USDA Natural Resources
Conservation Service

Ecological site R027XY045NV
SANDY 8-10 P.Z.

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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): 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 Sandy 8-10 P.Z. site occurs on fan remnants, lake terraces, and fan skirts. Slope gradients of 0 to 8 percent are typical. Elevations are 3900 to about 7200 feet. Soils are very deep, well drained and formed in mixed alluvium. Surface soils are typically overblown or alluvial sand more than 10 inches thick.

Associated sites

R027XY007NV	**LOAMY SLOPE 8-10 P.Z.** ACTH7 dominant grass
R027XY008NV	**DROUGHTY LOAM 8-10 P.Z.** ARTRW-GRSP codominant shrubs

Similar sites

R027XY058NV	**LOAMY 10-12 P.Z.** ACTH7 dominant grass; ARTRV dominant shrub; more productive site.
R027XY009NV	**SANDY 5-8 P.Z.** ATCA2 dominant shrub; ARTR2 absent

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. tridentata*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Elymus lanceolatus ssp. lanceolatus*

Physiographic features

The Sandy 8-10 P.Z. site occurs on fan remnants, lake terraces, and fan skirts. Slope gradients of 0 to 8 percent are typical. Elevations are 3900 to about 7200 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Lake terrace (3) Fan skirt
Runoff class	Low
Elevation	3,900–7,200 ft
Slope	0–8%

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 about 10(12) inches. Mean annual air temperature is 45 to 50 degrees F. The average growing season is about 90 to 120 days. There is no climate station available for this site.

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	
Precipitation total (average)	10 in

Influencing water features

There is no influencing water features associated with this site.

Soil features

Soils associated with this site are very deep, well drained and formed in mixed alluvium. Surface soils are typically overblown or alluvial sand more than 10 inches thick. These soils have rapid infiltration. Permeability is slow to moderately rapid and the available water capacity is very low to low. Surface runoff is very low to very high. Potential for sheet and rill erosion is slight, but wind erosion potential is high. The soil series associated with this site include: Deadyon, Fadoll, Watoopah, and Wedlar.

Table 4. Representative soil features

Parent material	(1) Alluvium–granite (2) Alluvium
Surface texture	(1) Gravelly sandy loam (2) Sand (3) Gravelly loamy sand
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Slow to moderately rapid
Soil depth	72–84 in
Surface fragment cover <=3"	6–43%
Surface fragment cover >3"	1–2%
Available water capacity (0-40in)	3.4–4.9 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–12
Soil reaction (1:1 water) (0-40in)	6.6–9

