USDA Natural Resources Conservation Service

Ecological site R027XY025NV
SODIC FLAT

Last updated: 6/03/2024
Accessed: 06/30/2024

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 Sodic Flat site occurs on alluvial flats, stream terraces and lake plains. Slope gradients range from 0 to 2 percent. Elevations are 3800 to 5600 feet. The soils associated with this site are very deep, moderately well drained to well drained and have formed in mixed alluvium. The soils are strongly to very strongly alkaline.

Associated sites

R027XY016NV	**SODIC DUNES** ACHY dominant grass; occurs on sand hill (dune) landform

Similar sites

R027XY006NV	**SALINE BOTTOM** LECI4 dominant plant; more productive site
R027XY036NV	**DRY SODIC TERRACE** SAVE4-ATCO codominant shrubs; LYSH important shrub
R027XY024NV	**SODIC TERRACE** SAVE4-ATCO codominant shrubs
R027XY012NV	**SODIC SANDS** ACHY dominant grass

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Sarcobatus vermiculatus*
Herbaceous	(1) *Distichlis spicata*

Physiographic features

The Sodic Flat site occurs on alluvial flats, stream terraces and lake plains. Slope gradients range from 0 to 2 percent. Elevations are 3800 to 5600 feet. Surface runoff is negligible to low and ponding occurs in the winter and early spring.

Table 2. Representative physiographic features

Landforms	(1) Alluvial flat (2) Lake plain (3) Stream terrace
Runoff class	Negligible to very high

Flooding duration	Long (7 to 30 days)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	3,800–5,600 ft
Slope	0–2%
Water table depth	11–72 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 3 inches to about 7 inches. Mean annual air temperature is 49 to 58 degrees F. The average growing season is about 100 to 140 days.

Table 3. Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	
Precipitation total (average)	7 in

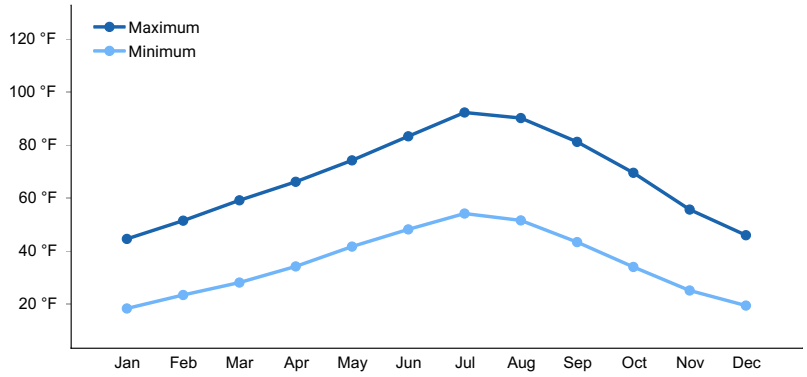


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

This site may receive additional moisture in the winter and early spring by ponding due to its occurrance on alluvial flats and lake plains.

Soil features

The soils associated with this site are very deep, moderately well drained to well drained and have formed in mixed alluvium. The soils are strongly to very strongly alkaline. Permeability is very slow to moderately rapid. Potential for sheet and rill erosion is slight. The soil moisture regime is typic aridic and the soil temperature regime is mesic. The soil series associated with this site include: Appian, Big Meadow, Boton, Bunejug, Carcity, Chuckles, Churchill, Cirac, Corbilt, Dia, Dithod, East Fork, Erber, Fallon, Fernley, Gardella, Gitakup, Humbolt, Huxley, Kniesley, Kodak, Lahontan, Mazuma, Nevadanile, Ocala, Parran, Placeritos, Ragtown, Slaw, Soda Lake, Sondoa, Sonoma, Stillwater, Swingler, Swope, Wabuska, and Yobe.

The representative soil series is Ragtown, a fine, smectitic, calcareous, mesic Typic Torriorthents. An ochric epipedon occurs from the soil surface to 18 cm and secondary carbonates occurs from 58 to 107 cm.

