USDA Natural Resources
Conservation Service

Ecological site R030XB123NV
LIMESTONE SLOPE 5-7 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.

Ecological site concept

This site typically occurs on sideslopes of mountains on all exposures. Slopes range from 8 to 50 percent. Elevations are 1900 to 3600 feet. The soil associated with this site are shallow to very shallow and well drained. These soils have formed in residuum and colluvium from limestone and dolomite. The soils are skeletal throughout the profile.

This is a group concept and provisional STM that also covers R030XB106NV, R030XB111NV.

Associated sites

R030XB105NV	**BOULDERY LIMESTONE SLOPE 5-7 P.Z.**

Similar sites

R030XB122NV	**LIMY SAND 3-5 P.Z.** Slopes <15%; occurs on lower fan piedmonts with thin sand sheet
R030XB111NV	**GRAVELLY LIMESTONE SLOPE 5-7 P.Z.** MOUT codominant shrub; less productive site
R030XB080NV	**STONY LOAM 5-7 P.Z.** KRLA2 dominant shrub; AMDU2 rare to absent
R030XB105NV	**BOULDERY LIMESTONE SLOPE 5-7 P.Z.** KRLA2-MOUT codominant shrubs
R030XB106NV	**GRAVELLY SLOPE 5-7 P.Z.** ATCO dominant shrub

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ambrosia dumosa*
Herbaceous	(1) *Pleuraphis rigida*

Physiographic features

This site typically occurs on sideslopes of mountains on all exposures. Slopes range from 8 to 50 percent. Elevations are 1900 to 3600 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope

Elevation	1,900–3,600 ft
Slope	8–50%

Climatic features

The climate of the Mojave Desert has extreme fluctuations of daily temperatures, strong seasonal winds, and clear skies. The climate is arid and is characterized with cool, moist winters and hot, dry summers. Most of the rainfall falls between November and April. Summer convection storms from July to September may contribute up to 25 percent of the annual precipitation. Average annual precipitation is 5 to 7 inches. Mean annual air temperature is 57 to 68 degrees F. The average growing season is about 180 to 300 days.

Table 3. Representative climatic features

Frost-free period (average)	300 days
Freeze-free period (average)	
Precipitation total (average)	7 in

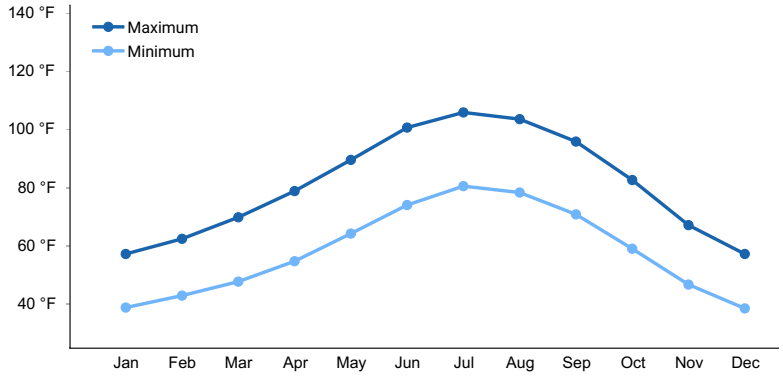


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soil associated with this site are shallow to very shallow and well drained. These soils have formed in residuum and colluvium from limestone and dolomite. The soils are skeletal throughout the profile. Effective rooting depth is 4 to 14 inches. Available water capacity is very low and permeability is moderately rapid. Wind erosion hazard is negligible due to the high amount of surface rock fragments. Soil series associated with the site include Helkitchen and St. Thomas.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone (2) Colluvium–dolomite
Surface texture	(1) Extremely flaggy sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	4–14 in
Surface fragment cover <=3"	15–40%
Surface fragment cover >3"	30–70%

Available water capacity (0-40in)	0.3–0.6 in
Calcium carbonate equivalent (0-40in)	25–80%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	40–60%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

