USDA Natural Resources Conservation Service

Ecological site R028AY002NV
COARSE SILTY 5-8 P.Z.

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

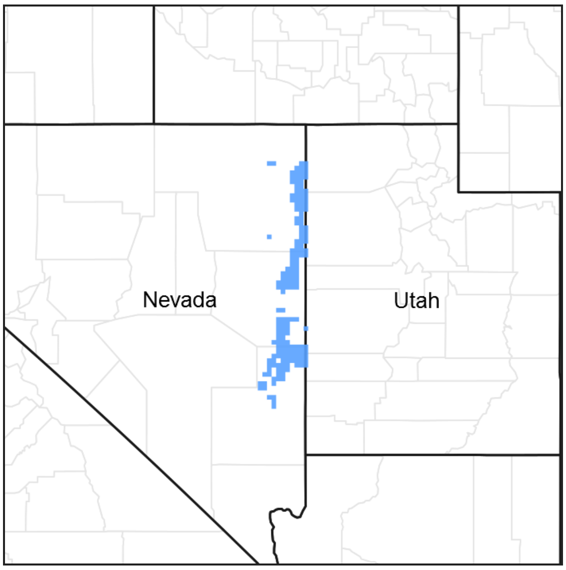

Figure 1. Mapped extent

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 remnants, beach plains, and fan skirts on all exposures. Slopes range from 0 to 8 percent. Elevations are 4400 to 6000 feet. Average annual precipitation is from 5 to about 8 inches with most occurring as snow in the winter months. Average annual air temperature is about 47 degrees F and average growing season is about 100 to 125 days.
The soils associated with this site are very deep and are coarse textured. These soils are well drained to somewhat excessively drained and have moderately rapid permeability. runoff is very low to medium. Reaction is moderately to very strongly alkaline. The soil moisture regime is typic aridic and the soil temperature regime is mesic.
The reference state is dominated by Indian ricegrass and winterfat. Other commonly associated plants are galleta, bud sagebrush, shadscale and greenmolly kochia. Production ranges from 400 to 800 pounds per acre.

Associated sites

R028AY013NV	**SHALLOW CALCAREOUS LOAM 8-10 P.Z.**
R028AY018NV	**COARSE GRAVELLY LOAM 5-8 P.Z.**
R028AY019NV	**SANDY 5-8 P.Z.**

Similar sites

R028AY019NV	**SANDY 5-8 P.Z.** ATCA2-KRLA2 codominant shrubs
R028AY018NV	**COARSE GRAVELLY LOAM 5-8 P.Z.** ATCO dominant shrub
R028BY018NV	**SILTY 5-8 P.Z.** Less productive site; soils not coarse textured
R028BY084NV	**COARSE SILTY 6-8 P.Z.** PLJA rare to absent and is not an "increaser" species

Table 1. Dominant plant species

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

Physiographic features

This site occurs on fan remnants, beach plains, and fan skirts on all exposures. Slopes range from 0 to 8 percent. Elevations are 4400 to 6000 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Beach plain (3) Fan skirt
Elevation	4,400–6,000 ft
Slope	0–8%
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).

Mean annual precipitation at WENDOVER, NEVADA Station is 4.59 inches. Average annual precipitation is 5 to about 8 inches. Mean annual air temperature is about 47 degrees F. The average growing season is about 100 to 125 days.

Monthly mean precipitation is:
January 0.28; February 0.28; March 0.37; April 0.48; May 0.72; June 0.51; July 0.25; August 0.34; September 0.34; October 0.47; November 0.29; December 0.25.

Table 3. Representative climatic features

Frost-free period (average)	103 days
Freeze-free period (average)	124 days
Precipitation total (average)	5 in

Climate stations used

- (1) WENDOVER AP AWOS [USW00024193], Wendover, UT

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils are very deep, well drained to somewhat excessively drained soils that formed in alluvium derived from limestone and welded tuff with some loess and volcanic ash. They are coarse-textured with rock fragments ranging from 15 to 60 percent in the profile. Permeability is high to moderately high and runoff is very low to medium. Reaction is moderately to very strongly alkaline. The soil moisture regime is typic aridic and the soil temperature regime is mesic. Soil series associated with this site include: Bienfait, Cliffdown, Escalante, Geer, Gravier, and Shafter.

