USDA Natural Resources Conservation Service

Ecological site R028AY007NV
GRAVELLY BARREN FAN

Accessed: 05/06/2024

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.

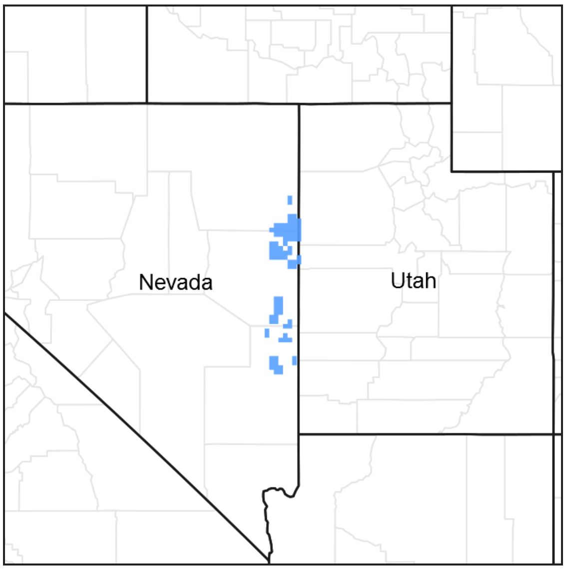

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 028A–Ancient Lake Bonneville

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

Ecological site concept

This site occurs on fan piedmonts, hills and pediments. Slopes range from 2 to 15 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 5700 to 6900 feet.
The climate associated with this site is semiarid, characterized by cool, moist winters and warm, dry summers. Average annual precipitation is (7)8 to 10 inches. Mean annual air temperature is 45 to 50 degrees F. The average growing season is about 100 to 120 days.
The soils associated with this site have a very shallow effective rooting depth. These soils are derived from mixed alluvium. Soil surfaces are usually very gravelly with a surface cover of rock fragments. Water intake rates are slow to moderate. Available water holding capacity is very low to low. Runoff is medium to very high and the soils are well drained.
The reference state is dominated by pygmy sagebrush. Where Utah juniper occurs on this site, total tree canopy cover is less than 10%. Production ranges from 150 to 350 pounds per acre.

Associated sites

F028AY021NV	**JUOS/ARPY2/ACHY**
R028AY004NV	**SHALLOW CALCAREOUS SLOPE 8-10 P.Z.**
R028AY013NV	**SHALLOW CALCAREOUS LOAM 8-10 P.Z.**
R028AY015NV	**LOAMY 8-10 P.Z.**
R028AY027NV	**SHALLOW CALCAREOUS HILL 8-10 P.Z.**

Similar sites

F028AY021NV	**JUOS/ARPY2/ACHY** Has more than 15% tree canopy in Reference Plant Community
R028AY123NV	**ERODED BARREN FAN** Less productive site; less than 10% gravels on surface

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia pygmaea*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Hesperostipa comata*

Physiographic features

This site occurs on fan piedmonts, hills and pediments. Slopes range from 2 to 15 percent, but slope gradients of 2 to 8 percent are most typical. Elevations are 5700 to 6900 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan piedmont (2) Hill
Elevation	1,737–2,103 m
Slope	2–15%
Aspect	Aspect is not a significant factor

Climatic features

Nevada’s climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms, heavy snowfall in the higher mountains, and great location variations with elevation. Three basic geographical factors

largely influence Nevada's climate: continentality, latitude, and elevation. Continentality is the most important factor. The strong continental effect is expressed in the form of both dryness and large temperature variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, with the result that the lowlands of Nevada are largely desert or steppes. The temperature regime is also affected by the blocking of the inland-moving maritime air. Nevada sheltered from maritime winds, has a continental climate with well-developed seasons and the terrain responds quickly to changes in solar heating.
Nevada lies within the mid-latitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs. To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with scattered thundershowers. The eastern portion of the state receives significant summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).
The climate associated with this site is semiarid, characterized by cool, moist winters and warm, dry summers. Average annual precipitation is (7)8 to 10 inches. Mean annual air temperature is 45 to 50 degrees F. The average growing season is about 100 to 120 days.

