USDA Natural Resources
Conservation Service

Ecological site R028BY074NV
SODIC TERRACE 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.

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 fan skirts, alluvial flats and lakeplains. Slopes range from 0 to 15 percent, but slope gradients of 0 to 8 percent are most typical. Elevations are 4300 to 5600 feet.

The climate associated with this site is semiarid, characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 5 to 8 inches. Mean annual air temperature is 45 to 50 degrees F. The average growing season is about 100 to 120 days.

The soils associated with this site are very deep, moderately well to well drained, and formed over lacustrine sediments. Depth to the lake sediments usually ranges from 30 to 40 inches. Soils are calcareous throughout and moderately to strongly saline.

The reference state is dominated by shadscale and black greasewood. Although

shadscale makes up most of the annual production, black greasewood is often prevalent enough to dominate the visual aspect. Production ranges from 200 to 600 pounds per acre.

Associated sites

R028BY017NV	**LOAMY 5-8 P.Z.** This site occurs on fan skirts. Slopes gradients of 2 to 8 percent are typical. Elevations range from 5000 to 6500 feet. The soils associated with this site are very deep, well drained, and formed in alluvium derived from mixed rocks. Soils are alkaline throughout and characterized by an ochric epipedon. Soil surface structure is typically platy with vesicular pores. The soil moisture regime is typic aridic and the soil temperature regime is mesic. The reference state is dominated by Indian ricegrass, bottlebrush squirreltail, and shadscale. Production ranges from 200 to 400 pounds per acre.
R028BY020NV	**SODIC FLAT 5-8 P.Z.** This site occurs on alluvial flats and lake plains. Slope gradients of less than 2 percent are typical. Elevations are 4700 to 6200 feet. The soils associated with this site are very deep, poorly drained, and formed in mixed alluvium and lacustrine sediments. Ground water is within 76cm (approximately 30") of the surface seasonally. The upper profile is strongly salt and sodium affected due to capillary movement of dissolved salts upward from the groundwater. High salt concentrations in the surface horizon and periods of ponding reduce seed viability and germination. Soil moisture regime is aquic and the soil temperature regime is mesic. The reference state is dominated by black greasewood and alkali sacaton. Vegetation of this site is restricted to coppice mound areas that are surrounded by nearly level, playa-like depressions that are usually barren. Production ranges from 150 to 500 pounds per acre. Potential vegetative composition is about 15 percent grasses, 5 percent forbs, and 80 percent shrubs.
R028BY073NV	**SHALLOW SILTY 5-8 P.Z.** This site occurs on fan skirts, lake plains and alluvial flats. Slopes range from 0 to 8 percent, but slope gradients of 2 to 4 percent are most typical. Elevations are 4800 to 6700 feet. Soils associated with this site are very deep and well drained. They typically have a restrictive layer at less than 10 inches from the surface. Permeability is slow to moderate and runoff is low to high. Surface textures are usually silts and silt loams. The soils are moderately to very strongly alkaline and calcareous throughout. The potential for sheet and rill erosion is slight. The reference state is dominated by shadscale. Production ranges from 200 to 400 pounds per acre.

Similar sites

R028BY020NV	**SODIC FLAT 5-8 P.Z.** SAVE4 codominant shrub
R028BY073NV	**SHALLOW SILTY 5-8 P.Z.** ATCO is the only major shrub

R028BY028NV	**SODIC TERRACE 8-10 P.Z.** SAVE4-ARTR2 codominant shrubs

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia* (2) *Sarcobatus vermiculatus*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Elymus elymoides*

Physiographic features

This site occurs on fan skirts, alluvial flats and lakeplains. Slopes range from 0 to 15 percent, but slope gradients of 0 to 8 percent are most typical. Elevations are 4300 to 5600 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan skirt (2) Alluvial flat (3) Lake plain
Runoff class	Negligible to medium
Flooding duration	Brief (2 to 7 days) to very brief (4 to 48 hours)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	1,311–1,707 m
Slope	0–8%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is semiarid, characterized by cool, moist winters and warm, dry summers.

Average annual precipitation ranges from 5 to 8 inches. Mean annual air temperature is about 45 to 50 degrees F. The average growing season is about 100 to 120 days.

Mean annual precipitation at the MONTELLO 1 SE,NEVADA climate station (265352) is 6.95 inches. Monthly mean precipitation is:
January 0.61; February 0.46; March 0.43; April 0.61;

May 0.91; June 0.83; July 0.56; August 0.52;
September 0.51; October 0.51;
November 0.53; December 0.48.

