Ecological site R027XY044NV
SALINE 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 Saline Flat site occurs on lower piedmont slopes, fan skirts, inset fans and lake terraces. Slope gradients of 2 to 8 percent are typical. Elevations are 3400 to 4300 feet. The soils are moderately deep to very deep and somewhat poorly to poorly drained. Surface soils are moderately-coarse textured and there are high amounts of gravels on the surface. The soils are calcareous and moderately to strongly alkaline throughout the soil profile.

Associated sites

R027XY041NV	**DEEP SODIC FAN** More productive site

Similar sites

R027XY003NV	**LOAMY BOTTOM** More productive site; ATTO, SAVE4 & DISP absent; soils not saline-alkali affected
R027XY006NV	**SALINE BOTTOM** More productive site; SAVE4 dominant shrub: ATTO minor shrub, if present
R027XY024NV	**SODIC TERRACE** Less productive site ATCO-SAVE4 codominant shrubs

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex torreyi*
Herbaceous	(1) *Leymus cinereus*

Physiographic features

The Saline Flat site occurs on lower piedmont slopes, fan skirts, inset fans and lake terraces. Slope gradients of 2 to 8 percent are typical. Elevations are 3400 to 4300 feet.

Table 2. Representative physiographic features

Landforms	(1) Lake plain (2) Flood plain (3) Alluvial flat
Runoff class	Negligible to high
Flooding duration	Brief (2 to 7 days) to very brief (4 to 48 hours)

Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	4,000–4,700 ft
Slope	0–2%
Water table depth	48–66 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 to 5 inches. Mean annual air temperature is 52 to 60 degrees F. The average growing season is about 120 to 180 days.

Table 3. Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	
Precipitation total (average)	5 in

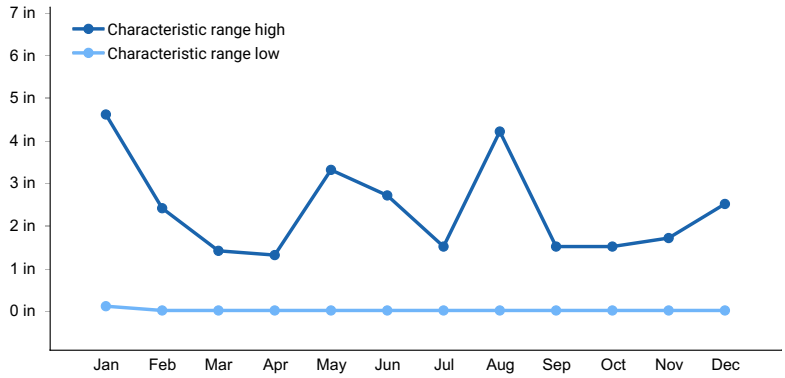


Figure 1. Monthly precipitation range

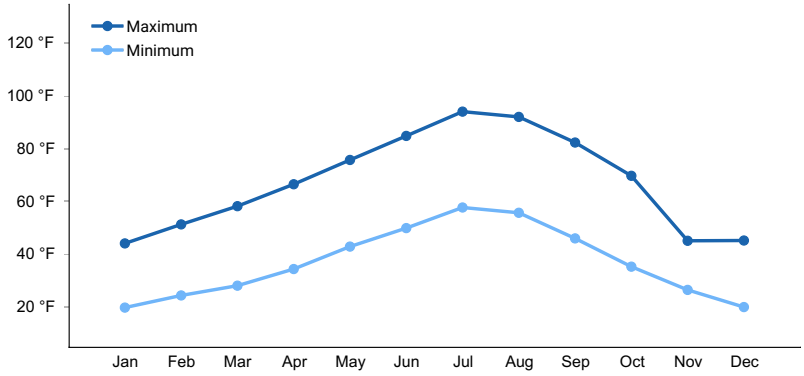


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are moderately deep to very deep and somewhat poorly to poorly drained. Surface soils are moderately-coarse textured and there are high amounts of gravels on the surface. These soils are calcareous and moderately to strongly alkaline throughout the soil profile. Permeability is very slow to moderately

slow and available water capacity is very low to high. Runoff is low to very high and ponding occurs in some areas. Potential for sheet and rill erosion is slight. The soil series associated with this site include: Bezo, Erber, and Vamp.

