USDA Natural Resources Conservation Service

Ecological site R028AY029NV
LIMESTONE HILL

Accessed: 05/13/2025

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.

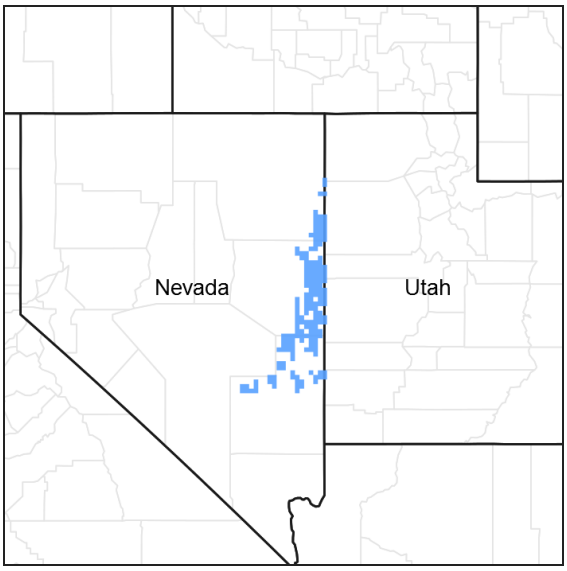

Figure 1. Mapped extent

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 sideslopes and mountain flanks of mountains and hills on all exposures. Slopes range from 8 to 75 percent, but slope gradients of 15 to 50 percent are typical. Elevations are 5000 to 8900 feet.

Average annual precipitation is 8 to 12 inches. Mean annual air temperature is 44 to 47 degrees F. The average growing season is about 100 to 150 days.

The soils associated with this site have formed in colluvium and residuum derived from highly calcareous sedimentary rock (i.e., limestone, dolomite). These soils are typically very shallow to shallow and well drained. The soil profile is modified with 50 to 85 percent rock fragments. Runoff is high to very high.

The reference state is dominated by littleleaf mountain mahogany. Black sagebrush, Stansbury cliffrose, Nevada greasebush and Scribner needlegrass are important species associated with this site. Production ranges from 500 to 900 pounds per acre.

Associated sites

R028AY004NV	**SHALLOW CALCAREOUS SLOPE 8-10 P.Z.**
R028AY034NV	**SHALLOW CALCAREOUS SLOPE 10-14 P.Z.**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Cercocarpus intricatus*
Herbaceous	(1) *Achnatherum scribneri*

Physiographic features

This site occurs on sideslopes and mountain flanks of mountains and hills on all exposures. Slopes range from 8 to 75 percent, but slope gradients of 15 to 50 percent are typical. Elevations are 5000 to 8900 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Mountain slope (3) Hill
Elevation	1,524–2,713 m
Slope	8–75%
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).

Average annual precipitation is 8 to 12 inches. Mean annual air temperature is 44 to 47 degrees F. The average growing season is about 100 to 150 days.

Mean annual precipitation at the LUND, NEVADA climate station (264745) is 10.04 inches.

January 0.78; February 0.85; March 1; April 0.98: May 0.95; June 0.82; July 0.69; August 0.87; September 0.77; October 0.92; November 0.69; December 0.73.

Table 3. Representative climatic features

Frost-free period (average)	102 days
Freeze-free period (average)	0 days
Precipitation total (average)	254 mm

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site have formed in residuum derived from highly calcareous sedimentary rock (i.e., limestone, dolomite). These soils are typically very shallow to shallow and well drained. The soil profile is modified with 50 to 85 percent rock fragments. Runoff is high to very high. Available water holding capacity is very low. The soils usually have high amounts of gravels, cobbles or stones on the surface that occupy plant growing space, yet help to reduce evaporation and conserve soil moisture. The soil moisture regime is aridic bordering on xeric and the soil temperature regime is mesic. The soil series associated with this site include: Eaglepass and Hopeka.

The representative soil series is Eaglepass, a Loamy-skeletal, carbonatic, mesic Lithic Xeric Torriorthents. Diagnostic horizons include an ochric epipedon from soil surface to 4 inches. Depth to bedrock is 4 to 6 inches. Clay content in the particle control sections average 8 to 18 percent. Rock fragments range from 60 to 75 percent, includes gravel, cobbles and stones. Reaction is moderately alkaline or strongly alkaline. Effervescence is violently effervescent. Lithology consists of limestone and dolomite.