The representative soil series is Gravier, classified as a Loamy-skeletal, mixed, superactive, mesic Sodic Haplocalcids. Diagnostic horizons include an ochric epipedon from the soil surface to 7 inches, and a calcic horizon from 4 to 50 inches. Clay content in the particle control section averages 8 to 18 percent. Rock fragments range from 35 to 60 percent mainly gravel, with up to 10 percent cobbles. Reaction is moderately alkaline through strongly alkaline. Effervescence is violently effervescent. Lithology consists of limestone and welded tuff.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone (2) Alluvium–welded tuff
Surface texture	(1) Gravelly loam (2) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately rapid
Soil depth	55–60 in
Surface fragment cover <=3"	20–30%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2.2–5.6 in
Calcium carbonate equivalent (0-40in)	5–30%
Electrical conductivity (0-40in)	1–5 mmhos/cm
Sodium adsorption ratio (0-40in)	1–30
Soil reaction (1:1 water) (0-40in)	8.3–8.8
Subsurface fragment volume <=3" (Depth not specified)	35–60%
Subsurface fragment volume >3" (Depth not specified)	0–10%

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).

This ecological site is dominated by deep-rooted cool season, perennial bunchgrasses and drought tolerant shrubs with high root to shoot ratios. The dominant shrubs usually root to the full depth of the winter-spring soil moisture recharge, which Fernandez and Caldwell (1975) reported as between 80 and 110 cm for shadscale and winterfat (*Krascheninnikovia lanata*). 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.
Shadscale and winterfat both initiate root growth, in early April, a few days to a week prior to aerial plant parts and shadscale in particular exhibits active root growth for several weeks after termination of shoot growth (Fernandez and Caldwell 1975). Continued root growth, even for established plants that are not exploring new areas of the soil, facilitates water absorption particularly in low soil moisture conditions (Gardner 1960).

Winterfat is a long-lived, drought tolerant, native chenopod shrub typically about 30 cm tall (Mozingo 1987). It is the dominant shrub on this ecological site and 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 rains 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).
The perennial bunchgrasses that are sub-dominant with the shrubs include Indian ricegrass and bottlebrush squirreltail. The dominant grass within this site, is Indian ricegrass a hardy, cool-season, densely tufted, native perennial bunchgrass that grows from 4 to 24 inches in height (Blaisdell and Holmgren 1984). Squirreltail is a competitive, short-lived, perennial grass that readily establishes from seed. These species generally have somewhat shallower root systems than the shrubs, but root densities are often as high or higher than those of the shrubs in the upper 0.5m of the soil profile. General differences in root depth distributions between grasses and shrubs results in resource partitioning these shrub – grass systems.

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.

Salt-desert shrub 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 textured 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 the winterfat, bud sagebrush and other shrubs, while bare ground increases. 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 disturbances on these sites include drought, inappropriate grazing management 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. However, if these buds are destroyed, winterfat will not sprout. In addition, 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 component of this ecological site, is a native, summer-deciduous shrub. It is a 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).

Indian ricegrass, the dominant grass within this site, is a hardy, cool-season, densely tufted, native perennial bunchgrass that grows from 4 to 24 inches in height (Blaisdell and Holmgren 1984). Indian ricegrass has been found to reestablish on burned sites through seed dispersed from adjacent unburned areas (Young 1983); thus, the presence of surviving, seed producing plants is necessary for 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. 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).

Galleta grass, another minor component on this ecological site, has been found to increase following fire likely due to its rhizomatous root structure and ability to resprout (Jameson 1962). This mat-forming grass species may retard reestablishment of deeper rooted bunchgrasses. Repeated frequent fire in this community will significantly reduce shadscale, bud sagebrush and winterfat while promoting establishment of an annual weed community with varying amounts of galleta, spiny hopsage, horsebrush, snakeweed and rabbitbrush.

