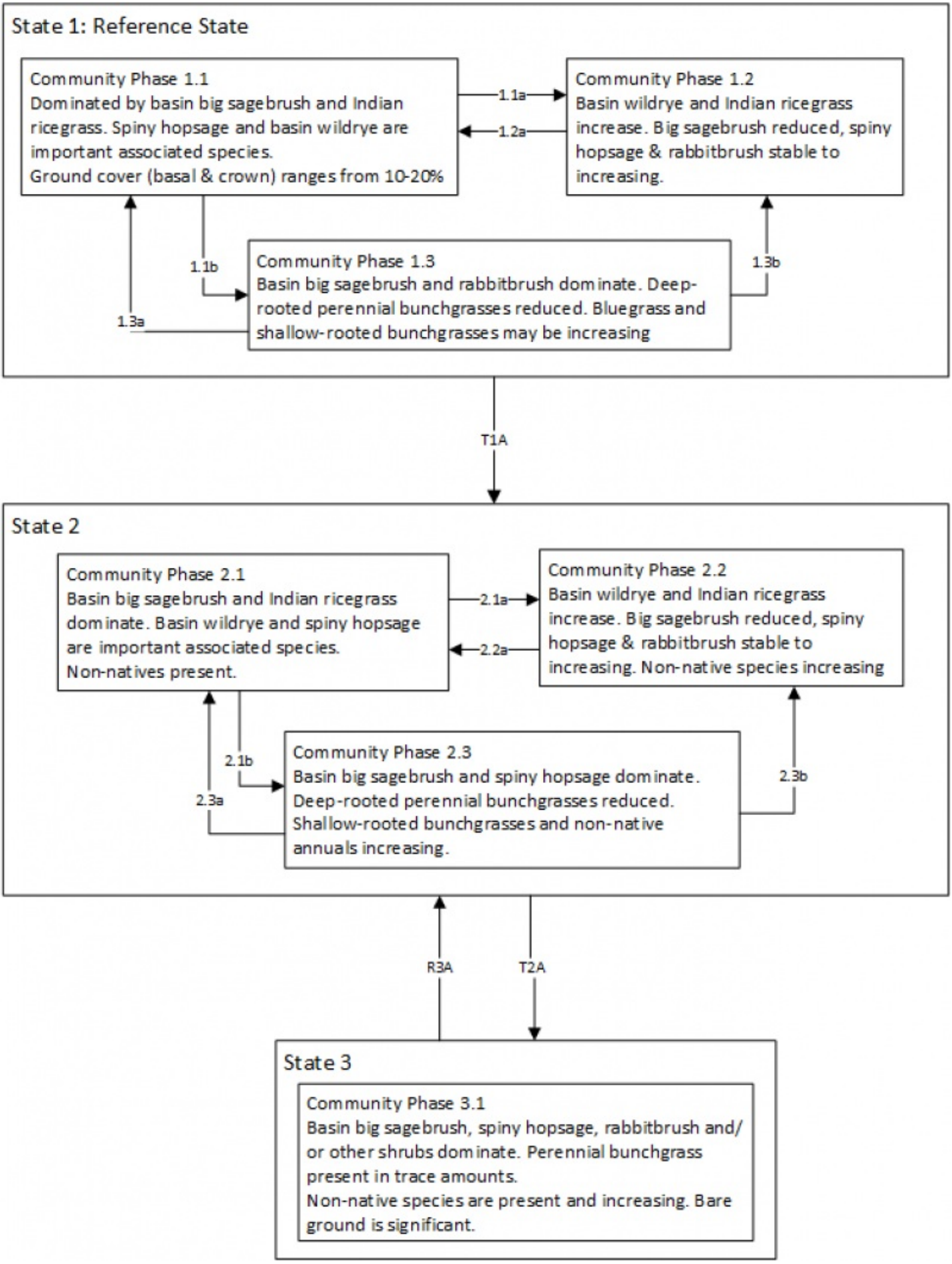
Ecological dynamics

As ecological condition deteriorates, big sagebrush and rabbitbrush increase as perennial grasses and forbs decrease. Species likely to invade this site are cheatgrass, Russian-thistle, halogeton, and annual mustards.