Table 4. Representative soil features

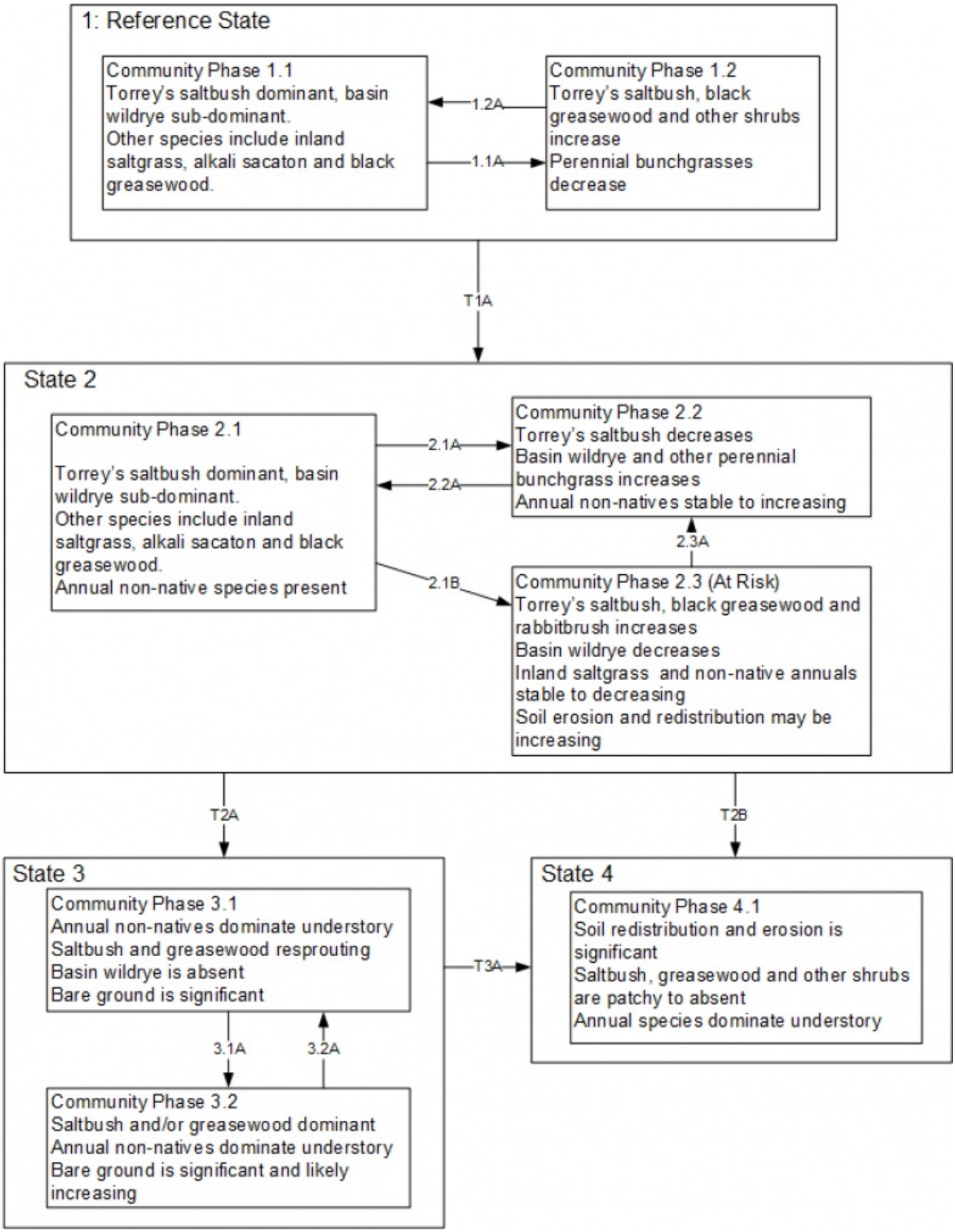
Parent material	(1) Alluvium
Surface texture	(1) Silt loam (2) Very fine sandy loam (3) Sand
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to poorly drained
Permeability class	Very slow to moderately rapid
Soil depth	20–84 in
Surface fragment cover <=3"	7–9%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2.4–7.7 in
Calcium carbonate equivalent (0-40in)	0–10%
Electrical conductivity (0-40in)	0–72 mmhos/cm
Sodium adsorption ratio (0-40in)	0–90
Soil reaction (1:1 water) (0-40in)	6.6–9.6
Subsurface fragment volume <=3" (Depth not specified)	7–9%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

As ecological condition declines, Torrey's quailbush, rubber rabbitbrush, and black greasewood increase as basin wildrye and other deep-rooted perennial herbaceous plants decrease. Inland saltgrass increases as condition declines and may dominate the understory when this site is in low ecological condition. Species likely to invade this site are annual mustards, cheatgrass, and whitetop.