Table 4. Representative soil features

Parent material	(1) Residuum–dolomite (2) Colluvium–limestone
Surface texture	(1) Extremely stony loam (2) Very cobbly loam (3) Extremely gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Rapid to moderately rapid

Soil depth	10–15 cm
Surface fragment cover <=3"	16–50%
Surface fragment cover >3"	30–55%
Available water capacity (0-101.6cm)	0.51–2.54 cm
Calcium carbonate equivalent (0-101.6cm)	30–50%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	8.2–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–30%
Subsurface fragment volume >3" (Depth not specified)	20–45%

Ecological dynamics

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

This ecological site is dominated by the long-lived littleleaf mountain mahogany, deep-rooted cool season perennial bunchgrasses, and other long-lived shrubs (50+ years) with high root to shoot ratios. Littleleaf mountain mahogany occurs rooted in the cracks and crevices of exposed limestone and dolomite (Davis 1990). The perennial bunchgrasses generally have somewhat shallower root systems than the shrubs, but root densities are often as high as or higher than those of shrubs in the upper 0.5 meters. General differences in root depth distributions between grasses and shrubs results in resource partitioning in this system.

The Great Basin sagebrush 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. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability within the soil profile (Bates et al 2006).

Littleleaf mountain mahogany (*Cercocarpus intricatus*) is a long-lived, intricately branched, and occasionally tree-like evergreen shrub. Its height may vary from 0.5 to 2.5m. It is found mostly on rocky limestone slopes primarily associated with pinyon or pinyon/juniper woodlands. Where it occurs near curl-leaf mountain mahogany (*Cercocarpus ledifolius*) the two may hybridize (Brayton and Mooney 1966).

Black sagebrush, an associated understory shrub, is generally long-lived; therefore it is not necessary for new individuals to recruit every year for perpetuation of the stand. Infrequent large recruitment events and simultaneous low, continuous recruitment is the foundation of population maintenance (Noy-Meir 1973). Survival of the seedlings is dependent on adequate moisture conditions.

The perennial bunchgrasses that are co-dominant with the shrubs include Scribner needlegrass, Indian ricegrass, bluebunch wheatgrass, muttongrass and squirreltail. These species generally have somewhat shallower root systems than the shrubs, but root densities are often as high as or higher than those of shrubs in the upper 0.5 m of the soil profile. General differences in root depth distributions between grasses and shrubs results in resource partitioning in these shrub/grass systems.

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. This is a very stable ecological site. Fire is the main disturbance but is rare and of low severity due to low fuel loads. The majority of fires are from lightning strikes

and result in minor spot burns which create a mosaic of trees, shrubs, grasses, and forbs. Open areas will be dominated by shrubs and bunchgrasses such as bluebunch wheatgrass.
This ecological site has low to moderate resilience to disturbance and resistance to invasion. Resilience increases with elevation, aspect, precipitation, and nutrient availability. Long-term disturbance response may be influenced by small differences in landscape topography. Concave areas receive run-in from adjacent landscapes and consequently retain more moisture to support the growth of deep-rooted perennial grasses (i.e. bluebunch wheatgrass) whereas convex areas where runoff occurs are slightly less resilient and may have more shallow-rooted perennial grasses (i.e. Sandberg bluegrass). North slopes are also more resilient than south slopes because lower soil surface temperatures operate to keep moisture content higher on northern exposures. Two possible alternative stable states have been identified for this site.

Fire Ecology:

Literature on fire response in littleleaf mountain mahogany communities is scarce, however Kitchen (2012) studied historical fire regimes in the Wah Wah mountains in Utah where numerous forest and woodland openings are dominated by black sagebrush and littleleaf mountain mahogany. Point mean fire interval estimates for areas around these sites ranged from 13.8 to 138.4 years.
Black sagebrush plants have no morphological adaptations for surviving fire and must reestablish from seed following fire (Wright et al. 1979). The ability of black sagebrush to establish after fire is mostly dependent on the amount of seed deposited in the seed bank the year before the fire. Seeds typically do not persist in the soil for more than 1 growing season (Beetle 1960). A few seeds may remain viable in soil for 2 years (Meyer 2008); however, even in dry storage, black sagebrush seed viability has been found to drop rapidly over time, from 81% to 1% viability after 2 and 10 years of storage, respectively (Stevens et al. 1981). Thus, repeated frequent fires can eliminate black sagebrush from a site, however black sagebrush in zones receiving 12 to 16 inches of annual precipitation have been found to have greater fire survival (Boltz 1994). In lower precipitation zones rabbitbrush may become the dominant shrub species following fire, often with an understory of Sandberg bluegrass and/or cheatgrass and other weedy 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). However, season and severity of the fire will influence plant response. Plant response will also vary depending on post-fire soil moisture availability.
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.
Fire will remove aboveground biomass from bluebunch wheatgrass but plant mortality is generally low (Robberecht and Defossé 1995) because the buds are underground (Conrad and Poulton 1966) or protected by foliage. Uresk et al. (1976) reported burning increased vegetative and reproductive vigor of bluebunch wheatgrass. Thus, bluebunch wheatgrass is considered to experience slight damage to fire but is more susceptible in drought years (Young 1983). Plant response will vary depending on season, fire severity, fire intensity and post-fire soil moisture availability.