Table 3. Representative climatic features

Frost-free period (average)	93 days
Freeze-free period (average)	110 days
Precipitation total (average)	178 mm

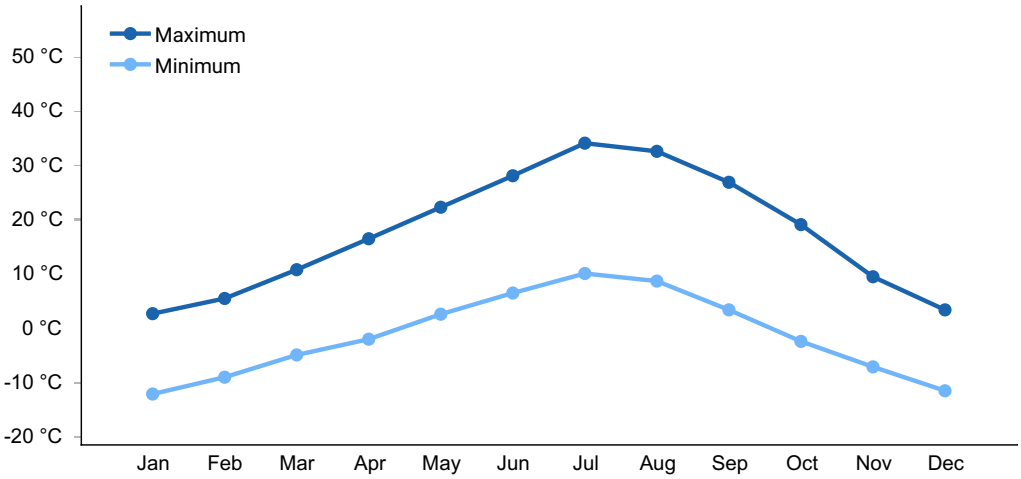

Figure 1. Monthly average minimum and maximum temperature

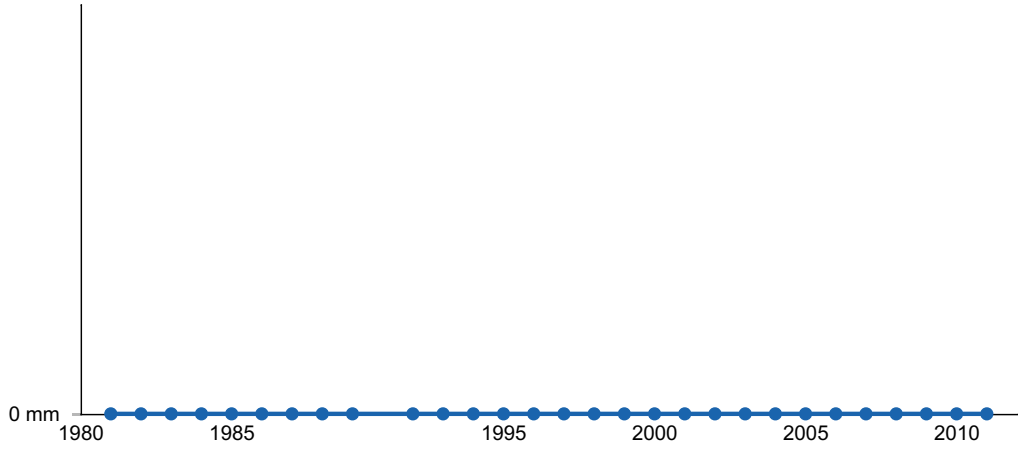

Figure 2. Annual precipitation pattern

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are typically very deep, moderately well to well drained,

and are formed over lacustrine sediments. Depth to the lake sediments usually ranges from 30 to 40 inches. Soils are calcareous throughout and moderately to strongly saline. Surface textures are typically silt loams. These soils typically have a thick vesicular crust which facilitates ponding. Runoff is negligible to medium, permeability is very slow to moderately rapid and available water holding capacity is medium to high. The soil series associated with this site include Benin, Gravier, Izamatch, Katelana, Littlespring, Luap, Mazuma, Mysol, Raph, Slaw, Sycomat, Tooele, Uvada, and Valmy.