Fire Ecology:
Fire return intervals in basin big sagebrush are intermediate between mountain big sagebrush (15 to 25 years) and Wyoming big sagebrush (10 to 70 years). A naturally wide variation in fire frequency in this system is expected. 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. 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. 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. Basin wildrye is top-killed by fire. Older basin wildrye plants with large proportions of dead material within the perennial crown can be expected to show higher mortality due to fire than younger plants having little debris. 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. Basin wildrye is generally tolerant of fire but may be

damaged by early season fire combined with dry soil conditions.

State and transition model



Reference State 1.0
State 1: The reference state is represented of the natural range of variability under natural conditions. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.
CP 1.1: This community is characterized by Indian ricegrass and basin big sagebrush. Basin wildrye and spiny hopsage are important associated species. This site is tolerant of dry conditions, but prolonged drought will result in an overall decline, with possible mortality, in the plant community.
1.1a: Fire significantly reduces sagebrush cover and leads to early/mid-seral community, dominated by grasses and sprouting shrubs.
1.1b: Time, lack of disturbance, and/or prolonged drought
CP 1.2: This community phase is characteristic of a post-disturbance plant community. Basin big sagebrush and other shrubs are reduced. Herbaceous perennials and sprouting shrubs will recover quickly.
1.2a: Time and lack of disturbance allow for shrub regeneration.
CP 1.3: This community phase is characterized by a decadent overstory of basin big sagebrush. Indian ricegrass, basin wildrye and other deep-rooted perennial bunchgrasses are reduced due to competition for water, nutrients and sunlight. This community phase is at-risk of crossing a threshold into an alternative stable site.
1.3a: Low severity/patchy fire, Aroga moth, or combinations will reduce big sagebrush and for recovery of deep-rooted perennial bunchgrass species.
1.3b: Widespread fire significantly reduces sagebrush cover

Transition T1A: Introduction of non-native species such as cheatgrass, hoary cress and thistles.
Current Potential State 2.0: This state is similar to the reference state, with the presence of non-native species in the plant community. Non-native species reduce resistance and resilience of the site, but are not controlling ecological dynamics.

CP 2.1: This community phase is similar to CP 1.1. It is dominated by basin big sagebrush and Indian ricegrass with the presence of non-native species in the understory.
2.1a: Fire significantly reduces sagebrush cover and leads to earl-seral community dominated by grasses and forbs.
2.1b: Time and lack of disturbance such as fire, drought, and/or Inappropriate grazing management will reduce perennial understory and favor shrub overstory.
CP 2.2: This community is characterized by dominance of perennial bunchgrasses. Shrubs are reduced, non-native species are present and may be increasing.
2.2a: Time, lack of disturbance and natural regeneration over time allows for recovery of sagebrush
2.3a: Low severity/patchy fire or Aroga moth infestation creates sagebrush/grass mosaic. Brush management with minimal soil disturbance; latefall/ winter grazing causing mechanical damage to sagebrush.
2.3b: High severity fire significantly reduces sagebrush cover leading to early mid-seral community.

Transition T2A: Time and lack of disturbance, may be coupled with inappropriate grazing management and/or hydrologic changes that favor shrubs over
perennial grasses. (3.1).
Shrub state 3.0 is characterized by the dominance of basin big sagebrush. Basin wildrye and other perennial bunchgrasses are significantly reduced and are not contributing to ecological function. Distribution of water and nutrient resources are spatially truncated due to the dominance of shrubs.

Restoration Pathway R3A: Mechanical/chemical brush treatment coupled with herbicide.

State 1
Reference Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by big sagebrush, spiny hopsage, Indian ricegrass and basin wildrye. Potential vegetative composition is about 35% grasses, 10% forbs and 55% shrubs. Approximate ground cover (basal and crown) is 10 to 20 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	165	275	440
Grass/Grasslike	105	175	280
Forb	30	50	80
Total	**300**	**500**	**800**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			100–200	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	75–125	–
	basin wildrye	LECI4	*Leymus cinereus*	25–75	–
2	**Secondary Perennial Grasses**			10–40	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	3–15	–
	squirreltail	ELEL5	*Elymus elymoides*	3–15	–
	needle and thread	HECO26	*Hesperostipa comata*	3–15	–
	James' galleta	PLJA	*Pleuraphis jamesii*	3–15	–
	Sandberg bluegrass	POSE	*Poa secunda*	3–15	–
Forb					
3	**Perennial**			10–40	
	princesplume	STANL	*Stanleya*	3–11	–
Shrub/Vine					
4	**Primary Shrubs**			160–300	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	100–150	–
	spiny hopsage	GRSP	*Grayia spinosa*	50–125	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	10–25	–
	Forb, perennial	2FP	*Forb, perennial*	7–20	–
	princesplume	STANL	*Stanleya*	3–15	–
5	**Secondary Shrubs**			25–75	
	fourwing saltbush	ATCA2	*Atriplex canescens*	5–15	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	5–15	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	5–15	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	5–15	–
	burrobrush	HYMEN3	*Hymenoclea*	5–15	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	5–15	–
	desert peach	PRAN2	*Prunus andersonii*	5–15	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	5–15	–