Table 4. Representative soil features

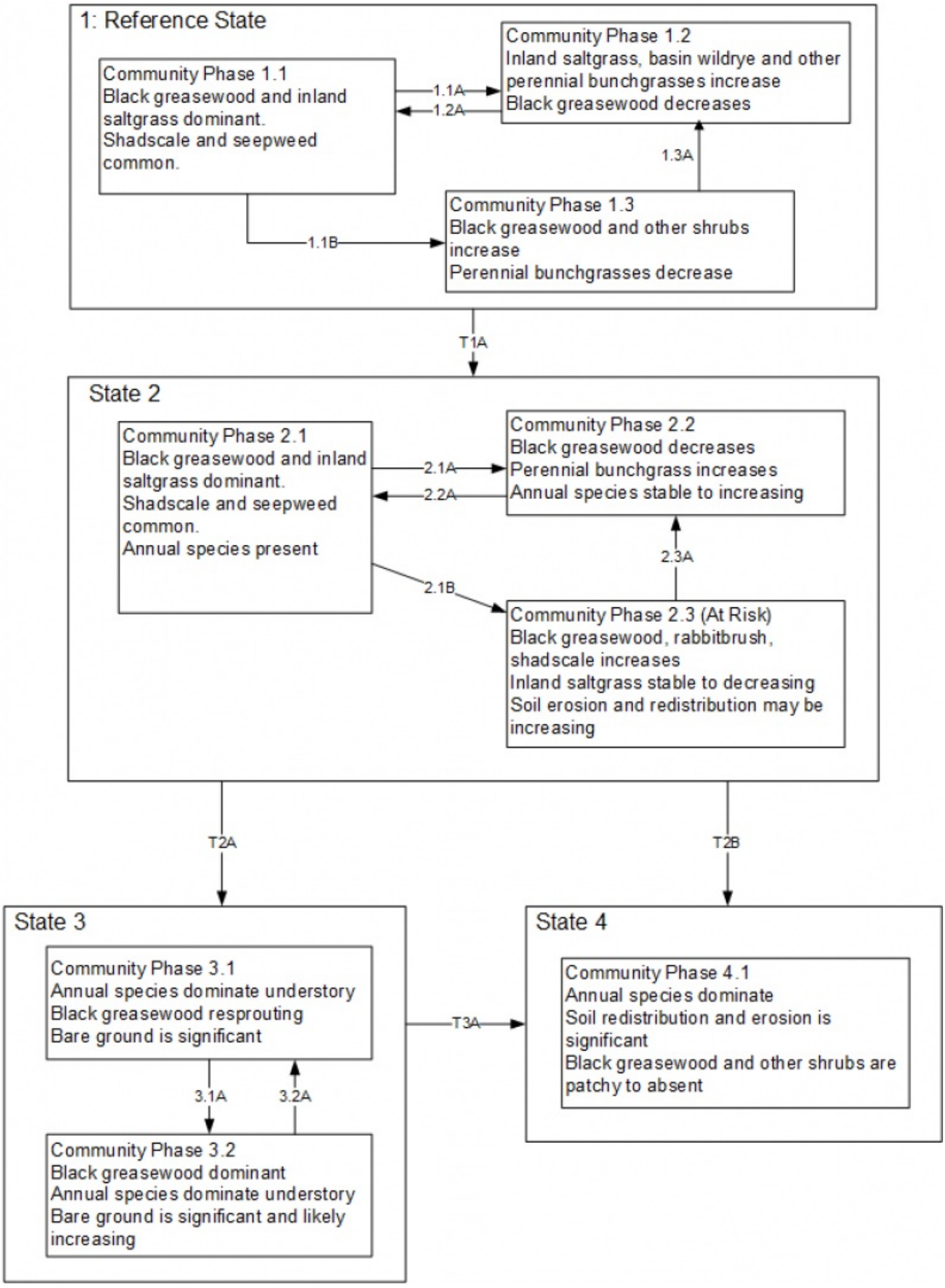
Parent material	(1) Alluvium (2) Lacustrine deposits
Surface texture	(1) Sandy clay loam (2) Silt loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately rapid
Soil depth	72–84 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3–7.9 in
Calcium carbonate equivalent (0-40in)	1–10%
Electrical conductivity (0-40in)	0–32 mmhos/cm
Sodium adsorption ratio (0-40in)	1–90
Soil reaction (1:1 water) (0-40in)	8–9.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

As ecological condition declines, Indian ricegrass and bottlebrush squirreltail decrease as shadscale and black greasewood increase. Species likely to invade this site are halogeton, annual mustards and cheatgrass.

