USDA Natural Resources Conservation Service

Ecological site R028BY018NV
SILTY 5-8 P.Z.

Accessed: 05/04/2024

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.

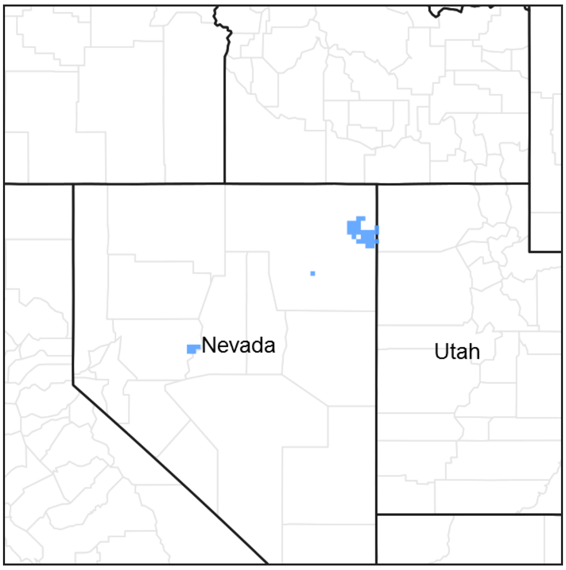

Figure 1. Mapped extent

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): 028B–Central Nevada Basin and Range

MLRA 28B occurs entirely in Nevada and comprises about 23,555 square miles (61,035 square kilometers). More than nine-tenths of this MLRA is federally owned. This area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by long, gently sloping to strongly sloping alluvial fans. The mountains are uplifted fault blocks with steep sideslopes. Many of the valleys are closed basins containing sinks or playas. Elevation ranges from 4,900 to 6,550 feet (1,495 to 1,995 meters) in the valleys and basins and from 6,550 to 11,900 feet (1,995 to 3,630 meters) in the mountains.
The mountains in the southern half are dominated by andesite and basalt rocks that were formed in the Miocene and Oligocene. Paleozoic and older carbonate rocks are prominent in the mountains to the north. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments are throughout this area. The valleys consist mostly of alluvial fill, but lake deposits are at the lowest elevations in the closed basins. The alluvial valley fill consists of cobbles, gravel, and coarse sand near the mountains in the apex of the alluvial fans. Sands, silts, and clays are on the distal ends of the fans.
The average annual precipitation ranges from 4 to 12 inches (100 to 305 millimeters) in most areas on the valley floors. Average annual precipitation in the mountains ranges from 8 to 36 inches (205 to 915 millimeters) depending on elevation. The driest period is from midsummer to midautumn. The average annual temperature is 34 to 52 degrees F (1 to 11 degrees C). The freeze-free period averages 125 days and ranges from 80 to 170 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 soil temperature regime, an aridic or xeric soil moisture regime, and mixed or carbonatic mineralogy. They generally are well drained, loamy or loamyskeletal, and shallow to very deep.
Nevada's climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms and heavy snowfall in the higher mountains. Three basic geographical factors largely influence Nevada's climate: continentality, latitude, and elevation. 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, as a result 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 midlatitude 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 occasional thundershowers. The eastern portion of the state receives noteworthy 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).

Ecological site concept

This site occurs on lakeplains. Slopes gradients are typically less than 4 percent and elevations range from 4500 to 5500 feet.

The soils associated with this site are very deep, well drained and formed in mixed alluvium. Soils are characterized by an ochric epipedon, a calcic horizon, and a vesicular surface horizon. Soil temperature regime is typic aridic and the soil moisture regime is mesic.

The plant community is dominated by winterfat. Indian ricegrass and bottlebrush squirreltail are other important species. Production ranges from 200 to 500 pounds per acre.

Following a comprehensive review of ecological site concepts and soil map unit components in 2016, it was determined that there is currently no way to separate or compete the site characteristics of this ecological site with those of Silty 8-10"PZ (028BY013NV). It is very possible that these two sites are one site and expressing different community phases, however this won't be confirmed without further field investigations. Any user of this ecological site should understand this possibility when making land management decisions.