State and transition model

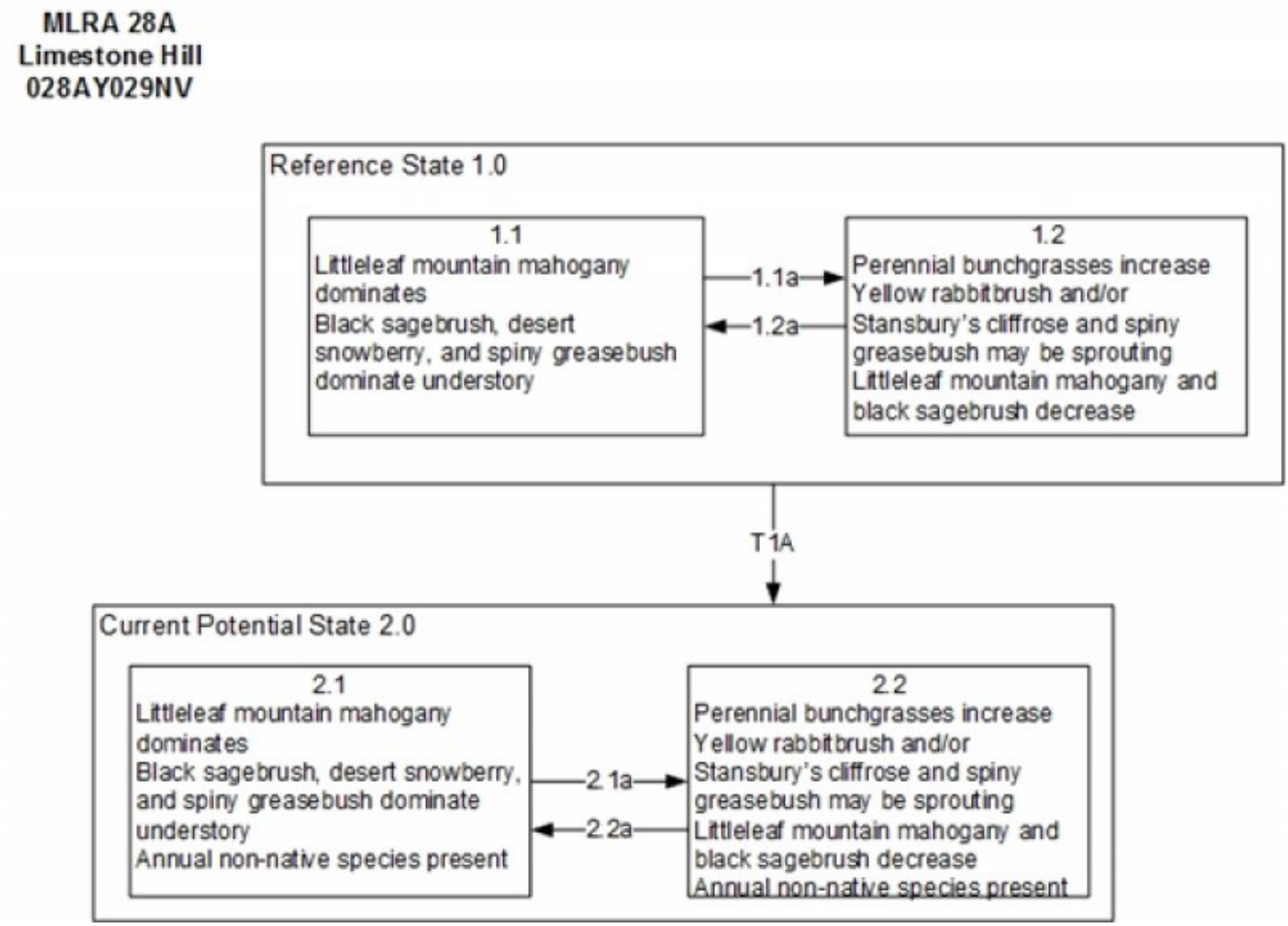

Figure 5. T Stringham 2/2015

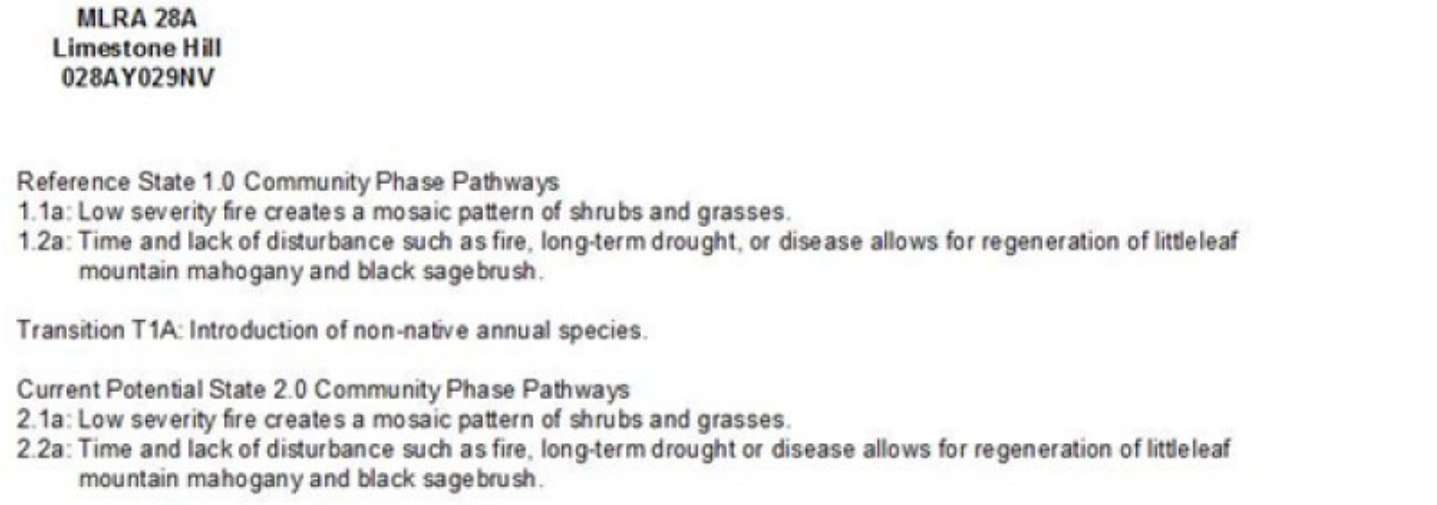

Figure 6. Legend

State 1
Reference State

The Reference State 1.0 is representative of the natural range of variability under pristine conditions. The

Reference State has two general community phases: a dominant tree/shrub phase and a dominant tree/grass phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.

Community 1.1
Community Phase

Figure 7. T. Stringham 8/2013, NV 708 MU 2103, Eaglepass ser

This community phase is characterized by mature littleleaf mountain mahogany shrubs. Black sagebrush and desert snowberry are the dominant shrubs in the understory. Scribner needlegrass and Indian ricegrass are the dominant bunchgrasses in the understory. Bottlebrush squirreltail, bluebunch wheatgrass and Sandberg bluegrass are also present. Perennial forbs such as mock goldenweed (*Stenotus acaulis*), beardtongue (Penstemon spp.), fineleaf hymenopappus (*Hymenopappus filifolius*) make up minor components. Singleleaf pinyon and Utah juniper may be present in small amounts. The plant community is dominated by littleleaf mountainmahogany. Black sagebrush, Stansbury's cliffrose, Nevada greasebush and Scribner's needlegrass are important species associated with this site. Potential vegetative composition is about 15% grasses, 10% forbs and 75% shrubs, tree-like shrubs and trees. Approximate ground cover (basal and crown) is 30 to 40 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	411	568	725
Grass/Grasslike	84	118	151
Forb	56	78	101
Tree	9	20	31
Total	**560**	**784**	**1008**

Community 1.2
Community Phase

Littleleaf mountain mahogany is reduced but remains as a major component of the overstory. Black sagebrush is reduced. Yellow rabbitbrush, desert snowberry and spiny greasebush may be sprouting. Perennial bunchgrasses may be reduced the first season after fire but will likely increase in cover and density due to the reduced competition from shrubs and trees. Forbs may increase the first season after fire, but continue to decline as grasses and shrubs return to pre-burn densities.