Fire Ecology:
The mean fire return interval for shadscale-greasewood communities range from 35 to over 100 years. Shadscale communities are usually unaffected by fire because of low fuel loads, although a year of exceptionally heavy winter rains can generate fuels by producing a heavy stand of annual forbs and grasses. Increased presence of non-native annual grasses, such as cheatgrass, can alter fire regimes in shadscale communities by increasing fire frequency under wet to near-normal summer moisture conditions. When fire does occur, the effect on the ecosystem may be extreme. Black greasewood may be killed by severe fires, but it commonly sprouts soon after low to moderate-severity fire.
Non-saline species have changed fire frequency and intensity. Saltgrass rhizomes occur deep in the soil where they are insulated from the heat of most fires. Saltgrass survives fire by sending up new growth from rhizomes.

State and transition model



The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. State dynamics are maintained by interactions between climatic patterns

and disturbance regimes, including burning by native people. 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.

Community phase 1.1: This community is dominated by black greasewood with inland saltgrass understory. Shadscale, seepweed and basin wildrye are present throughout the plant community. This community phase is stable and long-lived, it is tolerant of prolong drought conditions. Drought favors shrubs over grasses, due to their well developed root systems. However, prolonged drought will result in an overall decline in the plant community.

1.1a: Low severity fire resulting in a mosaic pattern.
1.1b: Time and lack of disturbance such as fire, drought, herbivory, or combinations of these.

Community phase 1.2: This community is characteristics of a post disturbance plant community. Perennial bunchgrasses increase and greasewood temporarily decreases, but likely sprouts from the root crown and returns to dominance within a few years. Fire are typically low severity and patchy due to limited fine fuels.

1.2a: Time, natural regeneration and lack of disturbance such as fire, drought, herbivory, or combinations of these.

Community phase 1.3: Black greasewood and shadscale increase in the absence of disturbance. Decadent shrubs dominate the overstory and deep-rooted perennial bunchgrasses in the understory are reduced, or mostly absent.

1.3a: Fire significantly reduces shrub cover.

Transition T1A: Introduction of non-native plants.

Current Potential State 2.0: This state is similar to the Reference State 1.0. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These feedbacks include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Community Phase 2.1:
This community phase is compositionally similar to the Reference State Community Phase 1.1 with the presence of non-native species in trace amounts. This community is dominated by black greasewood. Inland saltgrass, shadscale, seepweed and other shrubs comprise the minor components. Non-native annual species such as halogeton and cheatgrass are present.

2.1a: Fire or brush treatments (i.e. mowing) with minimal soil disturbance.
2.1b: Time and lack of disturbance such as fire. Drought, inappropriate grazing management, or combinations of these would

also decrease the perennial understory.

Community Phase 2.2:
This community phase is characteristic of a post-disturbance plant community with annual non-native species present. Perennial bunchgrasses such as alkali sacaton, inland saltgrass and basin wildrye are increasing. Depending on fire severity patches of intact shrubs may remain. Black greasewood and rabbitbrush may be sprouting. Annual non-native species are stable to increasing in the community.
2.2a: Time, natural regeneration and lack of disturbance such as fire. Drought, inappropriate grazing management, or combinations of these would also decrease the perennial understory.

Community Phase 2.3 (at-risk):
Black greasewood dominates the overstory and perennial bunchgrasses in the understory are reduced, either from competition with shrubs or from inappropriate grazing, or from both. Rabbitbrush and shadscale may be a significant component. Inland saltgrass is more grazing tolerant and may increase within the community. Annual non-native species are stable or increasing. This community is at risk of crossing a threshold to State 3.0 (grazing or fire).
2.3a: Low severity/patchy fire or heavy late fall/winter grazing causing mechanical damage to shrubs and/or brush treatment with minimal soil disturbance.