Mean annual precipitation at the Great Basin National Park climate station (263340) is 13.33 inches.
Monthly mean precipitation is:
January 1.05; February 1.18; March 1.37; April 1.21; May 1.24; June .87; July .97; August 1.18; September 1.08; October .96; December .96

Table 3. Representative climatic features

Frost-free period (average)	0 days
Freeze-free period (average)	110 days
Precipitation total (average)	229 mm

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site have a very shallow effective rooting depth. These soils are derived from mixed alluvium. Soil surfaces are usually very gravelly with a surface cover of rock fragments. Water intake rates are moderately low. Available water holding capacity is very low to low. Runoff is medium to very high and the soils are well drained. Soil series associated with this site include: Baberwit, Barfan, Ursine, and Wala.

The representative soil series is Baberwit, a Clayey-skeletal, carbonatic, mesic Typic Natrargids. Diagnostic horizons include an Ochric epipedon from the soil surface to 20 cm,
Natric horizon from 20 to 152 cm, and a Calcic horizon from about 20 to 84 cm. Clay content in the particle control sections average 35 to 45 percent. Rock fragments range from 35 to 60 percent, dominantly gravel. Reaction is moderately to very strongly alkaline. Effervescence is violent. Lithology consists of rhyolite with a component of calcareous loess.

Table 4. Representative soil features

Parent material	(1) Alluvium–rhyolite

Surface texture	(1) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	10–213 cm
Surface fragment cover <=3"	0–30%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	1.52–10.41 cm
Calcium carbonate equivalent (0-101.6cm)	30–50%
Electrical conductivity (0-101.6cm)	16–25 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	46–90
Soil reaction (1:1 water) (0-101.6cm)	8.2–9
Subsurface fragment volume <=3" (Depth not specified)	35–60%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

An ecological site is the product of all the environmental factors responsible for its development and it has a set of key characteristics that influence a site's resilience to disturbance and resistance to invasives. Key characteristics include 1) climate (precipitation, temperature), 2) topography (aspect, slope, elevation, and landform), 3) hydrology (infiltration, runoff), 4) soils (depth, texture, structure, organic matter), 5) plant communities (functional groups, productivity), and 6) natural disturbance regime (fire, herbivory, etc.) (Caudle et. al 2013). Biotic factors that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al. 2013).
The ecological site is dominated by deep-rooted cool season, perennial bunchgrasses and long-lived shrubs (50+ years) with high root to shoot ratios. The dominant shrubs usually root to the full depth of the winter-spring soil moisture recharge, which ranges from 1.0 and over 3.0 m (Comstock and Ehleringer 1992). The perennial bunchgrasses generally have somewhat shallower root systems than the shrubs, but root densities are often as high as or higher than those of shrubs in the upper 0.5 m but taper off more rapidly than shrubs. General differences in root depth distributions between grasses and shrubs results in resource partitioning in these shrub/grass systems.
In the Great Basin, the majority of annual precipitation is received during the winter and early spring. This continental semiarid climate regime favors growth and development of deep-rooted shrubs and herbaceous cool season plants using the C3 photosynthetic pathway (Comstock and Ehleringer 1992). Winter precipitation and slow melting of snow results in deeper percolation of moisture into the soil profile. Herbaceous plants, more shallow-rooted than shrubs, grow earlier in the growing season and thrive on spring rains, while the deeper rooted shrubs lag in phenological development because they draw from deeply infiltrating moisture from snowmelt the previous winter. Periodic drought regularly influences sagebrush ecosystems and drought duration and severity has increased throughout the 20th century in much of the Intermountain West. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability within the soil profile (Bates et al 2006). Nutrient availability is typically low but increases with elevation and closely follows moisture availability. The moisture resource supporting the greatest amount of plant growth is usually the water stored in the soil profile during the winter. The invasibility of plant communities is often linked to resource availability. Disturbance can decrease resource uptake due to damage or mortality of the native species and depressed competition or can increase resource pools by the decomposition of dead plant material following disturbance. The invasion of

sagebrush communities by cheatgrass has been linked to disturbances (fire, abusive grazing) that have resulted in fluctuations in resources (Chambers et al 2007).