Associated sites

R028BY017NV	**LOAMY 5-8 P.Z.**
R028BY047NV	**SALINE TERRACE 5-8 P.Z.**
R028BY073NV	**SHALLOW SILTY 5-8 P.Z.**
R029XY012NV	**SANDY 5-8 P.Z.**

Similar sites

R028BY075NV	**COARSE GRAVELLY LOAM 6-8 P.Z.** ATCO dominant shrub; more productive site.
R028BY084NV	**COARSE SILTY 6-8 P.Z.** ACHY dominant plant; more productive site.

R028BY071NV	**SILTY CLAY 8-10 P.Z.** ACHY-ELMA7 codominant grasses.
R028BY013NV	**SILTY 8-10 P.Z.** More productive site; inset fans of mid to upper piedmont slopes.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Krascheninnikovia lanata*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

This site occurs on lake plains. Slopes range from 0 to 8 percent, but slope gradients of less than 4 percent are most typical. Elevations are 4500 to 5500 feet.

Table 2. Representative physiographic features

Landforms	(1) Lake plain
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Very rare
Ponding frequency	None
Elevation	1,372–1,676 m
Slope	0–4%
Ponding depth	0 cm
Water table depth	0 cm
Aspect	Aspect is not a significant factor

Climatic features

The general climate associated with this site is semi-arid with cool, moist winters and warm, dry summers.
Mean annual precipitation across the range in which this ES occurs is 7.83".
Monthly mean precipitation: January 0.685; February 0.61; March 0.70; April 0.845; May .97; June 0.68; July 0.50; August 0.395; September 0.50; October 0.745; November 0.60; December 0.60.
*The above data is averaged from the Beowawe and Lages WRCC climate stations.

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	160 days
Precipitation total (average)	203 mm

Climate stations used

- (1) BEOWAWE 49S U OF N RCH [USC00260800], Eureka, NV
- (2) LAGES [USC00264341], Ely, NV

Influencing water features

Influencing water features are not associated with this site.

Soil features

The soils associated with this site are deep, well drained and formed in alluvium derived mixed rocks. Soils correlated to this site have very fine sandy loam or silty clay loam surface textures. They are characterized by an ochric epipedon, subsurface calcium carbonate accumulation and a vesicular soil surface. Available water holding capacity is high. The soil temperature regime is typic-aridic and the soil moisture regime is mesic. The soils series associated with this site include: Defler, Shuttle, and Toano.

The representative soil series is Shuttle, classified as a Coarse-loamy, mixed, superactive, mesic Duric Haplocalcids. Diagnostic horizons include an ochric epipedon from the soil surface to 18cm,
a calcic horizon from 15 to 114cm, and a duripan from 114 to 152cm. Clay content in the particle size control section averages 8 to 15 percent. Rock fragments range from 5 to 15 percent, consisting of mainly gravel. Lithology of fragments is conglomerate, limestone, shale, tuff, and quartzite. Reaction is moderately alkaline or strongly alkaline and soils are violently effervescent throughout.

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Table 4. Representative soil features

Surface texture	(1) Very fine sandy loam (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	102–183 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	5–20%
Electrical conductivity (0-101.6cm)	4–32 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	13–45
Soil reaction (1:1 water) (0-101.6cm)	7.5–9
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

An ecological site is the product of all the environmental factors responsible for its development and 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.) (USDA-NRCS 2003). Biotic factors that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al. 2013).

The Great Basin shrub communities have high spatial and temporal variability in precipitation, both among years and within growing seasons. 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.

These salt-desert shrub communities are dominated by plants belonging to the family Chenopodiaceae. Chenopods possess morphological and physiological traits that permit accommodation of both climatological drought resulting from low levels of precipitation, and physiological drought caused by high salt content of soils.
Winterfat is a long-lived, drought tolerant, native shrub typically about 30 cm tall (Mozingo 1987). It has a woody base from which annual branchlets grow (Welsh et al. 1987). The most common variety is a low-growing dwarf form (less than 38.1 cm), which is most often found on desert valley floors (Stevens et al. 1977). Total winter precipitation is a primary growth driver and lower than average spring precipitation can reverse the impact of plentiful winter precipitation. While summer rainfall has a limited impact, heavy August-September rain can cause a second flowering in winterfat (West and Gasto 1978).