Transition T2A: Time and lack of disturbance often coupled with excessive grazing pressure would reduce the perennial understory(3.1). Severe fire, lowering of water table from groundwater pumping and/or soil disturbing brush treatments (3.2)
Transition T2B: Severe fire, lowering of water table from groundwater pumping and/or soil disturbing brush treatments (4.1),

Shrub State 3.0: This state is characterized by a dominance of black greasewood and rabbitbrush in the overstory. This site has crossed a biotic and abiotic threshold and site processes are being controlled by shrubs. Bare ground has increased and pedestalling of grasses may be excessive. Non-natives are present and likely increasing.

Community Phase 3.1:
Black greasewood dominates the overstory. Rabbitbrush and shadscale may be a significant component. Deep-rooted perennial bunchgrasses have significantly declined. Annual nonnative species increase. Bare ground is significant.
3.1a: Drought and/or lowering of the water table due to groundwater pumping and/or severe fire.

Community Phase 3.2:
Rabbitbrush and shadscale dominates the site. Perennial grasses are present but a minor component. Annual non-native species are present and may be increasing in the understory.
3.2a: Release of drought and/or grazing pressure may allow for black greasewood and perennial bunchgrasses to increase
Transition T3A: Severe fire, lowering of water table by groundwater pumping and/or soil disturbing treatments (4.1)

Annual State 4.0
In this state, a biotic threshold has been crossed and state dynamics are driven by the dominance and persistence of the annual plant community which is perpetuated by a shortened fire return interval. The herbaceous understory is dominated by annual non-native species such as cheatgrass and halogeton. Bare ground may be abundant. The fire return

interval has shortened due to the dominance of cheatgrass in the understory and is a driver in site dynamics.

Community Phase 4.1:
This community is dominated by annual non-native species. Halogeton is common, cheatgrass and mustards may also be present. Trace amounts of shadscale and other shrubs may be present, but are not contributing to site function. Bare ground may be abundant, especially during low precipitation years. Soil erosion from wind and soil temperature are driving factors in site function.

State 1
Reference State

Community 1.1
Reference Plant Community

The reference plant community is dominated by black greasewood, shadscale and saltgrass. Vegetation on this site is restricted to coppice mound areas that are surrounded by playa-like, usually barren, depressions. Potential vegetative composition is about 15% grasses, 5% forbs and 80% 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	120	280	400
Grass/Grasslike	22	52	75
Forb	8	18	25
Total	**150**	**350**	**500**

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**			7–35	
	saltgrass	DISP	*Distichlis spicata*	7–35	–
2	**Secondary Perennial Grasses**			18–35	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–11	–
	squirreltail	ELEL5	*Elymus elymoides*	2–11	–
	basin wildrye	LECI4	*Leymus cinereus*	2–11	–
	alkali sacaton	SPAI	*Sporobolus airoides*	2–11	–
Forb					
3	**Perennial**			7–28	
Shrub/Vine					
4	**Primary Perennial Shrubs**			224–301	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	210–238	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	7–35	–
	seepweed	SUAED	*Suaeda*	7–28	–
	basin wildrye	LECI4	*Leymus cinereus*	2–11	–
5	**Secondary Perennial Shrubs**			18–53	
	alkali sacaton	SPAI	*Sporobolus airoides*	2–11	–
	iodinebush	ALOC2	*Allenrolfea occidentalis*	2–11	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	2–11	–
	Torrey's saltbush	ATTO	*Atriplex torreyi*	2–11	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	2–11	–
	spiny hopsage	GRSP	*Grayia spinosa*	2–11	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	2–11	–
	horsebrush	TETRA3	*Tetradymia*	2–11	–

Animal community

Livestock Interpretations:
This site is suitable for grazing by livestock. Grazing management should be keyed to inland saltgrass production. Saltgrass's value as forage depends primarily on the relative availability of other grasses of higher nutritional value and palatability. It can be an especially important late summer grass in arid environments after other forage grasses have deceased. Saltgrass is rated as a fair to good forage species only because it stays green after most other grasses dry. Livestock generally avoid saltgrass due to its coarse foliage. Saltgrass is described as an “increaser” under grazing pressure. 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. Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of livestock. Shadscale provides good browse for domestic sheep. Shadscale leaves and seeds are an important component of domestic sheep and cattle winter diets.