The introduction of annual weedy species, like cheatgrass, may cause an increase in fire frequency and eventually lead to an annual state. Conversely, as fire frequency decreases, sagebrush will increase and with inappropriate grazing management the perennial bunchgrasses and forbs may be reduced.

Variability in plant community composition and production depends on soil surface texture and depth. Needle and thread grass is adapted to coarser textured soils whereas Indian ricegrass will increase with sandy soil surfaces, and bottlebrush squirreltail will increase with silty soil surfaces.
Prolonged drought and/or abusive grazing will cause a decrease in Indian ricegrass and needle and thread grass while pygmy sagebrush and bare ground increases. Cheatgrass, halogeton, Russian thistle and other non-native annual weeds are likely to invade this site.
The ecological site may experience high wind erosion, especially with a decrease in vegetative cover. This can be caused by inappropriate grazing practices, drought, off-road vehicle use and/or fire.
The ecological site has low resilience to disturbance and resistance to invasion. Increased resilience increases with elevation, aspect, increased precipitation and increased nutrient availability. Three alternative states have been identified for this site.

Fire Ecology:
Habitats of dwarf sagebrush species such as pygmy sagebrush seldom support enough vegetation to carry a fire, however, invasive annuals such as cheatgrass can increase fire frequency in sagebrush communities. Fire kills pygmy sagebrush. The aboveground woody parts are often completely consumed by fire. Pygmy sagebrush does not sprout after a disturbance such as fire. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. Needleandthread grass is top-killed by fire. It may be killed if the aboveground stems are completely consumed. Needleandthread grass is classified as slightly too severely damaged by fire. Needleandthread grass sprouts from the caudex following fire, if heat has not been sufficient to kill underground parts. Recovery usually takes 2 to 10 years. Bottlebrush squirreltail's small size, coarse stems, and sparse leafy material aid in its tolerance of fire. Postfire regeneration occurs from surviving root crowns and from on- and off-site seed sources. Frequency of disturbance greatly influences postfire response of bottlebrush squirreltail. Undisturbed plants within a 6 to 9 year age class generally contain large amounts of dead material, increasing bottlebrush squirreltail's susceptibility to fire. Sandberg bluegrass is generally unharmed by fire. It produces little litter, and its small bunch size and sparse litter reduces the amount of heat transferred to perennating buds in the soil. Its rapid maturation in the spring also reduces fire damage, since it is dormant when most fires occur. Galleta is a rhizomatous perennial which can resprout after top-kill by fire.