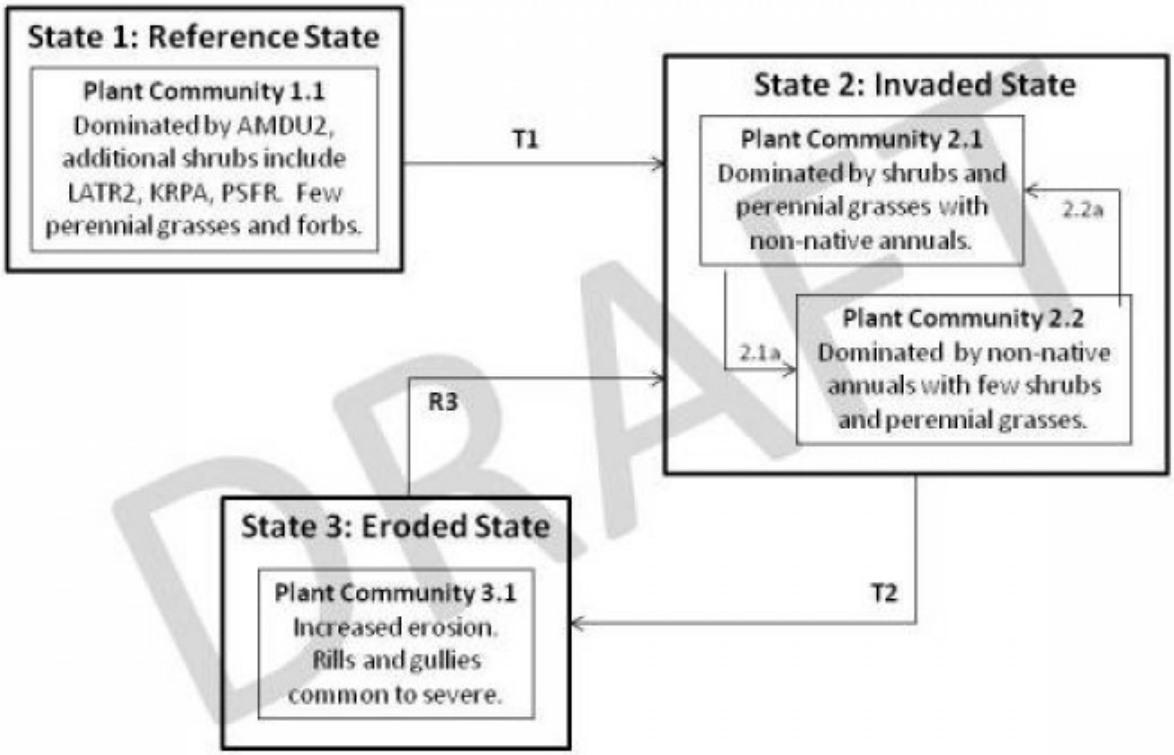
Creosotebush-white bursage association is extensive throughout the Mojave Desert and consists of both long-lived and short-lived perennial species. In stable, old communities, creosotebushes or clones may attain ages of several thousand years. Defoliation and death of branches of creosotebush may occur as a result of long periods of intense moisture stress. Surface disturbance on this site may reduce plant cover, density and diversity and increase erosion on this site. These changes can be very subtle or extremely obvious depending on the intensity of use, rate of use and an assortment of environmental factors (topography, rainfall, soil type).

This site has unique hydrological relationships due to its position within the landscape. Additional moisture from surrounding sites combined with micro-site variation on this ecological site allows for a more diverse expression of shrub species. Additional run-in moisture favors seedling establishment extensive canopy development during favorable years, but also makes this ecological site susceptible to extended periods of drought were additional moisture is unavailable (Hamerlynck and McAuliffe 2008).

Surface disturbance can reduce plant cover, density, and plant diversity of this site. These changes can be very subtle or extremely obvious depending on the intensity and frequency of disturbance. As ecological condition deteriorates big galleta and other perennial grasses decrease. Short-lived perennials such as threadleaf snakeweed will initially increase. White bursage, a long-lived, opportunistic, species may also increase. With a loss of perennial cover, non-native annual grasses and forbs such as red brome, cheatgrass, and red-stem filaree may invade this site.

Fire Ecology:
Fires in the Mojave Desert are infrequent and of low severity because production of annual and perennial herbs seldom provides a fuel load capable of sustaining fire. Fire generally kills white bursage. However, most white bursage plants burned because their canopies contained numerous small branches in proximity to herbaceous fuels. Fires in creosotebush scrub were an infrequent event in pre-settlement desert habitats, because fine fuels from winter annual plants were probably sparse, only occurring in large amounts during exceptionally wet winters. Fire kills many creosotebush. Creosotebush is poorly adapted to fire because of its limited sprouting ability. Creosotebush survives some fires that burn patchily or are of low severity. Severe fire can kill the perennating buds located several inches above the ground surface and thus kills the plant. In addition, severe fire usually destroys seed on the plant. Low-severity fire scorches or only partially consumes the aboveground portions of winterfat and thus does not cause high mortality. Fire typically destroys aboveground parts of Anderson wolfberry, but the degree of damage to the plant depends on fire severity. Range ratany is top-killed by fire. Range ratany resprouts from the root crown after fire. Fire most likely top-kills big galleta. Big galleta sprouts from rhizomes following fire. Damage to big galleta from fire varies, depending on whether big galleta is dormant when burned. If big galleta is dry, damage may be severe. However, when plants are green, fire will tend to be less severe and damage may be minimal, with big galleta recovering quickly. Desert needlegrass has persistent dead leaf bases, which make it susceptible to burning. Fire removes the accumulation; a rapid, cool fire will not burn deep into the root crown and surviving tufts will resprout.