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 also hinder reestablishment of deeper rooted bunchgrasses.

State and transition model

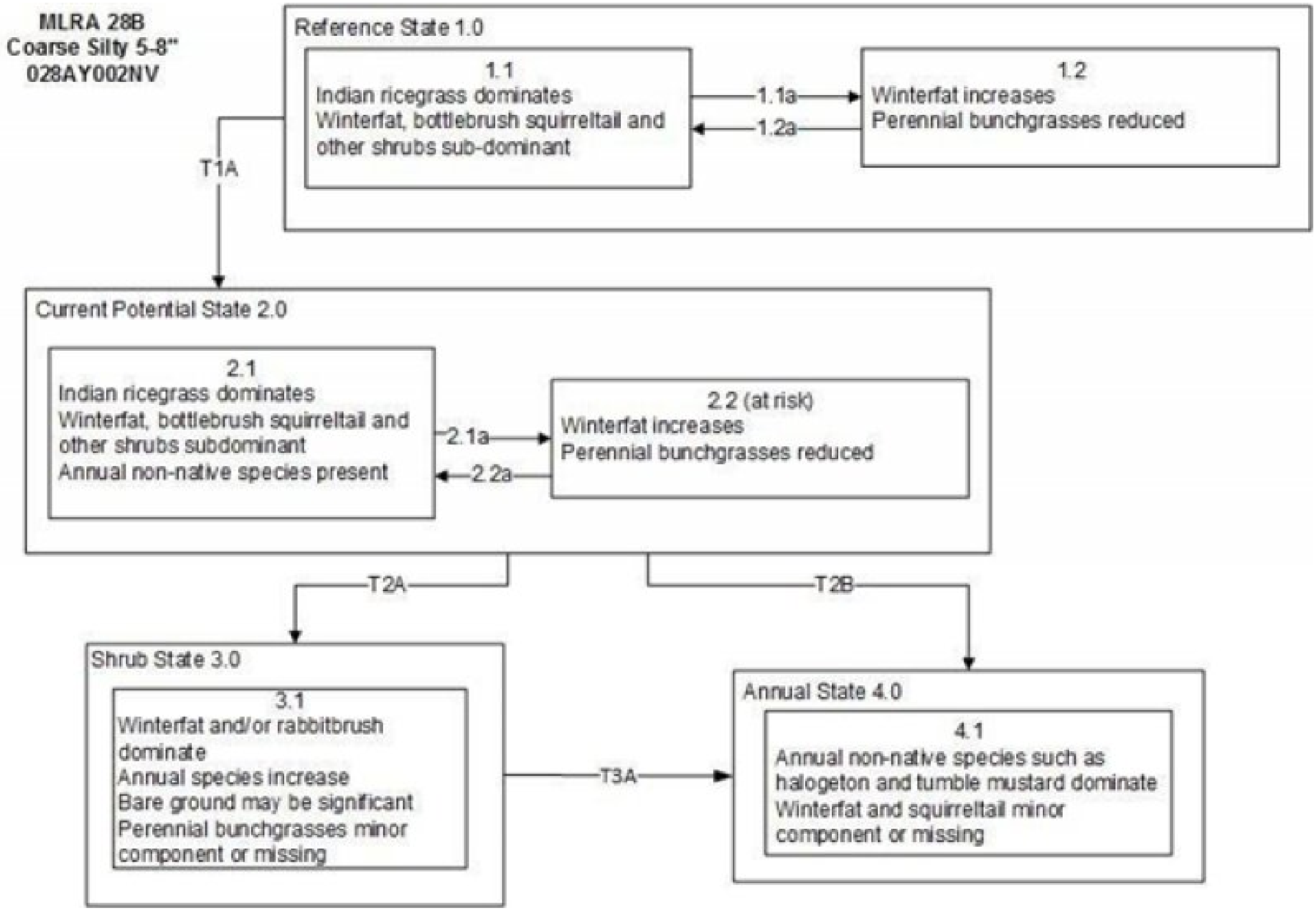

Figure 6. State and Transition Model

MLRA 28B
Coarse Silty 5-8"
028AY002NV

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. Other commonly associated species include shadscale, bud sagebrush, greenmolly kochia and galleta. 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 60% grasses, 5% forbs and 35% shrubs. Approximate ground cover (basal and crown) is 10-25%

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	240	360	480
Shrub/Vine	140	210	280
Forb	20	30	40
Total	**400**	**600**	**800**

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. Management would be to maintain high diversity of desired species to promote organic matter inputs and prevent the dispersal and seed production of the non-native invasive species.