Winterfat reproduces from seed and primarily pollinates via wind (Stevens et al. 1977). Seed production, especially in desert regions, is dependent on precipitation (West and Gasto 1978) with good seed years occurring when there is appreciable summer precipitation and little browsing (Stevens et al. 1977). Winterfat has multiple dispersal mechanisms: diaspores are shed in the fall or winter, dispersed by wind, rodent-cached, or carried on animals (Majerus 2003). Diaspores take advantage of available moisture, tolerating freezing conditions as they progress from imbibed seeds to germinants to nonwoody seedlings (Booth 1989). Under some circumstances, the degree of reproduction may be dependent on mature plant density (Freeman and Emlen 1995).

These communities often exhibit the formation of microbiotic crusts within the interspaces between shrubs. These crusts influence the soils on these sites and their ability to reduce erosion and increase infiltration; they may also alter the soil structure and possibly increase soil fertility (Fletcher and Martin 1948, Williams 1993). Finer-textured soils – silts, for example – tend to support more microbiotic cover than coarse texture soils (Anderson 1982). Disturbance such as hoof action and cheatgrass invasion can reduce biotic crust integrity (Anderson 1982, Ponzetti et al. 2007) and increase erosion.

Drought and/or inappropriate grazing management will initially favor shrubs but prolonged drought can cause a decrease in winterfat, bud sagebrush and other shrubs and an increase in bare ground. Squirreltail may maintain or also decline within the community. Repeated spring and early summer grazing will have an especially detrimental effect on winterfat and bud sagebrush. Halogeton (*Halogeton glomeratus*) and other non-native annual weeds increase with excessive grazing. Abusive grazing during the winter may lead to soil compaction and reduced infiltration. Prolonged abusive grazing during any season leads to abundant bare ground, desert pavement and active wind and water erosion. Repeated, frequent fire will promote cheatgrass dominance and elimination of the native plant community. These sites frequently attract recreational use, primarily by off highway vehicles (OHV). Annual non-native species increase where surface soils have been disturbed.

This ecological site has low resilience to disturbance and resistance to invasion. The primary disturbance on these sites is drought, inappropriate grazing and soil surface disturbance. Halogeton (*Halogeton glomeratus*), Russian thistle (*Salsola tragus*) and cheatgrass (*Bromus tectorum*) are most likely to invade disturbed sites. Four possible stable states have been identified for this site.

Fire Ecology:
Historically, salt-desert shrub communities had sparse understories and bare soil in intershrub spaces, making these communities somewhat resistant to fire (Young 1983, Paysen et al. 2000). They may burn only during high fire hazard conditions; for example, years with high precipitation can result in almost continuous fine fuels from the herbaceous component, increasing the fire hazard (West 1994, Paysen et al. 2000).

Winterfat tolerates environmental stress, extremes of temperature and precipitation, and competition from other perennials but not the disturbance of fire or overgrazing (Ogle et al. 2001). Fire is rare within these communities due to low fuel loads. There are conflicting reports in the literature about the response of winterfat to fire. In one of the first published descriptions, Dwyer and Pieper (1967) reported that winterfat sprouts vigorously after fire. This observation was frequently cited in subsequent literature, but recent observations have suggested that winterfat can be completely killed by fire (Pellant and Reichert 1984). The response is apparently dependent on fire severity. Winterfat is able to sprout from buds near the base of the plant, but if these buds are destroyed, the plant will not sprout. Research has shown that winterfat seedling growth is depressed in growth by at least 90% when growing in the presence of cheatgrass (Hild et al. 2007). Repeated, frequent fires will increase the likelihood of conversion to a non-native, annual plant community with trace amounts of winterfat.

Bud sagebrush, a minor shrub to this ecological site, is a native, summer-deciduous shrub. It is low growing, spinescent, aromatic shrub with a height of 4 to 10 inches and a spread of 8 to 12 inches (Chambers and Norton 1993). Bud sagebrush is fire intolerant and must reestablish from seed (Banner 1992, West 1994).