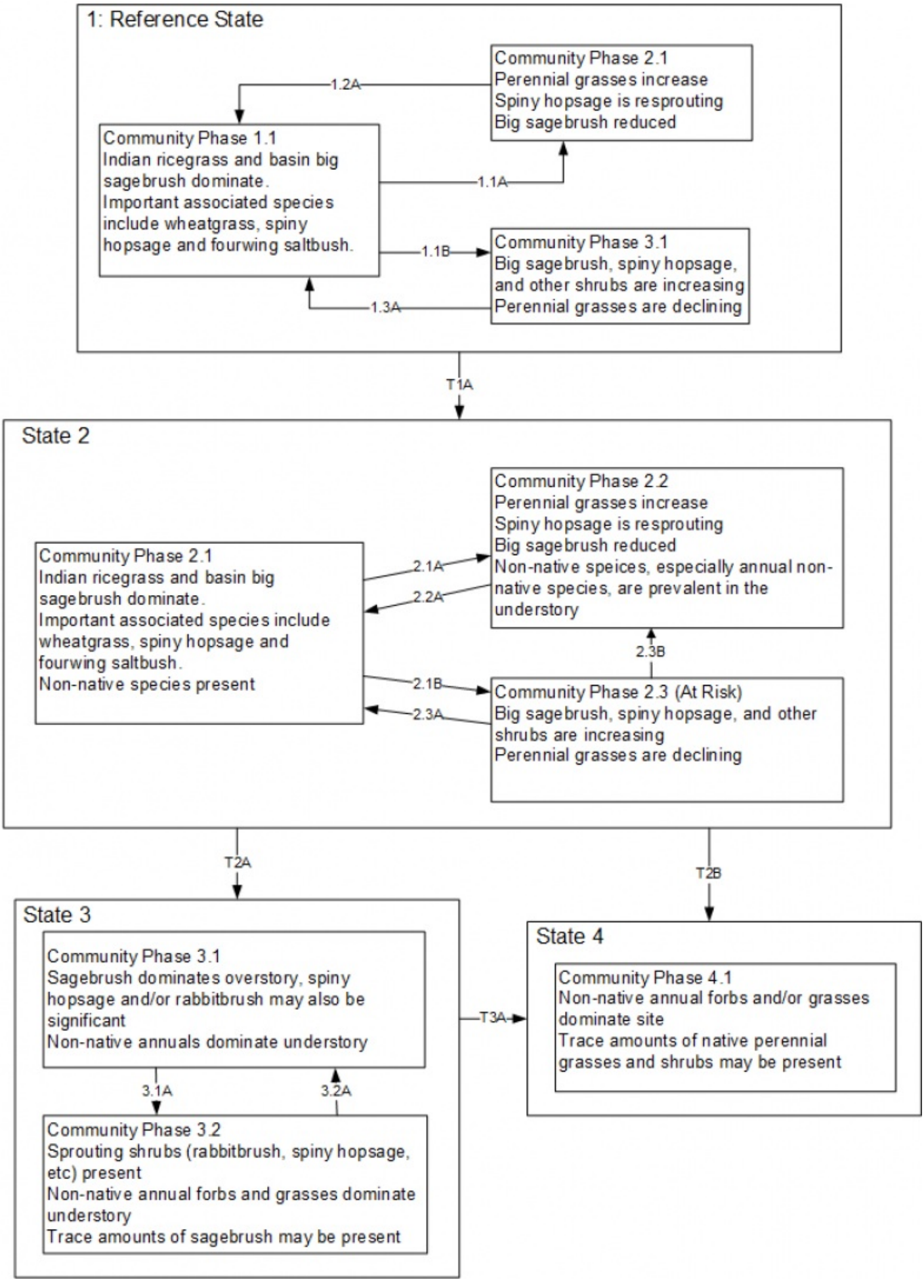
Subsurface fragment volume <=3" (Depth not specified)	6–43%
Subsurface fragment volume >3" (Depth not specified)	1–2%

Ecological dynamics

As ecological condition declines, big sagebrush and Douglas' rabbitbrush increase, while Indian ricegrass, rhizomatous wheatgrasses, and perennial forbs decrease. Species most likely to invade this site are cheatgrass, Russian thistle and annual mustards.

Fire Ecology:
Fire return intervals in basin big sagebrush are intermediate between mountain big sagebrush (5 to 15 years) and Wyoming big sagebrush (10 to 70 years). It is important to note that "given the wide range of fuel situations and our understanding of yearly climatic variation in the sagebrush ecosystem, a naturally wide variation in fire frequency in this system should be expected. Big sagebrush is readily killed when aboveground plant parts are charred by fire. If sagebrush foliage is exposed to temperature above 195 degrees Fahrenheit for longer than 30 seconds, the plant dies. Prolific seed production from nearby unburned plants coupled with high germination rates enables seedlings to establish rapidly following fire.
Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. Low culm density in Indian ricegrass reduces charring of crowns below soil, thereby protecting the growing points during a fire.
Wheatgrasses are generally fire resistant, and thickspike wheatgrass is quite tolerant of fire. Subsurface growing points and primarily rhizomatous reproduction may explain its ability to increase rapidly (within 2-5 years) following burning.