A representative soil component is Katelana (NV 766 MU 917), a fine-silty, carbonatic, mesic Typic Torriorthents. The soil has a silt loam texture to 32 inches. The soil is strongly saline and calcareous throughout. An ochric epipedon occurs from the soil surface to 7 inches. Clay content in the particle control section averages 18 to 27 percent, when mixed. Reaction is strongly alkaline. Effervescence is violently effervescent. Lithology consists of limestone over lacustrine sediments.

Table 4. Representative soil features

Parent material	(1) Lacustrine deposits–limestone
Surface texture	(1) Silt loam (2) Silty clay loam (3) Loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately rapid
Soil depth	152–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–20.07 cm
Calcium carbonate equivalent (0-101.6cm)	40–60%
Electrical conductivity (0-101.6cm)	4–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	16–30
Soil reaction (1:1 water) (0-101.6cm)	8.4–9.6
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

An ecological site is the product of all the environmental factors responsible for its development and has a set of key characteristics that influence a site's resilience to disturbance and resistance to invasives. Key characteristics include 1) climate (precipitation, temperature), 2) topography (aspect, slope, elevation, and landform), 3) hydrology (infiltration, runoff), 4) soils (depth, texture, structure, organic matter), 5) plant communities (functional groups, productivity), and 6) natural disturbance regime (fire, herbivory, etc.) (Caudle et al 2013). Biotic factors that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al. 2013).

The 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.

Shadscale is a densely clumped, rounded, compact native shrub. It generally attains heights of 8 to 32 inches and widths of 12 to 68 inches (Blaisdell and Holmgren 1984). Shadscale is considered an evergreen to partially deciduous shrub, as a small percentage of leaves are dropped in the winter (Smith and Nobel 1986). Shadscale possesses wider ecological amplitude than most Atriplex species (Crofts and Van Epps 1975), and shows ploidy levels from diploid (2x) to decaploid (10x). The extensive polyploidy of shadscale is an important consideration when implementing revegetation projects because ploidy levels are usually associated with distinct habitats (Sanderson et al. 1990). Diploid individuals are unlikely to perform as well in areas where tetraploids are more common. Diploid individuals generally occur above Pleistocene lake levels, whereas lake floors are usually occupied by autotetraploids. Overall, tetraploids are the most widespread throughout its range (Carlson 1984). Thus, the diploid most associated with this site is a tetraploid. Bud sagebrush, a common 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).

Black greasewood is classified as a phreatophyte (Eddleman 2002), and its distribution is well correlated with the distribution of groundwater (Mozingo 1987). Meinzer (1927) discovered that the taproots of black greasewood could penetrate from 20 to 57 feet below the surface. Romo (1984) found water tables ranging from 3.5-15 m under black greasewood dominated communities in Oregon. Black greasewood stands develop best

where moisture is readily available, either from surface or subsurface runoff (Brown 1965). It is commonly found on floodplains that are either subject to periodic flooding, have a high water table at least part of the year, or have a water table less than 34 feet deep (Harr and Price 1972, Blauer et al. 1976, Branson et al. 1976, Blaisdell and Holmgren 1984, Eddleman 2002). Ganskopp (1986) reported that water tables within 9.8 to 11.8 inches of the surface had no effect on black greasewood in Oregon. However, a study, conducted in California, found that black greasewood did not survive six months of continuous flooding (Groeneveld and Crowley 1988, Groeneveld 1990). Black greasewood is usually a deep rooted shrub but has some shallow roots near the soil surface; the maximum rooting depth can be determined by the depth to a saturated zone (Harr and Price 1972).

Seasonally high water tables have been found necessary for maintenance of productivity and reestablishment of basin wildrye following disturbances such as fire, drought or excessive herbivory (Eckert et al. 1973). The sensitivity of basin wildrye seedling establishment to reduced soil water availability is increased as soil pH increases (Stuart et al. 1971). Lowering of the water table through extended drought or water pumping will decrease basin wildrye production and establishment while black greasewood, rabbitbrush, inland saltgrass and invasive weeds will increase. Drought will initially cause a decline in bunchgrasses. Prolonged drought will cause a decline in shrubs, including shadscale and black greasewood, while annual weedy species and bare ground will increase. Shadscale is less adapted to drought than many of its common associates (Vest 1962, Holmgren and Hutchings 1972), showing high mortality during periods of prolonged drought (Schultz and Ostler 1995). Tolerance to drought is achieved through partial shedding of leaves; this reduces water loss during severe moisture stress (Lei 1999).
As site condition deteriorates, these sites may become a pure stand of black greasewood or a pure stand with an annual understory. A lowering of the water table can occur with groundwater pumping and this may contribute to the loss of deep-rooted species such as greasewood and basin wildrye and an increase in rabbitbrush, shadscale and other species that are not groundwater dependent.