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:
Black greasewood is an important winter browse plant for big game animals. It also receives light to moderate use by mule deer and pronghorn during spring and summer months. Black greasewood is an important source of food for jackrabbits. Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of wildlife particularly during spring and summer before the hardening of spiny twigs. It supplies browse, seed, and cover for birds, small mammals, rabbits, deer, and pronghorn antelope. Saltgrass provides cover for a variety of bird species, small mammals, and arthropods and is on occasion used as forage for several big game wildlife species.

Hydrological functions

Runoff on this site is negligible to very high. There are no rills or pedestals. Water flow patterns are rare to common dependent on location relative to major inflow areas. Water flow patterns are typically short, ending in depressional areas where water ponds. Moderately fine to fine surface textures and physical crusts result in limited infiltration rates. Concentrations of surface salts and sodium result in chemical crusts which also impede precipitation infiltration. Gullies are none to common depending on landform. Where this site occurs on landforms not associated with ephemeral or perennial drainageways gullies do not occur. Where this site occurs associated with drainageways, gullies are rare to common. The gullies and associated head cuts should be healing and stable. In areas with cover (sparse) of deep-rooted perennial herbaceous bunchgrasses (basin wildry) and/or rhizomatous grasses (salt grass) slow runoff and increase infiltration.

Other products

The leaves, seeds and stems of black greasewood are edible. Seeds of shadscale were used by Native Americans of Arizona, Utah and Nevada for bread and mush. Saltgrass was used as a food source by Native Americans. The stiffness of the plant also made it an excellent brushing material for cleaning various implements or removing cactus thorns from objects.

Other information

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. Given its extensive system of rhizomes and roots which form a dense sod, saltgrass is considered an outstanding species for controlling wind and water erosion.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Churchill County, NV	
Township/Range/Section	T17N R29E S34
General legal description	South of Fallon, southern end of Carson Lake Pasture at edge of playa, Churchill county Nevada. This site also occurs in Lyon, Mineral, Pershing, Storey, and Washoe 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/GD

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

Indicators

1. **Number and extent of rills:** None

2. **Presence of water flow patterns:** Water flow patterns are rare to common dependent on location relative to major inflow areas. Water flow patterns are typically short, ending in depressional areas where water ponds. Moderately fine to fine surface textures and physical crusts result in limited infiltration rates. Concentrations of surface salts and sodium result in chemical crusts which also impede precipitation infiltration.

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground >75%; surface rock fragments less than 5%; shrub canopy less than 10%; basal area for perennial herbaceous plants <5%.

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 of grasses and annual & perennial forbs) is expected to move the distance of slope length during periods of intense summer convection storms. Persistent litter (large woody material) will remain in place except during unusually severe flooding 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 will range from 1 to 4. (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 will be platy or massive. Soil surface colors are very light and are typified by an ochric epipedon. Organic carbon is typically less than 0.9 percent (OM values taken from lab characterization data.)

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** In areas with cover (sparse) of deep-rooted perennial herbaceous bunchgrasses (basin wildry) and/or rhizomatous grasses (salt grass) slow runoff and increase infiltration.

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 subsurface layers are normal for this site and are not to be interpreted as compaction.

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: salt-desert shrubs>

    Sub-dominant: Rhizomatous perennial grass > deep-rooted, cool season, perennial bunch grasses > deep-rooted, cool season, perennial forbs > shallow-rooted, cool season, perennial bunchgrasses > fibrous, shallow-rooted, cool season, perennial forbs.

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 35% of total woody canopy

14. **Average percent litter cover (%) and depth (in):** Under canopy and between plant interspaces (10-20%) and depth of litter is ±¼ inch.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (March thru mid-May) ±350 lbs/ac; Winter moisture significantly affects total production.

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Potential invaders include annual mustards, Russian thistle, halogeton and cheatgrass.

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