Pathway a
Community 1.1 to 1.2

A low severity fire would reduce cover of a few shrubs in the understory and allow the perennial bunchgrasses to increase.

Pathway a
Community 1.2 to 1.1

Time without disturbance such as fire, extended drought, or disease will allow for the trees and shrubs to increase in height and density.

State 2
Current Potential State

This state is similar to the Reference State 1.0 with two similar community phases. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These feedbacks include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Community 2.1
Community Phase

This community phase is characterized by mature littleleaf mountain mahogany shrubs. Black sagebrush and desert snowberry are the dominant shrubs in the understory. Scribner needlegrass and Indian ricegrass are the dominant bunchgrasses in the understory. Bottlebrush squirreltail, bluebunch wheatgrass and Sandberg bluegrass are also present. Perennial forbs comprise a minor component in the understory. Annual non-native species are present in the understory. Singleleaf pinyon and Utah juniper may be present in small amounts.

Community 2.2
Community Phase

Littleleaf mountain mahogany is reduced but remains as a major component of the overstory. Black sagebrush is reduced and desert snowberry may be sprouting. Perennial bunchgrasses may be reduced the first season after fire but will likely increase in cover and density due to the reduced competition from shrubs and trees. Annual non-native species respond well to fire and may increase.

Pathway a
Community 2.1 to 2.2

A low severity fire would reduce the canopy of the shrubs in the understory and allow the perennial bunchgrasses to increase.

Pathway a
Community 2.2 to 2.1

Time without disturbance such as fire, extended drought, or disease will allow for the trees and shrubs to increase in height and density.

Transition A
State 1 to 2

Trigger: This transition is caused by the introduction of non-native annual plants, such as cheatgrass and annual mustards. 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.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			55–118	
	Scribner needlegrass	ACSC11	*Achnatherum scribneri*	39–78	–
	James' galleta	PLJA	*Pleuraphis jamesii*	16–39	–
2	**Secondary Perennial Grasses**			39–118	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	4–24	–
	little Parish's needlegrass	ACPAD	*Achnatherum parishii var. depauperatum*	4–24	–
	threeawn	ARIST	*Aristida*	4–24	–
	blue grama	BOGR2	*Bouteloua gracilis*	4–24	–
	sedge	CAREX	*Carex*	4–24	–
	squirreltail	ELEL5	*Elymus elymoides*	4–24	–
	needle and thread	HECO26	*Hesperostipa comata*	4–24	–
	Sandberg bluegrass	POSE	*Poa secunda*	4–24	–
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	4–24	–
Forb					
3	**Perennial**			39–118	
	gilia	GILIA	*Gilia*	4–39	–
	mat rockspirea	PECA12	*Petrophytum caespitosum*	4–39	–
	phlox	PHLOX	*Phlox*	4–39	–
	goldenweed	PYRRO	*Pyrrocoma*	4–39	–
Shrub/Vine					
4	**Primary Shrubs**			518–690	
	littleleaf mountain mahogany	CEIN7	*Cercocarpus intricatus*	471–549	–
	black sagebrush	ARNO4	*Artemisia nova*	16–63	–
	spiny greasebush	GLSPA	*Glossopetalon spinescens var. aridum*	16–39	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	16–39	–
5	**Secondary Shrubs**			39–118	
	greenleaf manzanita	ARPA6	*Arctostaphylos patula*	8–24	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	8–24	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	8–24	–
	jointfir	EPHED	*Ephedra*	8–24	–
	buckwheat	ERIOG	*Eriogonum*	8–24	–
	spiny hopsage	GRSP	*Grayia spinosa*	8–24	–
	purple sage	SADOI	*Salvia dorrii ssp. dorrii var. incana*	8–24	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	8–24	–
Tree					
6	**Evergreen**			9–31	
	Utah juniper	JUOS	*Juniperus osteosperma*	4–16	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	4–16	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing due to steep slopes and low forage production. Scribner's needlegrass is palatable to livestock and is grazed during the spring. 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. Cattle and sheep will feed on littleleaf mountain mahogany slightly in the winter, and is generally of minor significance to livestock. In winter, at lower elevations, black sagebrush is heavily utilized by domestic sheep. Stansbury cliffrose is an important browse species for livestock, especially in the winter. Nevada greasebush has low forage value for 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:
Littleleaf mountain mahogany is good winter browse for deer and elk. Black sagebrush is a significant browse species within the Intermountain region. It is especially important on low elevation winter ranges in the southern Great Basin, where extended snow free periods allow animal's access to plants throughout most of the winter. In these areas it is heavily utilized by pronghorn and mule deer. Stansbury cliffrose is an important browse species for mule deer, pronghorn, game birds, and songbirds. Wild ungulates use it heavily in winter. Nevada greasebush has low forage value for wildlife. Scribner's needlegrass is palatable to wildlife and is grazed during the spring. Galleta provides moderately palatable forage when actively growing and relatively unpalatable forage during dormant periods. Galleta provides poor cover for most wildlife species.