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 such as silts tend to support more microbiotic cover than coarse texture soils (Anderson 1982). Disturbance such as hoof action from inappropriate grazing and cheatgrass invasion can reduce biotic crust integrity (Anderson 1982, Ponzetti et al. 2007) and increase erosion.

This ecological site has moderate resilience to disturbance and resistance to invasion. A primary disturbance on these ecological sites is extended drought or other disturbance leading to lowering of the seasonal water table. This facilitates an increase in shrubs and a decrease in basin wildrye. The introduction of annual weedy species, like cheatgrass, may cause an increase in fire frequency and eventually lead to an annual state or a state dominated by black greasewood and rabbitbrush. Three possible stable states have been identified for this site, though an Annual State has been noted in other MLRAs.

Fire Ecology:
Fire is a rare disturbance in salt-desert shrub communities and likely occurs in years with above average production. Natural fire return intervals are estimated to vary between less than 35 to 100+ years in salt-desert ecosystems with basin wildrye (Paysen et al. 2000). Historically, black greasewood-saltbush 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, increasing fire hazard (West 1994, Paysen et al. 2000).

Black greasewood may be killed by severe fires, but can resprout after low to moderate severity fires (Robertson 1983, West 1994). Sheeter (1969) reported that following a Nevada wildfire, black greasewood sprouts reached approximately 2.5 feet within 3 years. Grazing and other disturbance may result in increased biomass production due to sprouting and increased seed production, also leading to greater fuel loads (Sanderson and Stutz 1994). Higher production sites would have experienced fire more frequently than lower production sites.

Shadscale is intolerant of fire and can only regenerate through seed (Zielinski 1994). Increases in the fire return interval leads to increases in the shrub component of the plant community, potentially facilitating increases in bare ground, inland saltgrass and invasive weeds. Lack of fire combined with excessive herbivory decreases or eliminates the herbaceous understory, favoring black greasewood and annual species. Therefore, fire can be detrimental to these communities, especially in the presence of fire tolerant, annual non-native species.

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 all factor into the individual species response. 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).

Indian ricegrass 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.

Basin wildrye, a minor component on this site, is relatively resistant to fire, particularly dormant season fire, as plants sprout from surviving root crowns and rhizomes (Zschaechner 1985). Miller et al. 2013 reports fall and spring burning increased total shoot and reproductive shoot densities in the first year, although live basal areas were similar between burn and unburned plants. By year two there was little difference between burned and control treatments.