The effect of fire on bunchgrasses relates to culm density, culm-leaf morphology, and the size of the plant. The initial condition of bunchgrasses within the site along with seasonality and intensity of the fire factor into individual species' responses. For most forbs and grasses the growing points are located at or below the soil surface providing relative protection from disturbances which decrease above ground biomass, such as grazing or fire. Thus, fire mortality is more correlated to duration and intensity of heat which is related to culm density, culm-leaf morphology, size of plant and abundance of old growth (Wright 1971, Young 1983). However, season and severity of the fire and post-fire soil moisture availability will influence plant response.

Indian ricegrass is a deep-rooted, cool season perennial bunchgrass that is adapted primarily to sandy soils. A prominent grass on this site, it is fairly fire tolerant (Wright 1985), which is likely due to its low culm density and below ground plant crowns. Vallentine (1989) cites several studies in the sagebrush zone that classified Indian ricegrass as being slightly damaged from late summer burning. Indian ricegrass has also been found to reestablish on burned sites through seed dispersed from adjacent unburned areas (Young 1983, West 1994). Thus the presence of surviving, seed producing plants facilitates the reestablishment of Indian ricegrass. Grazing management following fire to promote seed production and establishment of seedlings is important.

Bottlebrush squirreltail, another cool-season, native perennial bunchgrass is common to this ecological site. Bottlebrush squirreltail is considered more fire tolerant than Indian ricegrass due to its small size, coarse stems, and sparse leafy material (Britton et al. 1990). Postfire regeneration occurs from surviving root crowns and from on- and off-site seed sources.

Sandberg bluegrass, a minor component of this ecological site, has been found to increase following fire likely due to its low stature and productivity (Daubenmire 1975). Sandberg bluegrass may retard reestablishment of deeper rooted bunchgrasses.