State and transition model


1: Reference State
Community Phase 2.1
Perennial grasses increase
Spiny hopsage is resprouting
Big sagebrush reduced
1.2A
Community Phase 1.1
Indian ricegrass and basin big sagebrush dominate.
Important associated species include wheatgrass, spiny hopsage and fourwing saltbush.
1.1A
1.1B
Community Phase 3.1
Big sagebrush, spiny hopsage, and other shrubs are increasing
Perennial grasses are declining
1.3A
T1A
State 2
Community Phase 2.2
Perennial grasses increase
Spiny hopsage is resprouting
Big sagebrush reduced
Non-native speices, especially annual non-native species, are prevalent in the understory
Community Phase 2.1
Indian ricegrass and basin big sagebrush dominate.
Important associated species include wheatgrass, spiny hopsage and fourwing saltbush.
Non-native species present
2.1A
2.2A
2.3B
2.1B
Community Phase 2.3 (At Risk)
Big sagebrush, spiny hopsage, and other shrubs are increasing
Perennial grasses are declining
2.3A
T2A
T2B
State 3
Community Phase 3.1
Sagebrush dominates overstory, spiny hopsage and/or rabbitbrush may also be significant
Non-native annuals dominate understory
3.1A
3.2A
Community Phase 3.2
Sprouting shrubs (rabbitbrush, spiny hopsage, etc) present
Non-native annual forbs and grasses dominate understory
Trace amounts of sagebrush may be present
T3A
State 4
Community Phase 4.1
Non-native annual forbs and/or grasses dominate site
Trace amounts of native perennial grasses and shrubs may be present

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 basin wildrye, with a lesser component of basin big sagebrush. Western wheatgrass and creeping wildrye 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. Basin wildrye and other deep-rooted perennial bunchgrasses are reduced due to competition for water, nutrients and sunlight. This community phase is at-rick 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.
CPP: This community phase is similar to community phase 1.1 with the presence of the non-native species.
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, especially non-native annuals, 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.
CP 3.1: This community phase is characterized by the dominance of shrubs. Perennial, deep-rooted bunchgrasses are trace to absent.
3.1a: Fire, brush management (soil disturbing practices may result in a transition to CP 4.1), and/or late-fall/winter grazing causing mechanical damage to sagebrush.
CP 3.2: This community phase is characteristic of a post disturbance plant community. Sagebrush may or may not be present. Spiny hopsage, rabbitbrush and other sprouting shrubs are increasing and may dominate for an extended period of time.
3.2a: Time and lack of disturbance (an unlikely/slow transition).
Transition T3A: Fire (4.1). Inappropriate grazing management, may be combined with higher than normal spring precipitation could increase annual non-native species in the understory (4.2)

Transition T2B: Catastrophic wildfire (4.1). Inappropriate grazing management in the presence of non-native annual species and/or higher than normal spring precipitation could increase the non-native annual species in the understory.

Annual state 4.0 is characterized by the dominance of non-native annual species. This state has crossed an ecological threshold and nutrient and hydrologic cycling are now controlled by non-native annuals. Regeneration of sagebrush in this state is unlikely due to the annual grass fire cycle.