State and transition model

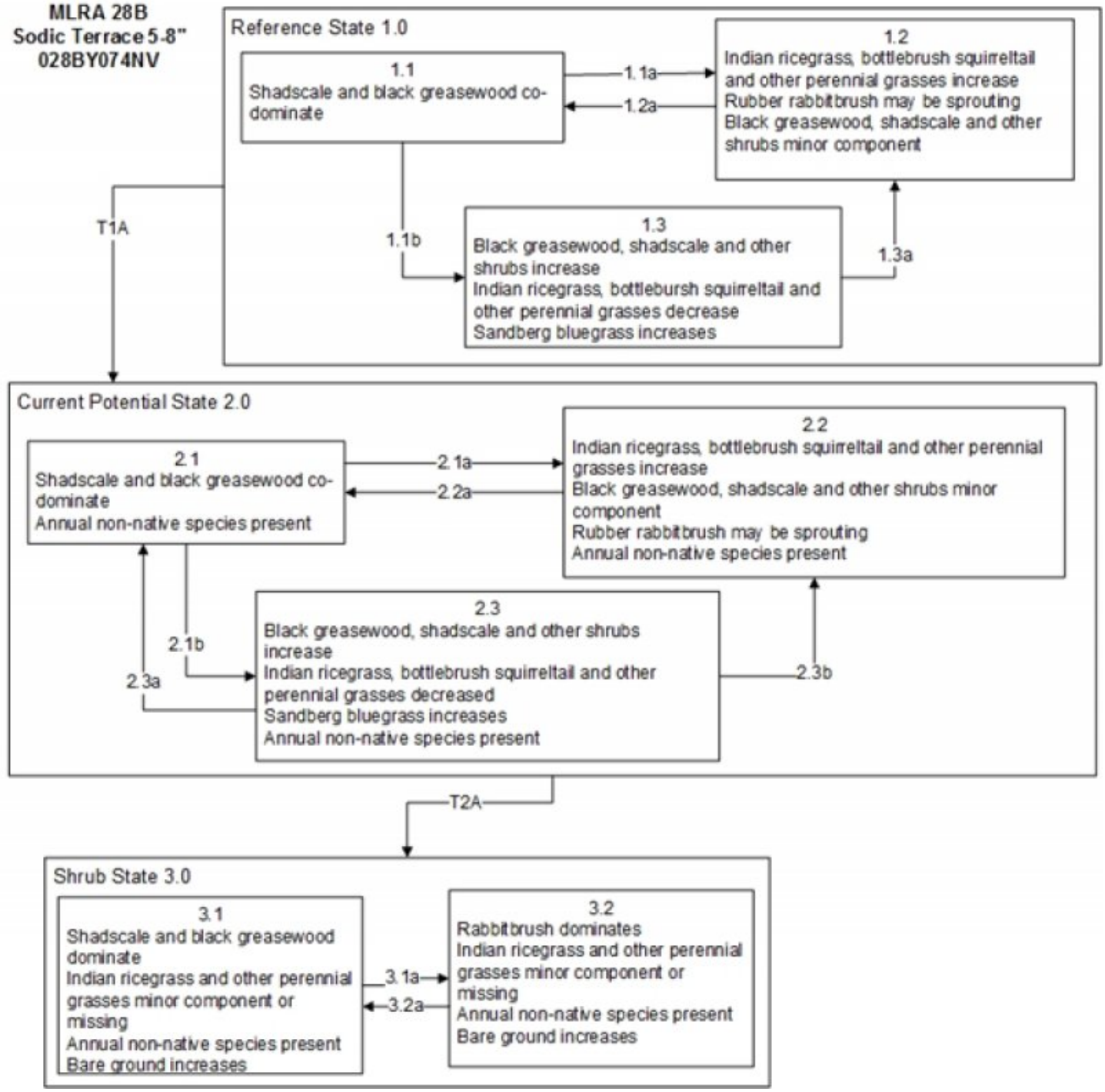

Figure 4. T. Stringham 2/2015

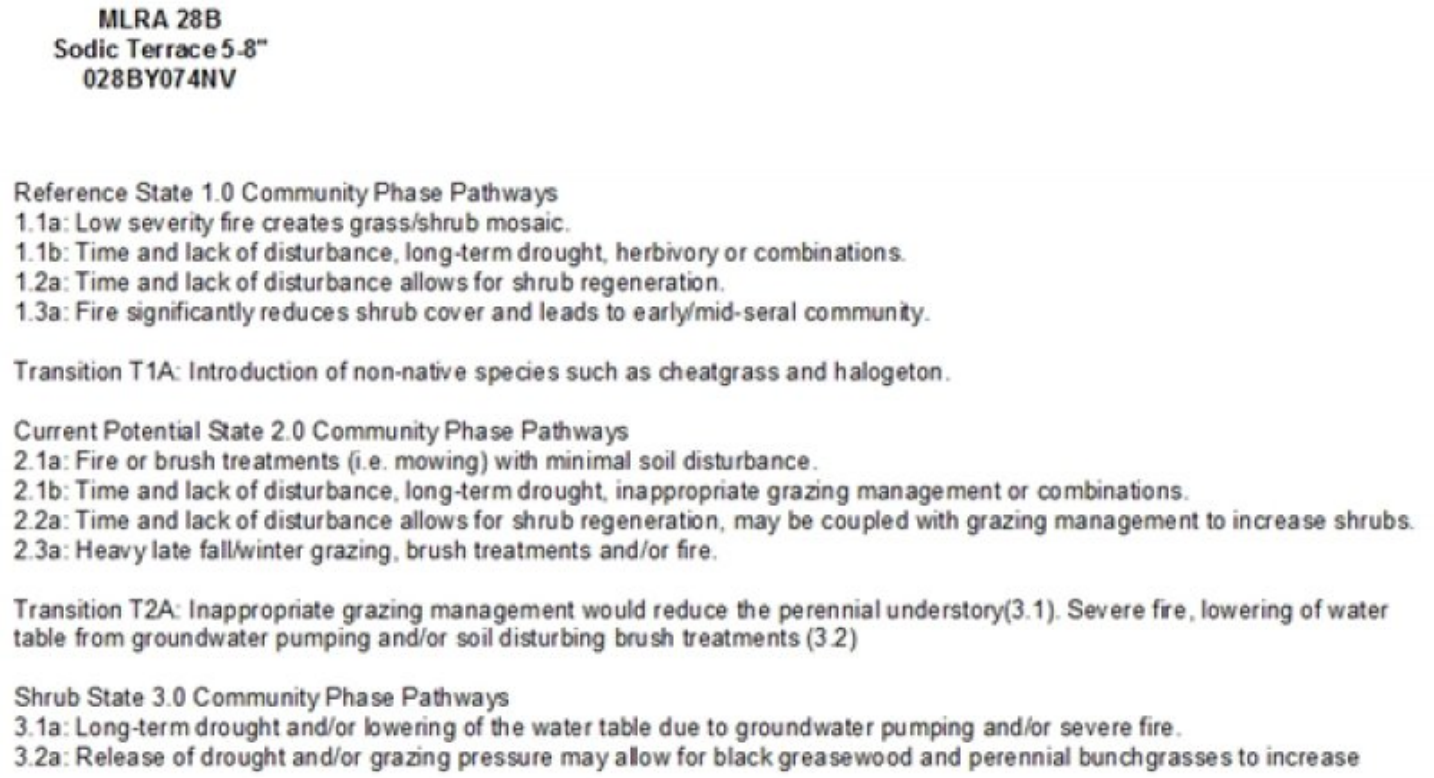

Figure 5. Legend

Animal community

Livestock Interpretations:
This site is suited for livestock grazing. Grazing management considerations include timing, intensity, frequency and duration of grazing.
During settlement, many of the cattle in the Great Basin were wintered on extensive basin wildrye stands however due to sensitivity to spring use many stands were decimated by early in the 20th century (Young et al. 1976). Basin wildrye is intolerant of heavy or repeated grazing, especially if grazed before reaching maturity. It is important forage for cattle and is readily grazed by cattle and horses in early spring and fall. Though coarse-textured during the winter, basin wildrye may be utilized more frequently by livestock and wildlife when snow has covered low shrubs and other grasses. Less palatable species such as black greasewood, rabbitbrush and inland salt grass increased in dominance along with invasive non-native species such as povertyweed, Russian thistle, mustards and cheatgrass (Roundy 1985). Spring defoliation of basin wildrye and/or consistent, heavy grazing during the growing season has been found to significantly reduce basin wildrye production and density (Krall et al. 1971). Thus, inadequate rest and recovery from defoliation can cause a decrease in basin wildrye and an increase in rabbitbrush and black greasewood, along with inland saltgrass and non-native weeds (Young et al. 1976, Roundy 1985). Additionally, natural basin wildrye seed viability has been found to be low and seedlings lack vigor (Young and Evans 1981). Roundy (1985) found that although basin wildrye is adapted to seasonally dry saline soils, high and frequent spring precipitation is necessary to establish it from seed suggesting that establishment of