Fire Ecology:
Torrey’s quailbush has been shown to have reduced flammability due to high moisture and ash contents. Torrey’s quailbush can survive at least some fires. The limited information available suggests that the most likely postfire regeneration strategy of Torrey’s quailbush is seed production.
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. 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

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 basin wildrye and Torrey's saltbush. Black greasewood and basin big sagebrush is common throughout the plant community. Inland saltgrass, alkiali sacaton and rubber rabbitbrush are also present. 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. This site may experience patchy fire under natural conditions. Basin wildrye will readily recover and return to dominance

1.1a: Time and lack of disturbance such as fire, drought, herbivory, or combinations of these.

Community phase 1.2: Black greasewood, rabbitbrush and other shrubs increase in the absence of disturbance. Decadent shrubs dominate the overstory and deep-rooted perennial bunchgrasses, such as basin wildry, are reduced. Rhizomatous and shallow-rooted grasses, like inland saltgrass and squirreltail, are stable or increasing.

1.2a: 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 basin wildrye and Torrey's saltbush. Alkali sacaton, black greasewood, basin big sagebrush and fourwing saltbush 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 allow greasewood to increase. Drought, inappropriate grazing management, or combinations of these would decrease the perennial herbaceous community.

Community Phase 2.2:
This community phase is characteristic of a post-disturbance plant community with annual non-native species present. Basin wildrye is increasing. Perennial bunchgrasses such as alkali sacaton, inland saltgrass and western wheatgrass also increase. Depending on fire severity patches of intact shrubs may remain. Torrey's saltbush and black greaswood 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.

Community Phase 2.3 (at-risk):
Torrey's saltbush and 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. Basin big sagebrush and rabbitbrush 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 Torrey's saltbush and black greasewood in the overstory. This site has crossed a biotic and abiotic threshold and site processes are being controlled by shrubs. Bare ground has increased. Non-natives are present and likely increasing.

Community Phase 3.1:
Torrey's saltbush, black greasewood and other shrubs increasing. Perennial grasses are present but a minor component. Annual non-native species are present and may be increasing in the understory.
3.1a: Drought and/or lowering of the water table due to groundwater pumping and/or severe fire.

Community Phase 3.2:
Torrey's saltbush and black greasewood dominate the overstory. Basin big sagebrush may be a significant component. Deep-rooted perennial bunchgrasses have significantly declined. Annual nonnative species increase. Bare ground is significant.
3.2a: Release of drought and/or grazing pressure may allow for 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 non-native 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 Pathways
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 saltbush, greasewood 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 Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by Torrey's quailbush. Basin wildrye, inland saltgrass, and black greasewood are other important species associated with this site. Potential vegetative composition is about 20% grasses, 5% forbs and 75% shrubs. Approximate ground cover (basal and crown) is 5 to 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	150	300	450
Grass/Grasslike	50	100	150
Forb	10	20	30
Total	**210**	**420**	**630**

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**			40–100	
	basin wildrye	LECI4	*Leymus cinereus*	20–60	–
	saltgrass	DISP	*Distichlis spicata*	20–40	–
2	**Secondary Perennial Grasses**			8–32	
	squirreltail	ELEL5	*Elymus elymoides*	2–12	–
	western wheatgrass	PASM	*Pascopyrum smithii*	2–12	–
	alkali sacaton	SPAI	*Sporobolus airoides*	2–12	–
Forb					
3	**Perennial Forbs**			8–32	
	milkvetch	ASTRA	*Astragalus*	2–8	–
	povertyweed	IVAX	*Iva axillaris*	2–8	–
	thelypody	THELY	*Thelypodium*	2–8	–
Shrub/Vine					
4	**Primary Shrubs**			228–360	
	Torrey's saltbush	ATTO	*Atriplex torreyi*	200–280	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	20–60	–
	iodinebush	ALOC2	*Allenrolfea occidentalis*	8–20	–
5	**Secondary Shrubs**			20–100	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	2–12	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	2–12	–
	seepweed	SUAED	*Suaeda*	2–12	–

Animal community

Livestock Interpretations:
Livestock browse the leaves of Torrey’s quailbush. 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:
Leaves and seeds of Torrey's quailbush are eaten by many species. Mule deer and pronghorn browse the leaves. Small mammals such as rabbits and rodents have been reported to eat Torrey's quailbush. Dense stands of Torrey's quailbush provide excellent cover for several species. 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.