State and transition model



State 1
Reference State

This state represents the natural range of variability under pristine conditions. Community phase changes are primarily driven by natural disturbances such as long-term drought and insect attack. Wildfire is infrequent and patchy in this ecological site due to low fuel loading and widely spaced shrubs. Timing of disturbance combined with weather events determines plant community dynamics.

Community 1.1
Reference Plant Community

White bursage and big galleta dominate the reference plant community. Potential vegetative composition is about 50% annual and perennial grasses, 10% annual and perennial forbs, and 40% shrubs. Approximate ground cover (basal and crown) is 15 to 25 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	175	250	350
Shrub/Vine	140	200	280
Forb	35	50	70
Total	**350**	**500**	**700**

State 2
Invaded

The invaded state is characterized by the presence of non-native species in the understory. A biotic threshold has been crossed with the introduction of non-native species, which cannot be removed from the system and have the potential to alter disturbance regimes significantly from their natural or historic range of disturbances. Dominant shrubs persist after invasion by non-native annuals, but other shrubs and desirable grasses may be unsuccessful competing with the non-natives. Introduced annuals such as red brome, schismus and redstem stork's bill have invaded the reference plant community and have become a dominant component of the herbaceous cover. This invasion of non-natives is attributed to a combination of factors including: 1) surface disturbances, 2) changes in the kinds of animals and their grazing patterns, 3) drought, and 4) changes in fire history. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent.

Community 2.1
Plant Community Phase 2.1

This plant community is compositionally similar to the Reference Plant community with non-natives in the understory. At this time, ecological processes have not been affected by the presence of non-natives, however, the resiliency of the state has been reduced. Dominant shrubs persist through invasion by non-natives, but other shrubs and desirable grasses may be unsuccessful in competing with the non-natives.

Community 2.2
Plant Community Phase 2.2

This plant community is characterized by the dominance of non-native annuals. Native shrubs will persist through the invasion but will experience reduced vigor and decreased recruitment. This plant community is identified as “at-risk”. The decreased native perennial vegetation and dominance by non-native annuals reduces the soil stability and leaves the site vulnerable to erosion from wind and water.

Pathway 2.1a
Community 2.1 to 2.2

Localized disturbance will change the relative abundance of native shrubs and non-native annuals.

Pathway 2.2a
Community 2.2 to 2.1

With time and the absence of disturbance native shrubs begin to reestablish from seed provided by an offsite source.

State 3
Eroded State

The Eroded State is characterized by increased erosion and the presence of rills and gullies. An abiotic threshold has been crossed, resulting from slow variables including reduced infiltration, low shrub recruitment rates and long-term loss of deep-rooted perennial grasses.

Community 3.1
Plant Community Phase 3.1

This plant community is characterized by the loss of perennial vegetation, soil and soil nutrients are being relocated down slope. All ecological processes have been significantly altered including infiltration and nutrient cycling.

Transition 1
State 1 to 2

Introduction of non-native species due to anthropogenic impacts including OHV use, dry land farming, grazing,

linear corridors, mining, military operations, and settlements.

Transition 2
State 2 to 3

Large scale disturbances remove native perennial vegetation. Increasing the amount of bare ground, leading to higher levels water erosion, decrease soil infiltration rates, and loosening of the soil surface causing channeling.

Restoration pathway 3
State 3 to 2

Restoration pathway. Possible restoration techniques, to stabilize the site and reestablish native perennials, include flattening and terracing hill slopes, closing roads, vertical, horizontal and rock mulching, as well as, planting container stock.