State and transition model

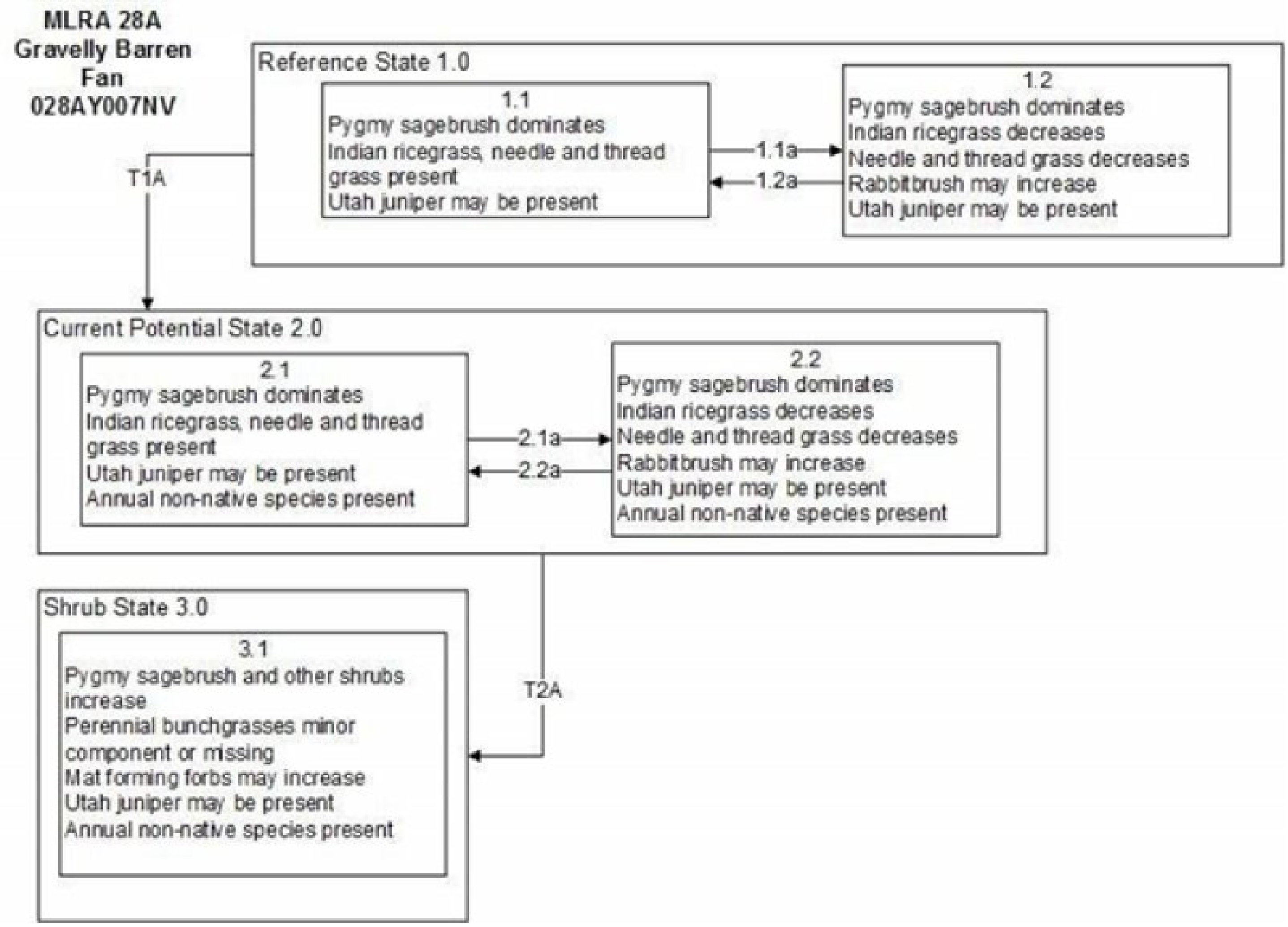

Figure 6. State and Transition Model

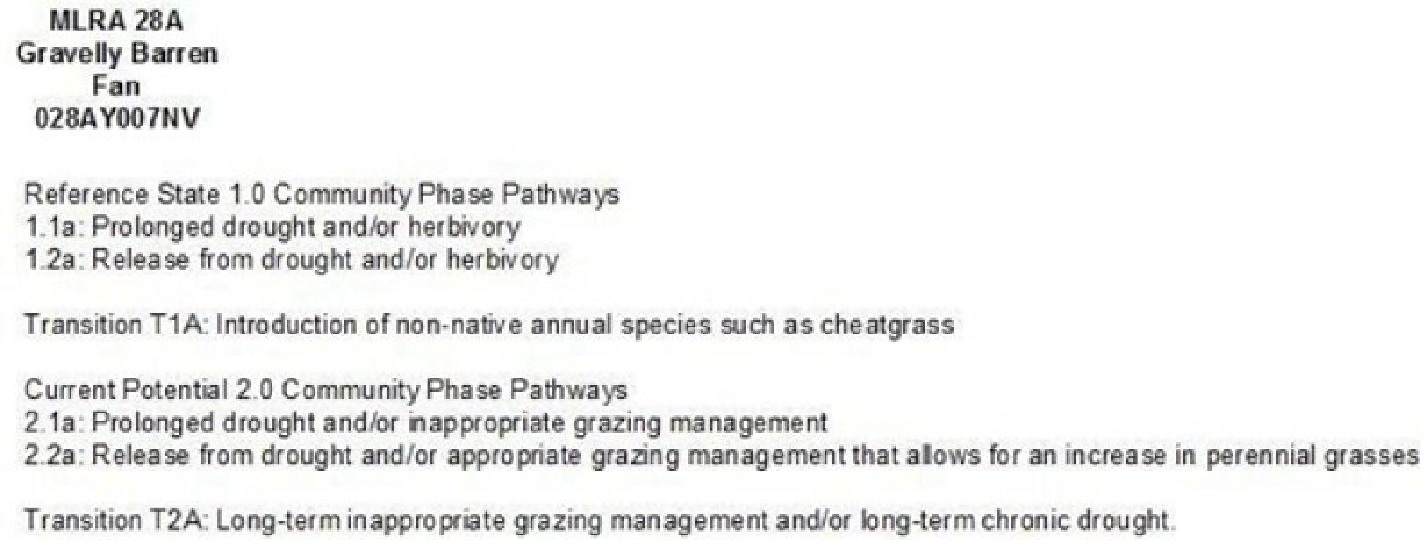

Figure 7. Legend

State 1
Reference State

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The reference state has two general community phases; a shrub-grass dominant phase and a shrub dominant phase. 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 precipitation, periodic drought and/or insect or disease attack.

This site is very stable, with little variation in plant community composition. Wet years will increase grass production, while drought years will reduce production. Shrub production will also increase during wet years.

Community 1.1
Community Phase

This community is dominated by pygmy sagebrush. Indian ricegrass and needleandthread grass are dominant grasses in the understory. Forbs and other grasses such as bottlebrush squirreltail and Sandberg bluegrass make up smaller components. Utah juniper is described in the site concept and may or may not be present. Community phase changes are primarily a function of chronic drought. Drought will favor shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in plant community production, regardless of functional group. Fire is very infrequent to non-existent. Where Utah juniper occurs on this site, total tree canopy cover is less than 10%. Potential vegetative composition is about 35% grasses, 5% forbs and 60% shrubs and trees. Approximate ground cover (basal and crown) is about 5 to 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	98	146	228
Grass/Grasslike	58	89	138
Forb	9	12	19
Tree	3	6	8
Total	**168**	**253**	**393**

Community 1.2
Community Phase