Community 2.1
Community Phase

This community is dominated by winterfat and Indian ricegrass. Shadscale, bud sagebrush, greenmolly kochia and galleta are commonly associated speices. 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 60% grasses, 5% forbs and 35% 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 may result in an increase in less desirable shrubs such as rabbitbrush, and a decrease in winterfat and bud sagebrush.

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 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

Figure 9. Coarse Silty 5-8", T.Stringham, May 2012, NV766 MU116

Figure 10. Coarse Silty 5-8", T.Stringham, May 2012, NV766 MU1522

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

Figure 11. T.Stringham_5/2012, NV766, MU1522

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 and soil moisture.

Transition B
State 2 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: 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 (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			252–408	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	240–360	–
	James' galleta	PLJA	*Pleuraphis jamesii*	12–48	–
2	**Secondary Perennial Grasses**			12–48	
	squirreltail	ELEL5	*Elymus elymoides*	3–18	–
	needle and thread	HECO26	*Hesperostipa comata*	3–18	–
	Sandberg bluegrass	POSE	*Poa secunda*	3–18	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	3–18	–
Forb					
3	**Perennial**			12–60	
	James' galleta	PLJA	*Pleuraphis jamesii*	12–48	–
	globemallow	SPHAE	*Sphaeralcea*	3–30	–
Shrub/Vine					
4	**Primary Shrubs**			162–288	
	winterfat	KRLA2	*Krascheninnikovia lanata*	150–210	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	12–48	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–30	–
5	**Secondary Shrubs**			12–48	
	fourwing saltbush	ATCA2	*Atriplex canescens*	6–12	–
	yellow rabbitbrush	CHVIP4	*Chrysothamnus viscidiflorus ssp. puberulus*	6–12	–
	spiny hopsage	GRSP	*Grayia spinosa*	6–12	–

Animal community

Livestock Interpretations:
This site is suited for livestock grazing. Grazing management consideration include timing, intensity, frequency, and duration of grazing. Productivity and grazing capacities are typically low for salt-desert shrub communities and these sites are typically used for winter range.
Winterfat is an important forage plant for livestock in salt-desert shrub rangeland and subalkaline flats, especially during winter when forage is scarce. Winterfat is a valuable forage species with an average of 10 percent crude protein during winter when there are few nutritious options for livestock and wildlife (Welch 1989). However, excessive grazing throughout the west has negatively impacted survival of winterfat stands (Hilton 1941, Statler 1967, Stevens et al. 1977). Time of grazing is critical for winterfat with the active growing period being most critical (Romo 1995). Stevens et al. (1977) found that both vigor and reproduction of winterfat were reduced in Steptoe Valley, Nevada by improper season of use, and he recommended no more than 25% utilization during periods of active growth and up to 75% utilization during dormant season use. Rasmussen and Brotherson (1986) found significantly greater foliar cover and density of winterfat in areas ungrazed for 26 years versus winter grazed areas in Utah. In exclosures protected from grazing for between 5 and 16 years, Rice and Westoby (1978) found that winterfat increased in foliar cover but not in density where it was dominant, and in both foliar cover and density in shadscale-perennial grass communities where it was not dominant.
Indian ricegrass is highly palatable to all classes of livestock in both green and cured condition. It supplies a source of green feed before most other native grasses have produced much new growth. 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 forage 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.

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.

Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of livestock. Shadscale provides good browse for domestic sheep. Shadscale leaves and seeds are an important component of domestic sheep and cattle winter diets. Traditionally, shadscale plant communities provided good winter forage for the expanding sheep and cattle industry in the arid west. Shadscale is a valuable browse species for a wide variety of wildlife and livestock (Blaisdell and Holmgren 1984). The spinescent growth habit of shadscale lends to its browsing tolerance with no more than 15 to 20% utilization by sheep being reported (Blaisdell and Holmgren 1984) and significantly less utilization by cattle. Increased presence of shadscale within grazed versus ungrazed areas is generally a result of the decreased competition from more heavily browsed associates (Cibils et al. 1998). Reduced competition from more palatable species in heavily grazed areas may increase shadscale germination and establishment. Chambers and Norton (1993) found shadscale establishment higher under spring than winter browsing as well as heavy compared to light browsing. During years of below average precipitation, shadscale has been found very susceptible to grazing pressure regardless of season (Chambers and Norton 1993). Following fire, grazing exclusion for 2 or more years is beneficial for revegetation of shadscale communities as first year shadscale seedlings lack spines and are highly susceptible to browsing. Spines develop in the second year (Zielinski 1994).

Bud sagebrush is palatable and nutritious forage for domestic sheep in the winter and spring although it is known to cause mouth sores in lambs. Bud sagebrush can be poisonous or fatal to calves when eaten in quantity. Budsage, while desired by cattle in spring, is poisonous to cattle when consumed alone.

In summary, overgrazing causes a decrease in Indian ricegrass along with bud sagebrush, while shadscale 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). 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 is provides valuable habitat for a number of species. Winterfat is an important forage plant for wildlife in salt-desert shrub rangeland and subalkaline flats, especially during winter when forage is scarce. Winterfat seeds are eaten by rodents. Winterfat is a staple food for black-tailed jackrabbit. Winterfat and perennial grasses average 80% of jackrabbits' diet in southeastern Idaho, with shrubs being grazed in fall and winter particularly (Johnson and Anderson 1984). Mule deer and pronghorn antelope browse winterfat (Stevens et al. 1977, Ogle et al. 2001). Pronghorn and rabbits browse stems, leaves, and seed stalks of winterfat year round, especially during periods of active growth (Stevens et al. 1977). Winterfat is used for cover by rodents. It is potential nesting cover for upland game birds, especially when grasses grow up through its crown. 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).
Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of wildlife particularly during spring and summer before the hardening of spiny twigs. It supplies browse, seed, and cover for birds, small mammals, rabbits, deer, and pronghorn antelope. Shadscale provides feed for wild ungulates: mule deer (Odocoileus hemionus) browse shadscale, especially during winter (Bartmann 1983). Although it is not preferred, shadscale is also browsed in winter by pronghorn (Antilocapra americana) (Beal and Smith 1970).
Bud sagebrush is palatable, nutritious forage for upland game birds, small game and big game in winter. Bud sagebrush is rated as "regularly, frequently, or moderately taken" by mule deer in Nevada in winter and is utilized by bighorn sheep in summer, but the importance of bud sagebrush in the diet of bighorns is not known. Bud sagebrush comprises 18 – 35% of a pronghorn's diet during the spring where it is available. Chukar will utilize the leaves and seeds of bud sagebrush. Bud sagebrush is highly susceptible to effects of browsing. It decreases under browsing due to year-long palatability of its buds and is particularly susceptible to browsing in the spring when it is physiologically most active.