Hydrological functions

Permeability is impermeable to moderately rapid. Runoff is high to very high. Hydrologic soil group is D. Rills are none to rare. Rock fragments armor the surface. Water flow patterns are none to rare. A few may occur on steeper slopes after summer convection storms or rapid snowmelt. These are typically short (<1m) and meandering between rock fragments and vegetation. Pedestals are none to rare and are typically confined to water flow paths. Terracettes are none to rare and typically occur on steeper slopes. Shrub canopy, associated litter and rock fragments break raindrop impact and allow for snow capture on the site. Deep-rooted perennial grasses increase infiltration and reduce runoff.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for hiking and has potential for upland and big game hunting.

Other products

Triterpenoids extracted from Stansbury cliffrose have been shown to have inhibitory effects on HIV and Epstein-Barr virus. Native Americans used the inner bark for making clothing and ropes, and the branches for making arrows.

Other information

Black sagebrush is an excellent species to establish on sites where management objectives include restoration or improvement of domestic sheep, pronghorn, or mule deer winter range. Stansbury cliffrose is recommended for wildlife, roadside, construction, and mine spoils plantings; and for restoring pinyon-juniper woodland, mountain brushland, basin big sagebrush grassland, black sagebrush, and black greasewood communities. It can be established on disturbed seedbeds by broadcast seeding, drill seeding, or transplanting. Fall or winter seeding is recommended.

Type locality

Location 1: White Pine County, NV	
Township/Range/Section	T12N R69E S10
Latitude	38° 55′ 37″
Longitude	114° 12′ 53″
General legal description	About ¼ mile north of Snake Creek road, Snake Range, Great Basin National Park, White Pine County, Nevada. Also occurs in Elko and Lincoln Counties, Nevada.

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Rangeland health reference sheet

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

Author(s)/participant(s)	P Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	01/05/2016
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are none to rare. Rock fragments armor the surface.

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2. **Presence of water flow patterns:** Water flow patterns are none to rare. A few may occur on steeper slopes after summer convection storms or rapid snowmelt. These are typically short (<1m) and meandering between rock fragments and vegetation.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare and are typically confined to water flow paths. Terracettes are none to rare and typically occur on steeper slopes.

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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 to 5-15%. Surface rock fragments up to 85%.

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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. Rock fragments protect soil surface.

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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) expected to move short distances among rock fragments during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during large rainfall events.

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically fine subangular blocky. Soil surface colors are browns and soils are typified by an ochric epipedon. Surface textures are loams. Organic matter of the surface 2 to 3 inches is 1 to 3 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shrub canopy, associated litter and rock fragments break raindrop impact and allow for snow capture on the site. Deep-rooted perennial grasses increase infiltration and reduce runoff.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

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: evergreen tall shrubs (littleleaf mountain mahogany) >>

    Sub-dominant: associated shrubs > deep-rooted, cool-season, perennial grasses > deep-rooted cool season perennial forbs > > shallow-rooted, cool-season perennial grasses >annual forbs.

    Other: evergreen trees

    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; mature bunchgrasses commonly (<20%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces 25-35% and depth <¼-inch.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ± 700 lbs/ac. Favorable years ± 900 lbs/ac and unfavorable years ± 500 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 on this site include cheatgrass and annual mustards.

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