This community is dominated by pygmy sagebrush. Perennial bunchgrasses such as Indian ricegrass and needleandthread are decreased. Rabbitbrush may increase.

Pathway a
Community 1.1 to 1.2

Long-term drought and/or herbivory. Drought will favor shrubs over perennial bunchgrasses.

Pathway a
Community 1.2 to 1.1

Release from drought and/or herbivory would allow the vegetation to increase and bare ground would eventually decrease.

State 2
Current Potential State

This state is similar to the Reference State 1.0 with two similar community phases. 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. 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 2.1
Community Phase

This community is compositionally similar to Reference State Community Phase 1.1 with the presence of non-native species in trace amounts. This community is dominated by pygmy sagebrush. Indian ricegrass and needleandthread grass makeup the understory. Forbs and other grasses make up smaller components. Utah juniper is described in the site concept and may or may not be present. Community phase changes are primarily a function of chronic drought. Fire is very infrequent due to low fuel loads.

Community 2.2
Community Phase

Figure 9. Gravelly Barren Fan (R028AY007NV). T.Stringham, April 2013

Pygmy sagebrush and other shrubs increase while Indian ricegrass and needleandthread grass decline. Bare ground increases along with annual weeds. Rabbitbrush may increase. Prolonged drought may lead to an overall decline in the plant community.

Pathway a
Community 2.1 to 2.2

Inappropriate growing season grazing favors unpalatable shrubs over bunchgrasses. Prolonged drought will also decrease the perennial bunchgrasses in the understory.