State and transition model

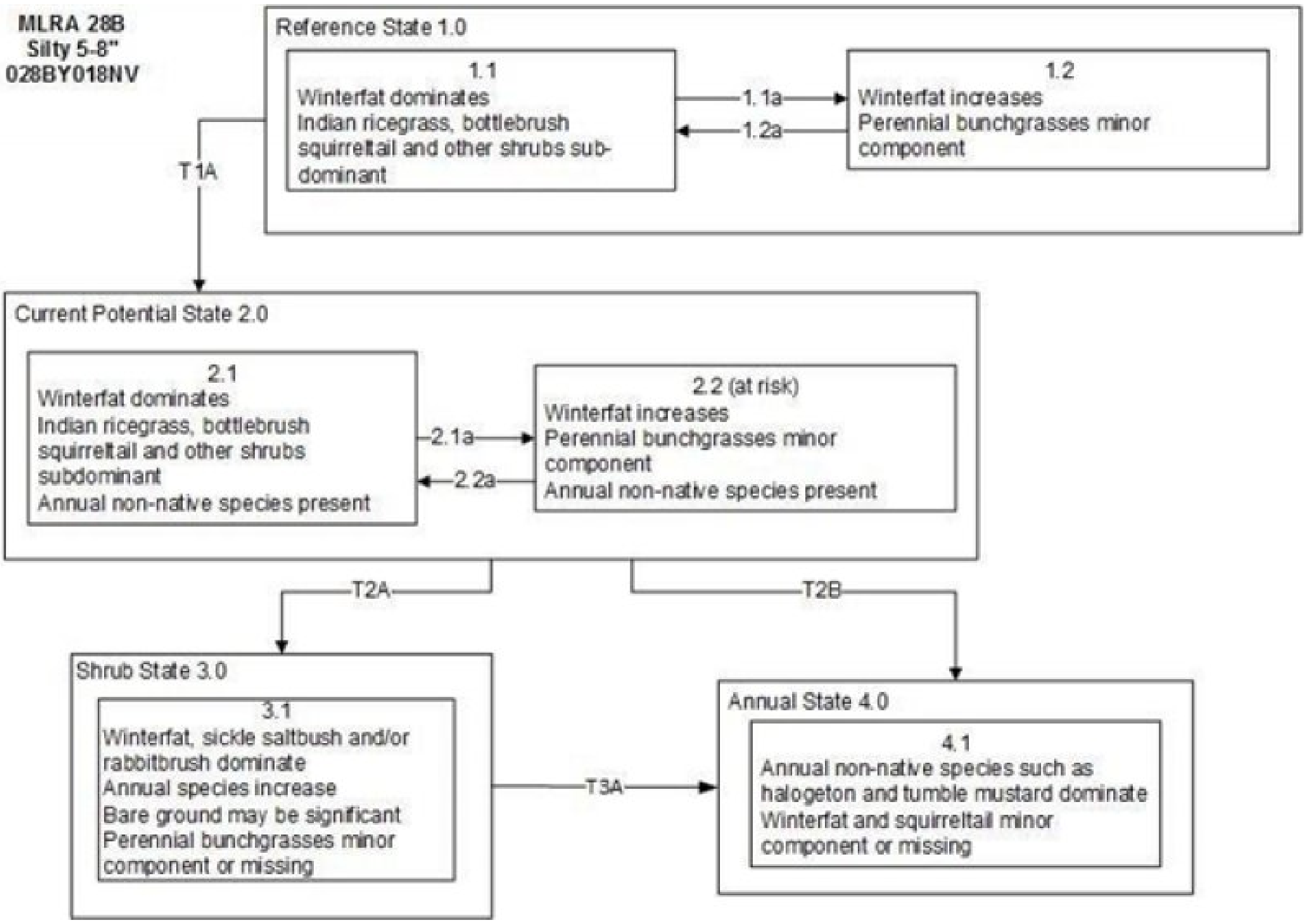

Figure 6. State and Transition Model

MLRA 28B
Silty 5-8"
028BY018NV

Reference State 1.0 Community Phase Pathways
1.1a: Long-term drought and/or excessive herbivory favors as decrease in perennial bunchgrasses. Fire was infrequent but would be patchy due to low fuel loads.
1.2a: Time and lack of disturbance and/or release from drought

Transition T1A: Introduction of non-native species such as cheatgrass and halogeton.

Current Potential State 2.0 Community Phase Pathways
2.1a: Long-term drought and/or inappropriate grazing management
2.2a: Time and lack of disturbance and/or release from drought

Transition T2A: Inappropriate grazing management in the presence of non-native species (3.1)

Transition T2B: Catastrophic fire and/or multiple fires, inappropriate grazing management and/or soil disturbing treatments (4.1)

Transition T3A: Catastrophic fire and/or multiple fires, inappropriate grazing management and/or soil disturbing treatments (4.1)

Figure 7. Legend

State 1
Reference State

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. This state has two community phases, one co-dominated by shrubs and grass, and the other dominated by shrubs. 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. This site is very stable, with little variation in plant community composition. Plant community changes would be reflected in production in response to drought or wet years. Wet years will increase grass production, while drought years will reduce production. Shrub production will also increase during wet years; however, recruitment of winterfat is episodic.

Community 1.1
Community Phase

This community is dominated by winterfat and Indian ricegrass. Bottlebrush squirreltail is also a important species on this site. Community phase changes are primarily a function of chronic drought. Fire is infrequent and patchy due to low fuel loads. Potential vegetative composition is about 20% grasses, 5% forbs, and 75% shrubs. Approximate ground cover (basal and crown) is 10 to 20 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	168	295	420
Grass/Grasslike	45	78	112
Forb	11	19	28
Total	**224**	**392**	**560**

Community 1.2
Community Phase

Drought will favor shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in the plant community, regardless of functional group.

Pathway a
Community 1.1 to 1.2

Drought and/or herbivory. Fires would also decrease vegetation on these sites but would be infrequent and patchy due to low fuel loads.

Pathway a
Community 1.2 to 1.1

Time, lack of disturbance and recovery from drought 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. This state has the same two general 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. 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 2.1
Community Phase

Figure 9. Silty 5-8" , T.Stringham May 2012, NV765 MU2001

This community is dominated by winterfat and Indian ricegrass. Bottlebrush squirreltail is also a important species on this site. Community phase changes are primarily a function of chronic drought. Fire is infrequent and patchy due to low fuel loads. Non-native annual species are present in minor amounts (<5%). Potential vegetative composition is approximately 15% grasses, 10% forbs and 75% shrubs.