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**			160–265	
	big galleta	PLRI3	*Pleuraphis rigida*	150–225	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	10–40	–
2	**Secondary Perennial Grasses**			10–40	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	3–15	–
	threeawn	ARIST	*Aristida*	3–15	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	3–15	–
3	**Annual Grasses**			1–15	
Forb					
4	**Perennial forbs**			1–40	
	Mojave sandwort	ARMA3	*Arenaria macradenia*	3–10	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	3–10	–
5	**Annual forbs**			1–75	
Shrub/Vine					
6	**Primary shrubs**			130–315	
	burrobush	AMDU2	*Ambrosia dumosa*	75–125	–
	creosote bush	LATR2	*Larrea tridentata*	25–75	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	10–50	–
	water jacket	LYAN	*Lycium andersonii*	10–40	–
7	**Secondary shrubs**			25–75	
	Fremont's chaffbush	AMFR2	*Amphipappus fremontii*	5–15	–
	cottontop cactus	ECPO2	*Echinocactus polycephalus*	5–15	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	5–15	–
	mormon tea	EPVI	*Ephedra viridis*	5–15	–
	Utah mortonia	MOUT	*Mortonia utahensis*	5–15	–
	Fremont's dalea	PSFR	*Psorothamnus fremontii*	5–15	–
	woody crinklemat	TICA3	*Tiquilia canescens*	5–15	–
	Mojave woodyaster	XYTO2	*Xylorhiza tortifolia*	5–15	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production, steep slopes and stony surfaces. Big galleta is considered a valuable forage plant for cattle and domestic sheep. Its coarse, rigid culms make it relatively resistant to heavy grazing and trampling. Desert needlegrass produces considerable basal foliage and is good forage while young. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses and cattle but rarely grazed by sheep. White bursage is of intermediate forage value. It is fair to good forage for horses and fair to poor for cattle and sheep. However, because there is often little other forage where white bursage grows, it is often highly valuable to browsing animals and is sensitive to browsing. Creosotebush is unpalatable to livestock. Consumption of creosotebush may be fatal to sheep. Winterfat is an important forage plant for livestock in salt-desert shrub rangeland and subalkaline flats. Winterfat palatability is rated as good for sheep, good to fair for horses, and fair for cattle. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Grazing season has more influence on winterfat than grazing intensity. Early winter grazing may actually be beneficial. Anderson wolfberry is sometimes used as forage by livestock and feral burros. Range ratany is an important forage species for all classes of livestock. Palatability of range ratany is rated fair to good for cattle and sheep.

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:
White bursage is an important browse species for wildlife. Creosotebush is unpalatable to most browsing wildlife. Winterfat is an important forage plant for wildlife in salt-desert shrub rangeland and subalkaline flats. Animals that browse winterfat include mule deer, Rocky Mountain elk, desert bighorn sheep, and pronghorn antelope. Range ratany is an important forage species for deer. Mule deer browse range ratany year-long with seasonal peaks. Mule deer peak use is from February to April and from August to October. Desert bighorn sheep and feral horses and burros will graze desert needlegrass.

Hydrological functions

Available water capacity is very low and permeability is moderately rapid.

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

White bursage is a host for sandfood, a parasitic plant. Sandfood was a valuable food supply for Native Americans. Creosotebush has been highly valued for its medicinal properties by Native Americans. It has been used to treat at least 14 illnesses. Twigs and leaves may be boiled as tea, steamed, pounded into a powder, pressed into a poultice, or heated into an infusion. Native Americans used the fleshy berries of Anderson wolfberry either fresh or boiled and then dried them for later use. The Papago Indians used an infusion of the twigs externally for treating sore eyes and internally for dysentery. The roots provided them with a red dye for wool and other materials. The dye was also used as an ink.

Other information

Big galleta's clumped growth form stabilizes blowing sand. Desert needlegrass may be used for groundcover in areas of light disturbance, but it is susceptible to excessive trampling. White bursage may be used to revegetate disturbed sites in southwestern deserts. Once established, creosotebush may improve sites for annuals that grow under its canopy by trapping fine soil, organic matter, and symbiont propagules. It may also increase water infiltration and storage. Anderson wolfberry is also used as an ornamental valued chiefly for its showy red berries.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T19S R66E S17
General legal description	On Bitter Ridge, three miles east of Muddy Peak, Clark County, Nevada.

Other references

Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/plants/).

Hamerlynck, E.P. and J.R. McAuliffe. 2008. Soil-dependent canopy die-back and plant mortality in two Mojave Desert shrubs. J. of Arid Environments. 72:1793-1802.

USDA-NRCS Plants Database (Online; http://www.plants.usda.gov).

Contributors

PN-E/GKB

Approval

Sarah Quistberg, 2/26/2025

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)	P Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	07/19/2010
Approved by	Sarah Quistberg
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.

2. **Presence of water flow patterns:** Water flow patterns are none to rare. Rock fragments armor the surface.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 5-10%.

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during catastrophic 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 1 to 4 on most soil textures found on this site. (To be field tested.)

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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 weak medium to moderate thin platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface horizon is typically less than 1 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shrub canopy and associated litter break raindrop impact.

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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 not typical. Subsoil calcic horizons are not to be interpreted as compacted.

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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: deep-rooted, warm-season, bunchgrasses >> Mojave Desert shrubs

    Sub-dominant: deep-rooted, cool-season, bunchgrasses > perennial forbs > annual forbs > annual grasses

    Other:

    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 common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<10%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces up to 15%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season ± 500 lbs/ac.

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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:** Red brome, red-stem filaree and Mediterranean grass are invaders on this site.

17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years.