natural basin wildrye seedlings occurs only during years of unusually high precipitation. Therefore, reestablishment of a stand that has been decimated by grazing may be episodic.

Black greasewood is an important winter browse plant for domestic sheep and cattle. Black greasewood may increase in response to grazing. Removal of competition can dramatically increase growth rates and total leader length of black greasewood. Black greasewood is considered an important browse species for wildlife and livestock. In a study by Smith et al. (1992), utilization of new growth on greasewood shrubs by cattle was 77 percent in summer, and greasewood was found to have the highest amounts of crude protein when compared to perennial and annual grasses. Black greasewood plants have been found to contain high amounts of sodium and potassium oxalates which are toxic to livestock and caution should be taken when grazing these communities. These shrubs can be used lightly in the spring as long as there is a substantial amount of other preferable forage available (Benson et al. 2011).

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 ($p<0.01$). During years of below average precipitation, shadscale has been found very susceptible to grazing pressure regardless of season (Chambers and Norton 1993).

Budsage is palatable and nutritious forage for domestic sheep in the winter and spring although it is known to cause mouth sores in lambs. Budsage 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.

Alkali sacaton has been found to be sensitive to early growing season defoliation whereas late growing season and/or dormant season use allowed recovery of depleted stands (Hickey and Springfield 1966). Shadscale, squirreltail, and saltgrass will eventually decline with continued inappropriate grazing. Thus, inadequate rest and recovery from defoliation can cause a decrease in basin wildrye and an increase in rabbitbrush and black greasewood, along with inland saltgrass and non-native weeds (Young et al. 1976, Roundy 1985).