Community 2.2
Community Phase (At Risk)

Drought will favor shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in the plant community, regardless of functional group. Inappropriate grazing management will favor unpalatable shrubs such as shadscale, and cause a decline in winterfat and budsage.

Pathway a
Community 2.1 to 2.2

Inappropriate grazing management and/or drought.

Pathway a
Community 2.2 to 2.1

Release from drought and/or a change in grazing management which allows recovery of bunchgrasses, winterfat, and bud sagebrush.

State 3
Shrub State

This state consists of one community phase. This site has crossed a biotic threshold and site processes are being controlled by shrubs. Bare ground has increased.

Community 3.1
Community Phase

Perennial bunchgrasses, like Indian ricegrass are reduced and the site is dominated by winterfat. Rabbitbrush (Chrysothamnus spp.) and shadscale may be significant components or dominant shrubs. Annual non-native species increase. Bare ground has increased.

State 4
Annual State

This state consists of one community phase. This community is characterized by the dominance of annual non-native species such as halogeton and cheatgrass. Rabbitbrush and other sprouting shrubs may dominate the overstory.

Community 4.1
Community Phase

This community is dominated by annual non-native species. Trace amounts of winterfat and other shrubs may be present, but are not contributing to site function. Bare ground may be abundant, especially during low precipitation years. Wind erosion and extreme soil temperatures are driving factors in site function.

Transition A
State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual plants, such as halogeton and cheatgrass. 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: Inappropriate, long-term grazing of perennial bunchgrasses during the growing season and/or long term drought will favor shrubs and initiate a transition to Community phase 3.1. 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.

Transition B
State 2 to 4

Trigger: Severe fire/ multiple fires, long term inappropriate grazing and/or soil disturbing treatments such as plowing. Slow variables: Increased production and cover of non-native annual species. Threshold: Loss of deep-rooted perennial bunchgrasses and shrubs truncates, spatially and temporally, nutrient capture and cycling within the community. Increased, continuous fine fuels from annual non-native plants modify the fire regime by changing intensity, size and spatial variability of fires.

Transition A
State 3 to 4

Trigger: Severe fire/ multiple fires, long term inappropriate grazing management, and/or soil disturbing treatments such as plowing. Slow variables: Increased production and cover of non-native annual species. Threshold: Increased, continuous fine fuels modify the fire regime by changing intensity, size and spatial variability of fires. Changes in plant community composition and spatial variability of vegetation due to the loss of perennial bunchgrasses and shrubs truncate energy capture spatially and temporally thus impacting nutrient cycling and distribution.

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**			28–71	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	20–39	–
	squirreltail	ELEL5	*Elymus elymoides*	8–31	–
2	**Secondary Perennial Grasses**			8–20	
	western wheatgrass	PASM	*Pascopyrum smithii*	2–8	–
	Sandberg bluegrass	POSE	*Poa secunda*	2–8	–
Forb					
3	**Perennial**			8–31	
	milkvetch	ASTRA	*Astragalus*	2–8	–
	beardtongue	PENST	*Penstemon*	2–8	–
	globemallow	SPHAE	*Sphaeralcea*	2–8	–
	princesplume	STANL	*Stanleya*	2–8	–
Shrub/Vine					
4	**Primary Shrubs**			235–275	
	winterfat	KRLA2	*Krascheninnikovia lanata*	235–275	–
5	**Secondary Shrubs**			20–59	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	4–12	–
	sickle saltbush	ATFA	*Atriplex falcata*	4–12	–
	yellow rabbitbrush	CHVIP4	*Chrysothamnus viscidiflorus ssp. puberulus*	4–12	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	4–12	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Grazing management considerations include timing, intensity, frequency, and duration of grazing.
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). Cook and Child (1971) found significant reduction in plant cover even after 7 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. In summary, adaptive management is required to manage this bunchgrass well.
Reduced bunchgrass vigor or density provides an opportunity for Sandberg bluegrass expansion and/or cheatgrass and other invasive species to occupy interspaces, leading to increased fire frequency and potentially an annual plant community. Sandberg bluegrass increases under grazing pressure (Tisdale and Hironaka 1981) and is capable of co-existing with cheatgrass. Depending on the season of use, the grazer and site conditions, either Sandberg bluegrass or cheatgrass may become the dominant understory with inappropriate grazing management.
Bottlebrush squirreltail is very palatable winter forage for domestic sheep of Intermountain ranges. Domestic sheep