Animal community

Livestock Interpretations:
This site is suited for livestock grazing. Grazing management should be keyed to Indian ricegrass production. Basin big sagebrush may serve as emergency food during severe winter weather, but it is not usually sought out by livestock. Spiny hopsage is tolerant of grazing and where abundant is a valuable browse plant for many species of livestock. Spiny hopsage provides a palatable and nutritious food source for livestock, particularly during late winter through spring. Its relative forage value may be less during the fall when it has been described as "useless".
Indian ricegrass has good forage value for domestic sheep, cattle and horses. It can be important cattle forage in winter, particularly in salt desert communities. Indian ricegrass is often used most heavily in the late winter, when succulent and nutritious new green leaves are produced. It supplies a source of green feed before most other native grasses have produced much new growth.
The early growth and abundant production of basin wildrye make it a valuable source of forage for livestock. It is

important forage for cattle and is readily grazed by cattle and horses in early spring and fall. Though coarse-textured during the winter, basin wildrye may be utilized more frequently by livestock and wildlife when snow has covered low shrubs and other grasses.

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:
Basin big sagebrush is browsed by mule deer from fall to early spring, but is not preferred. Basin big sagebrush is the least palatable of all the subspecies of big sagebrush. Spiny hopsage is tolerant of grazing and where abundant is a valuable browse plant for many species of wildlife. Spiny hopsage provides a palatable and nutritious food source for big game, particularly during late winter through spring. Its relative forage value may be less during the fall when it has been described as "useless". Basin wildrye provides winter forage for mule deer, though use is often low compared to other native grasses. Basin wildrye provides summer forage for black-tailed jackrabbits. Because basin wildrye remains green throughout early summer, it remains available for small mammal forage for longer time than other grasses. Indian ricegrass is an important forage species for several wildlife species.

Hydrological functions

Runoff is very low. Permeability is moderately rapid.

Other products

Some Native American peoples used the bark of big sagebrush to make rope and baskets.
Some Native American peoples traditionally ground parched seeds of spiny hopsage to make pinole flour.
Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source.
Basin wildrye was used as bedding for various Native American ceremonies, providing a cool place for dancers to stand.

Other information

Basin big sagebrush shows high potential for range restoration and soil stabilization. Basin big sagebrush grows rapidly and spreads readily from seed.
Spiny hopsage has moderate potential for erosion control and low to high potential for long-term re-vegetation 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.
Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement.
Basin wildrye is useful in mine reclamation, fire rehabilitation and stabilizing disturbed areas. Its usefulness in range seeding, however, may be limited by initially weak stand establishment.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Churchill County, NV	
Township/Range/Section	T19N R39E S7
General legal description	About 2 miles south of USHwy 50, Edwards Creek Valley, Churchill County, Nevada. This site also occurs in Pershing 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

DK/GD
TK Stringham

Approval

Kendra Moseley, 6/03/2024

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)	P NOVAK-ECHENIQUE
Contact for lead author	State Rangeland Management Specialist
Date	07/12/2012
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. A few can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt.

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

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 20-30% depending on amount of surface rock fragments

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

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 (<10 ft) 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.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically medium platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 1.5 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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 [i.e., Indian ricegrass, basin wildrye] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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 layers.

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>>Wyoming big sagebrush & spiny hopsage

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

    Other:

    Additional: After wildfire, perennial bunchgrasses and sprouting shrubs (ephedra, rabbitbrush) dominate. Sagebrush is removed for 5 to 10 years.

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 (up to 20%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Within plant interspaces (10-20%) and depth of litter is <1/4 inch

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

production): For normal or average growing season (end of May) ± 500 lbs/ac; Favorable years ±800 lbs/ac and unfavorable years ± 300 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, halogeton, Russian thistle, bassia 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. Reduced growth and reproduction occur during extreme or extended drought periods.