Pathway a
Community 2.2 to 2.1

Release from drought and/or appropriate grazing management that facilitates an increase in perennial grasses.

State 3
Shrub State

This state has one community phase that is characterized by a pygmy sagebrush and rabbitbrush overstory with a mat forming forb understory. The site has crossed a biotic threshold and site processes are being controlled by shrubs. Shrub cover exceeds the site concept and may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. The shrub overstory dominates site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed. Bareground has increased.

Community 3.1
Community Phase


Figure 10. Gravelly Barren Fan (R028AY007NV). T.Stringham, August 2013

Decadent pygmy sagebrush dominates the overstory. Rabbitbrush and/or other sprouting shrubs may be a significant component. Mat-forming forbs may be significant component. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Annual non-native species increase. Bare ground is significant. Utah juniper may be present.

Transition A
State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual plants, such as cheatgrass, mustards, and Russian thistle. Slow variables: Over time the annual non-native species will increase within the community. Threshold: Any amount of introduced non-native species causes an immediate decrease in the resilience of the site. Annual non-native species cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation.

Transition A
State 2 to 3

Trigger: Long-term inappropriate grazing and/or long-term chronic drought will decrease or eliminate deep rooted perennial bunchgrasses and favor shrub growth and establishment. Slow variables: Long term decrease in deep-rooted perennial grass density. Threshold: Loss of deep-rooted perennial bunchgrasses changes nutrient cycling, nutrient redistribution, and reduces soil organic matter.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			28–89	
	needle and thread	HECO26	*Hesperostipa comata*	6–26	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	6–26	–
	squirreltail	ELEL5	*Elymus elymoides*	6–12	–
	James' galleta	PLJA	*Pleuraphis jamesii*	6–12	–
	Sandberg bluegrass	POSE	*Poa secunda*	6–12	–
2	**Secondary Perennial Grasses**			6–19	
	threeawn	ARIST	*Aristida*	1–8	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	1–8	–
Forb					
3	**Perennial**			6–26	
	rockcress	ARABI2	*Arabis*	1–6	–
	buckwheat	ERIOG	*Eriogonum*	1–6	–
	spiny phlox	PHHO	*Phlox hoodii*	1–6	–
	globemallow	SPHAE	*Sphaeralcea*	1–6	–
Shrub/Vine					
4	**Primary Shrubs**			127–177	
	pygmy sagebrush	ARPY2	*Artemisia pygmaea*	127–177	–
5	**Secondary Shrubs**			12–38	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	2–8	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	2–8	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	2–8	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	2–8	–
Tree					
6	**Evergreen**			1–6	
	Utah juniper	JUOS	*Juniperus osteosperma*	1–6	–

Animal community

Livestock/Wildlife Interpretations:
Pygmy sagebrush is a small cushion-like evergreen shrub and has little to no value as browse for wildlife or livestock (Johnson 1987, McArthur and Stevens 2004). It does however provide important groundcover in the dry, alkaline areas where little else will grow (McArthur and Stevens 2004).
Indian ricegrass is a deep-rooted, cool season perennial bunchgrass that is adapted primarily to sandy soils. Indian ricegrass is a preferred forage species for livestock and wildlife (Cook 1962, Booth et al. 2006). This species is often heavily utilized in winter because it cures well (Booth et al. 2006). It is also readily utilized in early spring, being a source of green feed before most other perennial grasses have produced new growth (Quinones 1981). Booth et al. (2006) note that the plant does well when utilized in winter and spring. Cook and Child (1971) however, found that repeated heavy grazing reduced crown cover, which may reduce seed production, density, and basal area of these plants. Additionally, heavy early spring grazing reduces plant vigor and stand density (Stubbendieck 1985). In eastern Idaho, productivity of Indian ricegrass was at least 10 times greater in undisturbed plots than in heavily grazed ones (Pearson 1965). A study by Cook and Child (1971) found significant reduction in plant cover after seven years of rest from heavy (90%) and moderate (60%) spring use. The seed crop may be reduced where grazing is heavy (Bich et al. 1995). Tolerance to grazing increases after May, thus spring deferment may be necessary for stand enhancement (Pearson 1964, Cook and Child 1971); however, utilization of less than 60% is recommended. Indian ricegrass is eaten by pronghorn in "moderate" amounts whenever available. A number of

heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground. Needleandthread grass is most commonly found on warm/dry soils (Miller et al. 2013). It is not grazing tolerant and will be one of the first grasses to decrease under heavy grazing pressure (Smoliak et al. 1972, Tueller and Blackburn 1974). Heavy grazing is likely to reduce basal area of these plants (Smoliak et al. 1972). With the reduction in competition from deep rooted perennial bunchgrasses, shallower rooted grasses such as Sandberg bluegrass and forbs may increase (Smoliak et al. 1972). Needleandthread is moderately important spring forage for mule deer, but use declines considerably as more preferred forages become available. Bottlebrush squirreltail is a dietary component of several wildlife species. Bottlebrush squirreltail may provide forage for mule deer and pronghorn. Sandberg bluegrass is an important forage species for many wildlife species.
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.
Sandberg bluegrass is a palatable species, but its production is closely tied to weather conditions. It produces little forage in drought years, making it a less dependable food source than other perennial bunchgrasses. When actively growing, galleta provides good to excellent forage for cattle and horses and fair forage for domestic sheep. Although not preferred, all classes of livestock may use galleta when it is dry. Domestic sheep show greater use in winter than summer months and typically feed upon central portions of galleta tufts, leaving coarser growth around the edges. Galleta may prove somewhat coarse to domestic sheep. Pygmy sagebrush provides little value to livestock and large mammals due to its scarcity and small size.Bottlebrush squirreltail is a dietary component of several wildlife species. Bottlebrush squirreltail may provide forage for mule deer and pronghorn. Galleta provides moderately palatable forage when actively growing and relatively unpalatable forage during dormant periods. Galleta provides poor cover for most wildlife species.

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.

Hydrological functions

Runoff is medium to very high. Permeability is moderately low.

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

Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source.

Other information

Needleandthread grass is useful for stabilizing eroded or degraded sites. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

Type locality

Location 1: White Pine County, NV	
UTM zone	N
UTM northing	0730170
UTM easting	4424062

General legal description	Spring Valley area, White Pine County, Nevada. This site also occurs in Elko County, Nevada.

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Contributors

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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-ECHNENIQUE
Contact for lead author	State Rangeland Management Specialist.
Date	04/02/2014
Approved by	
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 rills can be expected particularly in areas subjected to summer convection storms or rapid spring snowmelt. They will begin healing during the following growing season.

2. **Presence of water flow patterns:** Water flow patterns are none to rare. Water flow patterns may commonly occur in areas subjected to summer convection storms. Flow patterns are short (<1m) and not connected.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare with occurrence typically limitec to area within water flow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground +50%; surface rock cover up to 30%

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** Minor evidence of wind-scouring with slight depositional mounding at base of shrubs and grasses. This site is subject to severe wind erosion if the vegetative cover is lost.

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 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 2 to 4 on most soil textures found on this site. Areas of this site occurring on soils that have a physical crust will probably have stability values less than 3.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically moderate thin platy. Soil surface colors are light grays and soils are typified by an ochric epipedon. Surface textures are gravelly loams. Organic matter of the surface 2 to 3 inches is less than 1 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse shrub canopy and associated litter break raindrop impact. Perennial bunchgrasses and galleta grass increase infiltration and reduce runoff.

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. Massive subsurface structure 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: Reference State: Low-statured shrubs (pygmy sagebrush)

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

    Other: evergreen trees, microbiotic crusts

    Additional:

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 35% of total woody canopy; mature bunchgrasses commonly (±25%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces 5-15%, <1/4 inch depth

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (thru June) ±225lbs/ac; Favorable years 350 lbs/ac; Unfavorable years: 150 lbs/ac

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 and annual mustards

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