relish the green foliage. Overall, bottlebrush squirreltail is considered moderately palatable to livestock. Bottlebrush squirreltail has the ability to produce large numbers of highly germinable seeds, with relatively rapid germination (Young and Evans 1977) when exposed to the correct environmental cues. Early spring growth and ability to grow at low temperatures contribute to the persistence of bottlebrush squirreltail among cheatgrass dominated ranges (Hironaka and Tisdale 1973). Squirreltail generally increases in abundance when moderately grazed or protected (Hutchings and Stewart 1953). In addition, moderate trampling by livestock in big sagebrush rangelands of central Nevada enhanced bottlebrush squirreltail seedling emergence compared to untrampled conditions. Heavy trampling however was found to significantly reduce germination sites (Eckert et al. 1987). Squirreltail is more tolerant of grazing than Indian ricegrass but all bunchgrasses are sensitive to over utilization within the growing season.
Winterfat is an important forage plant for livestock, especially during winter when forage is scarce. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Effects depend on severity and season of grazing.
In summary, overgrazing causes a decrease in Indian ricegrass along with bud sagebrush, while shadscale (also a minor component of this site) may initially increase. Spring grazing year after year can be detrimental to bud sagebrush and bunchgrasses. Continued abusive grazing leads to increased bare ground and invasion by annual weeds (e.g., cheatgrass, halogeton, and tansy mustard). Shadscale may become dominant with an annual understory. With further deterioration, shadscale declines, bare ground increases, soil redistribution accelerates and site productivity decreases. On some soils, erosion can result in increased surface salts and development of desert pavement. Reestablishment of perennials is limited in areas of extensive desert pavement. Fire is a very infrequent and patchy event in these salt desert shrub communities; however, where it has occurred the shrub community is greatly reduced and annual exotic weeds will increase if present. Repeated fire within a 10 to 20 year timeframe has the potential to convert this site to an annual weed dominated system. Knowledge of successful rehabilitation strategies in these droughty plant communities is limited grass was at least 10 times greater in undisturbed plots than in heavily grazed ones (Pearson 1965). Cook and Child (1971) found significant reduction in plant cover even after 7 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. Adaptive management is required to manage this bunchgrass well.
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:
This site provides valuable habitat for a number of wildlife species. Winterfat is an important forage plant for wildlife in salt-desert shrub rangelands, especially during winter when forage is scarce. Winterfat seeds are eaten by rodents. Lagamorphs such as the Black-tailed jackrabbits will feed selectively on winterfat which comprises a majority of their diet. (Johnson and Anderson 1984). Similarly, although Nuttall's cottontail (Sylvilagus nuttallii) consumed mostly grasses and forbs, winterfat made up a large component of their diet as well (Johnson and Hansen 1979).
Mule deer (Odocoileus hemionus) and pronghorn (Antilocapra americana) browse winterfat (Stevens et al. 1977, Ogle et al. 2001). Management of wildlife browse is difficult and browse may be harmful to winterfat reestablishment as seed production and regrowth are curtailed if grazing occurs as the plant begins to grow (Eckert 1954).
Rodents also utilize winterfat habitat. The diet of Townsend's ground squirrel (Urocitellus townsendii) consisted on average of 47% winterfat and three other native plant species (Yensen and Quinny 1992). Great Basin pocket mice can be found sporadically in winterfat communities (Dobkin and Sauder 2004).Piute ground squirrels (Urocitellus mollis), little pocket mice (Perognathus longimembris), dark kangaroo mice (Microdipodops megacephalus), chisel-toothed kangaroo rats (Dipodomys microps) and desert woodrats (Neotoma lepida) are found invariably in various shrubsteppe communities especially where winterfat occurs (Dobkin and Sauder 2004).
Several passerine species occur in winterfat-dominated communities; these include horned lark (Eremophila alpestris), Brewer's sparrow (Spizella breweri), and sage thrasher (Oreoscoptes montanus) in east-central Nevada; however, they are not dependent on these species as their range extend well beyond the distribution of winterfat (Carey 1995, Bradford et al. 1996, Dobkin and Sauder 2004). Furthermore, the sandy soils found in winterfat communities can be important to burrowing owls (Athene cunicularia) and short-eared owls (Asio flammeus) (Nevada Wildlife Action Plan Team 2012)