State 1
Reference Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by Indian ricegrass, rhizomatous wheatgrasses, and big sagebrush. Potential vegetative composition is about 60% grasses, 5% forbs and 35% shrubs. Approximate ground cover (basal and crown) is 15 to 20 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	240	360	480
Shrub/Vine	140	210	280
Forb	20	30	40
Total	**400**	**600**	**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**			156–378	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90–180	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	30–90	–
	needle and thread	HECO26	*Hesperostipa comata*	30–60	–
	western wheatgrass	PASM	*Pascopyrum smithii*	6–48	–
2	**Secondary Perennial Grasses**			30–60	
	sedge	CAREX	*Carex*	3–18	–
	squirreltail	ELEL5	*Elymus elymoides*	3–18	–
	basin wildrye	LECI4	*Leymus cinereus*	3–18	–
	James' galleta	PLJA	*Pleuraphis jamesii*	3–18	–
	Sandberg bluegrass	POSE	*Poa secunda*	3–18	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	3–18	–
Forb					
3	**Perennial Forbs**			6–48	
	basin wildrye	LECI4	*Leymus cinereus*	3–18	–
	buckwheat	ERIOG	*Eriogonum*	3–12	–
	evening primrose	OENOT	*Oenothera*	3–12	–
	beardtongue	PENST	*Penstemon*	3–12	–
	globemallow	SPHAE	*Sphaeralcea*	3–12	–
Shrub/Vine					
4	**Primary Shrubs**			126–258	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	90–150	–
	spiny hopsage	GRSP	*Grayia spinosa*	30–60	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	6–48	–
	James' galleta	PLJA	*Pleuraphis jamesii*	3–18	–
5	**Secondary Shrubs**			30–60	
	sedge	CAREX	*Carex*	3–18	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	3–18	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	3–18	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	3–18	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	3–18	–

Animal community

Livestock Interpretations:
This site is suited for livestock grazing. Grazing management should be keyed to Indian ricegrass. Big sagebrush is eaten by domestic sheep and cattle, but has long been considered to be of low palatability to domestic livestock, a competitor with more desirable species, and a physical impediment to grazing.
Indian ricegrass has good forage value for domestic sheep, cattle and horses. 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.

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:
Big sagebrush is highly preferred and nutritious winter forage for mule deer. Sage grouse are also highly dependent on big sagebrush for both food and cover. Indian ricegrass is an important forage species for several wildlife species.

Hydrological functions

Runoff is very low to very high. Permeability is slow to moderately rapid.

Recreational uses

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

Other products

Some Native American peoples used the bark of big sagebrush to make rope and baskets.
Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source. Triticeae members, including thickspike wheatgrass, are valued for scientific research due to the following traits: extreme morphological variation, varied ecological requirements, wide range in chromosome number, large chromosomes that are well adapted to cytological analysis, and an unusual ability to hybridize with other species. Because of their wide distribution and economic importance, the Triticeae grasses are frequently used in experimental work and are often reported in agronomic and other literature.

Other information

Basin big sagebrush shows high potential for range restoration and soil stabilization. Basin big sagebrush grows rapidly and spreads readily from seed. Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Churchill County, NV	
Township/Range/Section	T15N R31E S33
General legal description	South of Diamond Field Jack Wash, Barnett Hills area, Churchill County, Nevada. This site also occurs in Lyon, Mineral, and Pershing 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

DK/GED

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)	Patti Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	07/19/2013
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.

2. **Presence of water flow patterns:** Flow patterns are none.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare to none.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground to 35-50% 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 to rare. Some wind-scouring will occur after wildfires.

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 extreme wind events. Persistent litter (large woody material) will remain in place.

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 1 to 4 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):** Structure

of soil surface is weak medium platy or single grain. Soil surface colors are pale browns or grays and soils are typified by ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 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:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Indian ricegrass]) 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. Subsurface massive soil structure or argillic horizons should not be interpreted as compaction.

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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 (i.e., Indian ricegrass)

    Sub-dominant: tall shrubs (big sagebrush) > associated shrubs > shallow-rooted, cool season, perennial bunchgrasses > perennial forbs > annual forbs

    Other:

    Additional: After wildfire: deep-rooted cool season perennial bunchgrasses and sprouting shrubs are dominant for an extended period. Big sagebrush will be removed for 5 to 10 years.

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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 common and standing dead shrub canopy material may be as much as 25% of total woody canopy; mature bunchgrasses may have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces 20-30% and depth <¼-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 (February thru June) ± 600lbs/ac. Favorable years ±800 lbs/ac and unfavorable years ± 400 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 halogeton, annual mustards, Russian thistle, and cheatgrass.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average and above average growing season years. Little growth or reproduction occurs during extreme or extended drought periods.