Salt-desert shrub and Intermountain cold desert habitats, where winterfat, budsage, and shadscale occur, throughout northeastern Nevada are important home ranges for small mammals. The chisel-toothed kangaroo rat (Dipodomys microps) feed on shadscale foliage and use shadscale habitats during the spring, summer, and fall. Deer mice (Peromyscus maniculatus) use shadscale habitats all year (O'farrell and Clark 1986). Shadscale leaves and seeds are preferred forage for jackrabbits (Lepus californicus) (Currie and Goodwin 1966). The Great Basin kangaroo rat (Dipodomys ordii) also feeds on shadscale foliage (Kenagy 1973).
Several bird species will eat the fruit and use salt-desert shrub habitats for cover and nesting sites. The horned lark (Eremophila alpestris) occurs throughout shadscale communities. Although less commonly apparent the Brewer's sparrow (Spizella breweri) and sage thrasher (Oreoscoptes montanus) also occur in shadscale habitat. Other species, observed occasionally throughout breeding season in shadscale habitat include: northern harrier (Circus cyaneus), red-tailed hawk (Buteo jamaicensis) , ferruginos hawk (Buteo regalis), golden eagle (Aquila chrysaetos), American kestrel (Falco sparverius) , prairie falcon (Falco mexicanus), mourning dove (Zenaida macroura), burrowing owl (Athene cunicularia), short-eared owl (Asio flammeus), violet-green swallow (Tachycineta thalassina), cliff swallow (Petrochelidon), bam swallow (Hirundo rustica), common raven (Corvus corax), loggerhead shrike (Lanius ludovicianus), vesper sparrow (Pooecetes gramineus), black-throated sparrow (Amphispiza bilineata), and western meadowlark (Sternella neglecta) (Medin 1990).
Reptile and amphibian distribution is not widely studied throughout the Intermountain cold desert shrub region; however, several reptiles and amphibians are recorded to occur throughout Nevada, where winterfat, budsage, fourwing saltbush and other desert shrubs are known to grow (Bernard and Brown 1977). In shadscale habitat specifically, western rattle snakes (Crotalus viridis) and gopher snakes (Pituophis catenifer catenifer) were recorded in a study by Diller and Johnson (1988).
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.
Galleta provides moderately palatable forage when actively growing and relatively unpalatable forage during dormant periods. Galleta provides poor cover for most wildlife species.
Changes in plant community composition could affect the distribution and presence of wildlife species and proper management is important to maintain healthy ecological communities.

Hydrological functions

Runoff is very low to medium. Permeability is moderately rapid. Water flow patterns are rare to common depending on site location relative to major inflow areas. Flow patterns are typically short <2m), meandering and not connected. Fine litter (foliage of grasses and annual & perennial forbs) expected to move distance of slope length (<3 m) 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 (ponding) events. Shrubs and deep-rooted perennial herbaceous bunchgrasses aid in infiltration. Shrub canopy and associated litter provide some protection from raindrop impact and provide opportunity for snow catch and accumulation on 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 has potential for upland and big game hunting.

Other products

Seeds of shadscale were used by Native Americans of Arizona, Utah and Nevada for bread and mush.

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

Type locality

Location 1: Elko County, NV	
Township/Range/Section	T29N R70E S34
General legal description	Approximately 27 miles southeast of Wendover, Ferguson Flat area, 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-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	12/10/2012
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, thus rills are not expected.

2. **Presence of water flow patterns:** Water flow patterns are rare to common depending on site location relative to major inflow areas. Flow patterns are typically short <2m), meandering and not connected.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare, and typically occur in 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 50-60% depending on amount of surface rock fragments

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scouring is rare, but may occur after a severe wildfire that removes all vegetation, or during a wind event prior to a summer convection storm or winter storm.

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 (<3 m) 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 (ponding) 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 thin to medium platy. Soil surface colors are grays or browns and soils are typified by an ochric epipedon. Surface textures are 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 deep-rooted perennial herbaceous bunchgrasses aid in infiltration. Shrub canopy and associated litter provide some protection from raindrop impact and provide opportunity for snow catch and accumulation on site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are none. Platy, subangular blocky, prismatic, 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 State: deep-rooted, cool season, perennial bunchgrasses >

    Sub-dominant: Low statured or half shrubs (winterfat & budsage) >> shallow-rooted cool season, perennial bunchgrasses > associated shrubs = 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 25% of total woody canopy.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (15 -25%) and depth (< ¼ in.).

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) ± 600 lbs/ac. Favorable years ± 800 lbs/ac and unfavorable years ± 400 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, annual mustards, annual kochia, Russian thistle, halogeton, and knapweeds.

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