Reptiles and amphibians have been documented to utilize habitat associated with winterfat. The use of winterfat by other reptiles and amphibians has not been well documented. However, several species of reptiles and amphibians are found where winterfat occurs (intermountain cold desert shrub habitat and semi-desert grasslands).

Bottlebrush squirreltail is a dietary component of several wildlife species. Bottlebrush squirreltail may provide forage for mule deer and pronghorn.
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. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. 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.
Changes in plant community composition caused by human activity, invasive weeds, fire and frequency associated with this ecological site could affect the distribution and presence of wildlife species and it is important to maintain the community for optimal productivity and species diversity (Nevada Wildlife Action Plan 2012).

Hydrological functions

Runoff is low to medium. Permeability is moderately slow to moderately rapid. Water flow patterns are rare to common dependent on site location relative to major inflow areas and on fan skirts subject to summer convection storms. Water flow patterns are typically short (<2m), meandering and stable. A few gullies may be evident where this site occurs adjacent to major in-flow areas or ephemeral channels. Deep-rooted bunchgrasses (i.e., Indian ricegrass) increase reduce runoff and aid in infiltration. Shrubs and litter provide protection from raindrop impact and aid in snow capture on this site.

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 the seed as a reserve food source.

Other information

Winterfat adapts well to most site conditions, and its extensive root system stabilizes soil. However, winterfat is intolerant of flooding, excess water, and acidic soils. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

Type locality

Location 1: Elko County, NV	
Township/Range/Section	T38 N R69 E S23
Latitude	41° 9′ 50″
Longitude	114° 7′ 40″
General legal description	SW¼SW¼, Approximately 4 miles north of Bar O Ranch, Pilot Valley area, Elko County, Nevada. This site also occurs in Eureka, and White Pine Counties, Nevada.

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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-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	12/14/2015
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** This site is nearly level so rills are not expected.

2. **Presence of water flow patterns:** Water flow patterns are rare to common dependent on site location relative to major inflow areas and on fan skirts subject to summer convection storms. Water flow patterns are typically short (<2m), meandering and stable.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 80%;

5. **Number of gullies and erosion associated with gullies:** A few gullies may be evident where this site occurs adjacent to major in-flow areas or ephemeral channels.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scouring is none to rare, but would occur after a severe wildfire that removed all vegetation.

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage of grasses and annual & perennial forbs) expected to move distance of slope length during periods of intense summer convection storms or run in of early spring snow melt flows. Persistent litter (large woody material) will remain in place except during unusual 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 3 to 6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Structure of soil surface is typically thick or thin platy. Soil surface colors are light grays or light brownish grays and soils are typified by an ochric epipedon. Surface textures are silt loams. Organic matter is typically less than 1 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shrubs and litter provide protection from raindrop impact and allow for snow capture on this site. Deep-rooted bunchgrasses (i.e., Indian ricegrass) decrease runoff and aid in 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. Duripans and 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: Short-stature salt-desert shrub (winterfat) >>

    Sub-dominant: deep-rooted, cool season, perennial bunchgrasses (Indian ricegrass) = shallow-rooted/rhizomatous grasses = associated shrubs > = cool season, rhizomatous grasses > deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, perennial and annual forbs.

    Other: 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.

14. **Average percent litter cover (%) and depth (in):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 35% of total woody canopy

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 May) ± 350 lbs/ac; Favorable years ±500 lbs/ac and unfavorable years ±200 lb/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: annual mustards, annual kochia, Russian thistle, and halogeton.

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