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. Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of livestock.

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:
Salt-desert shrub communities provide valuable habitat for a number of species. Black greasewood also provides good cover for wildlife species (Benson et al. 2011).
Black greasewood dominates the salt desert shrub-type habitat, generally bordering areas that are dominated by sagebrush species. Black greasewood is an important winter cover and browse plant for wildlife. (Nevada Wildlife Action Plan 2012, Dayton 1931, Austin and Hash 1988, Johnson 1979).
Ungulates, such as pronghorns (Antilocapra americana), browse black greasewood. Trace amounts of black greasewood were identified in the feces of pronghorn (seasonal preference was not determined) in a microhistology study by Johnson (1979). Furthermore, pronghorn and mule deer that occurred in greasewood habitat, utilized greasewood for cover, although the study did not determine if black greasewood was a desirable forage (Hanley and Hanley 1982). Other studies indicated that although mule deer (Odocoileus hemionus) and pronghorn do not prefer black greasewood as forage, the ungulates use black greasewood habitat as cover (Oedekoven and Lindzey 1987). Small mammals will also utilize black greasewood. For example, trace amounts of black greasewood were identified in the feces of black-tailed jack rabbits (Lepus californicus), seasonal preference was not determined (Johnson 1979). A study in the Great Basin by Feldhamer (1979) found that pocket mice (Perognathus parvus) and chipmunk (Tamius spp.) populations were restricted to plant communities dominated by black greasewood. Furthermore, black greasewood habitat is documented as used in minor amounts by other small mammals including voles, chipmunks, porcupines (Erethizon dorsatum), and raccoons (Procyon lotor) (Anderson 2004) Soils of this habitat tend to be loose and either sandy or gravelly and are often easy to dig making them attractive to species such as the pale kangaroo mouse (Microdipodops pallidus) (Nevada Wildlife Action Plan 2012). This habitat is also an important feeding ground for pallid bats (Antrozous pallidus), which eat scorpions and other large invertebrates off its exposed desert flats (Nevada Wildlife Action Plan 2012).
Black greasewood provides cover and nest sites for several species of birds. Bird species, such as the sage sparrow (Amphispiza belli) and lark buntings (Calamospiza melanocorys), are known to utilize black grease wood habitat (Wiens and Rotenberry 1981). The loggerhead shrike (Lanius ludovicianus) will use black greasewood for nesting and cover. Burrowing owls (Athene cunicularia) will use the loose soils for burrowing. Bald eagles (Haliaeetus leucocephalus) and prairie falcons (Falco mexicanus) winter in the valley bottoms where black greasewood occurs, preying on jack rabbits, and other rodents Nevada Wildlife Action Plan 2012).
Reptiles and amphibians also occur in black greasewood habitats. Western rattle snakes (Crotalus viridis) and gopher snakes (Pituophis catenifer) were recorded in greasewood habitat in a study by Diller and Johnson (1988). Reptile species including: eastern racers (Coluber constrictor), ringneck snakes (Diadophis punctatus), night snakes (Hypsiglena torquata), Sonoran mountain kingsnakes (Lampropeltis pyromelana), striped whipsnakes (Masticophis taeniatus), long-nosed snakes (Rhinocheilus lecontei), wandering gartersnakes (Thamnophis elegans vagrans), sidewinders (Crotalus cerastes), Great Basin rattlesnakes (Crotalus oreganus), Great Basin collared lizard (Crotaphytus bicinctores), long-nosed leopard lizard (Gambelia wislizenii), short-horned lizard

(Phrynosoma hernandesi), desert-horned lizard (Phrynosoma platyrhinos), western fence lizards (Sceloporus occidentalis), northern side-blotched lizards (Uta stansburiana nevadensis), banded gecko (Coleonyx variegatus), desert iguana (Dipsosaurus dorsalis), zebra-tailed lizard (Callisaurus draconoides), pigmy horned-lizard (Phrynosoma douglasii), desert night lizard (Xantusia vigilis), whip-tailed lizard (Aspidoscelis uniparens) and western skinks (Plestiodon skiltonianus) occur in areas where black greasewood habitat is prominent. Similarly, amphibians such as: western toads, (Anaxyrus boreas) Woodhouse's toads (Anaxyrus woodhousii), northern leopard frogs (Lithobates pipiens), Columbia spotted frogs (Rana luteiventris), bullfrogs (Lithobates catesbeianus), and Great Basin spadefoots (Spea intermontana), California toads (Anaxyrus boreas halophilus), Amargosa toads (Anaxyrus nelsoni), great plains toads (Anaxyrus cognatus), Sonoran toads (Anaxyrus alvarius), red-spotted toads (Anaxyrus punctatus) and mountain toad (Anaxyrus cavifrons), also occur throughout the Great Basin in areas where black greasewood is dominant (Hamilton 2004).