Hydrological functions

Runoff is low to very high. There are no rills or pedestals. Water flow patterns may commonly occur. Moderately fine to fine surface textures result in limited infiltration rates. Concentrations of surface salts and sodium often result in chemical crusts which impede infiltration of precipitation. Water flow patterns are typically short, ending in depressional areas. Gullies are rare 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. Gullies and associated head cuts should be healing and stable. Deep-rooted, perennial grasses (i.e., basin wildrye & alkali sacaton] slow runoff and increase infiltration. Tall stature and relatively coarse foliage of basin wildrye and shrubs (with associated litter) break raindrop impact and provide opportunity for snow catch and moisture accumulation on site.

Other products

Tribes of the American southwest used Torrey's quailbush seeds to make a thick gruel. They made flour to make small cakes, used the leaves as soap, and used the flowers, stems and leaves as a treatment for nasal congestion. The seeds were likely used in a similar way to fourwing saltbush. Seeds of fourwing saltbush were also reportedly ground into flour. Other uses for fourwing saltbush that may have been similar for big saltbush are the use of the ground meal as an emetic, use of ground flowers or roots moistened with saliva in treating ant bites, and addition of ashes to water for dyeing meal greenish-blue.
Basin wildrye was used as bedding for various Native American ceremonies, providing a cool place for dancers to stand.

Other information

Torrey's quailbush is a recommended revegetation species in riparian areas throughout its range and has also been used in revegetation projects in other habitats.
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	T21N R34E S24
General legal description	About 2 miles east of Dixie Valley Road (NvHwy 121) south side of Settlement Road, Dixie Valley area, Churchill County, Nevada. This site also occurs in Lyon, Mineral, Pershing, and Storey Counties, Nevada.
Location 2: Churchill County, NV	
Township/Range/Section	T22N R26E S33
General legal description	East of Fernley, along I80 about 4 miles southwest of Brady's Hot Springs, Churchill County, Nevada. This site also occurs in Lyon, Mineral, Pershing, and Storey 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 Rangelanad 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

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2. **Presence of water flow patterns:** Water flow patterns may commonly occur. Moderately fine to fine surface textures result in limited infiltration rates. Concentrations of surface salts and sodium often result in chemical crusts which impede infiltration of precipitation. Water flow patterns are typically short, ending in depressional areas.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 30%; cover of surface rock fragments often more than 35%; shrub canopy ±15%; basal area for perennial herbaceous plants ± 1%.

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5. **Number of gullies and erosion associated with gullies:** Gullies are rare 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. Gullies and associated head cuts should be

healing and stable.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Persistent litter (large woody material) will remain in place except during catastrophic run-in (flooding) events.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values will range from 1 to 4. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Structure of soil surface will be platy or massive. Soil surface colors are light and are typified by an ochric epipedon. Organic carbon can range from 1.5 to 4.5 percent (OM values taken from lab characterization data.)

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Deep-rooted, perennial grasses (i.e., basin wildrye & alkali sacaton] slow runoff and increase infiltration. Tall stature and relatively coarse foliage of basin wildrye and shrubs (with associated litter) break raindrop impact and provide opportunity for snow catch and moisture 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 not typical. Platy or massive subsurface layers are normal for this site and are not to 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: Reference Plant Community: Tall shrubs >> tall-statured, deep-rooted, cool season, perennial bunchgrasses. (By above ground production)

    Sub-dominant: Associated low shrubs > perennial rhizomatous grasses > deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, perennial and annual forbs = shallow-rooted, cool season, perennial grasses and grass-like plants. (By above ground production)

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 25% of total woody canopy.

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14. **Average percent litter cover (%) and depth (in):** Within plant interspaces (± 40%) and depth of litter ± 1 inch.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through mid-May) ± 400 lbs/ac; Winter moisture significantly affects total 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:** Rubber rabbitbrush; annual mustards; povertyweed; annual kochia; pigweed; bassia; cheatgrass; knapweeds

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