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. Black greasewood is an important winter browse plant for big game animals and a food source for many other wildlife species. It also receives light to moderate use by mule deer and pronghorn during spring and summer months. Budsage is palatable, nutritious forage for upland game birds, small game and big game in winter. Budsage 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 budsage in the diet of bighorns is not known. Bud sage comprises 18 – 35% of a pronghorn's diet during the spring where it is available. Chukar will utilize the leaves and seeds of bud sage. Budsage 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.

Basin wildrye provides winter forage for mule deer, though use is often low compared to other native grasses. Basin wildrye provides summer forage for black-tailed jackrabbits. Because basin wildrye remains green throughout early summer, it remains available for small mammal forage for longer time than other grasses.

Indian ricegrass is eaten by pronghorn in "moderate" amounts whenever available. In Nevada it is consumed by desert bighorns. 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.

Saltgrass provides cover for a variety of bird species, small mammals, and arthropods and is on occasion used as forage for several big game wildlife species.

Bottlebrush squirreltail is a dietary component of several wildlife species. Bottlebrush squirreltail may provide forage for mule deer and pronghorn.

Hydrological functions

Permeability is very slow to moderately rapid. Runoff is negligible to medium. A thick vesicular crust facilitates ponding. Water flow patterns are often numerous in areas subjected to summer convection storms. Flow patterns are short and stable. Pedestals are rare with occurrences typically limited to areas within water flow paths. Sparse shrub canopy and associated litter break raindrop impact. Medium to fine textured surface soils have moderate to slow infiltration.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition. This site offers rewarding opportunities to photographers and for nature study. This 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. The leaves, seeds and stems of black greasewood are edible. Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source.

Other information

Black greasewood is useful for stabilizing soil on wind-blown areas. It successfully revegetates eroded areas and sites too saline for most plant species. Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Elko County, NV	
Township/Range/Section	T40N R70E S20
Latitude	41° 20′ 21″
Longitude	114° 4′ 12″
General legal description	SE¼SW¼ Section 20, T40N. R70E. MDBM. Approximately 7 miles northeast of Montello, Tecoma Valley area, Elko County, Nevada. This site also occurs in Eureka and White Pine Counties, Nevada.

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Approval

Kendra Moseley, 2/19/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	GK Brackley / P Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	06/01/2006
Approved by	Kendra Moseley
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 on this site.

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2. **Presence of water flow patterns:** Water flow patterns are often numerous in areas subjected to summer convection storms. Flow patterns are short (<3m), meandering, and stable.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare with occurrences typically limited to areas within water flow patterns.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 40-60%

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

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Wind scouring may occur during severe wind events, prior to winter or summer convection storms.

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) is expected to move the distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during large rainfall events.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 3 to 6 on most soil textures found on this site.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically fine to medium platy or prismatic. Soil surface colors are light grays or pale browns and the soils are typified by an ochric epipedon. A thick vesicular crust is common on the surface. Organic carbon of the surface 2 to 3 inches is less than to 1 percent.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse shrub canopy and associated litter provide some protection from raindrop impact. Shrub canopy provides an opportunity for snow capture on this site.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are none. Platy or massive sub-surface horizons, or subsoil calcic horizons are not to be interpreted as compacted layers.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Reference State: Salt desert shrubs (shadscale & black greasewood) >> cool season perennial grasses (by above ground production)

    Sub-dominant: associated shrubs = rhizomatous grasses = deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, annual and perennial forbs (by above ground production)

    Other: Microbiotic crusts

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs are common and standing dead shrub canopy material may be as much as 35% of total woody canopy; mature bunchgrasses commonly (±25%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces 10 to 20% 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 (thru May) ± 400 lbs/ac. Favorable years ± 600 lbs/ac and unfavorable years ± 200 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 halogeton, Russian thistle, annual mustards, cheatgrass, and knapweeds.

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