USDA Natural Resources
Conservation Service

Ecological site R030XB017NV
LIMY HILL 3-5 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 occurs on hills, mountains, fan remnants, ballenas, and rock pediments. Slopes range from 8 to 50 percent, but slope gradients of 15 to 30 percent are most typical. Elevations are 1000 to 4400 feet. The soils associated with this site are shallow and are formed from a variety of parent materials.

This site is part of group concept R030XB139CA.

Associated sites

R030XB077NV	**STEEP SOUTH SLOPE**
R030XB001NV	**LIMY HILL 5-7 P.Z.**
R030XB005NV	**Arid Active Alluvial Fans**
R030XB019NV	**Eroded Fan Remnant Pavette 4-6 P.Z.**

Similar sites

R030XB001NV	**LIMY HILL 5-7 P.Z.** More productive site; AMDU2 dominant shrub
R030XB078NV	**BARREN HILL 3-5 P.Z.** AMDU2 absent to rare
R030XB084NV	**ERODED SLOPE** Not a stable plant community; vegetation constantly shifting with sloughing of surface soil/gravels
R030XY092NV	**DESERT PATINA** Occurs on flat summits of erosional fan remnants
R030XB005NV	**Arid Active Alluvial Fans** AMDU2-LATR2 codominant; not on hill landform; more productive site

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata*
Herbaceous	(1) *Dasyochloa pulchella*

Physiographic features

This site occurs on hills, mountains, fan remnants, ballenas, and rock pediments. Slopes range from 8 to 50 percent, but slope gradients of 15 to 30 percent are most typical. Elevations are 1000 to 4400 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Fan remnant (3) Mountain
Elevation	1,000–4,400 ft
Slope	8–50%
Aspect	Aspect is not a significant factor

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 3 to 5 inches. Mean annual air temperature is 65 to 76 degrees F. The average growing season is about 270 to 360 days.

Table 3. Representative climatic features

Frost-free period (average)	360 days
Freeze-free period (average)	
Precipitation total (average)	5 in

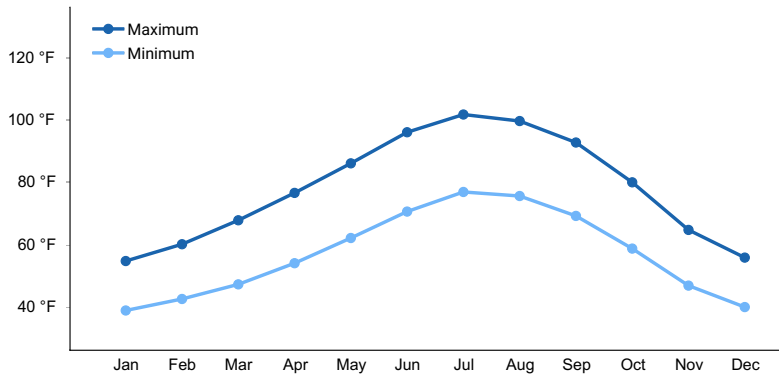


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are shallow and are formed from a variety of parent materials. Textures are sandy loams to stony loams. The water intake rate is slow to moderately rapid and available water capacity is very low to low. Runoff is low to very high and soils are well to somewhat excessively drained. The soil series associated with this site are Baseline, Callville, Cheme, Gypwash, Haleburu, Heleweiser, Huevi, St. Thomas, Sunrock, and Tencee.

Table 4. Representative soil features

Surface texture	(1) Extremely gravelly fine sandy loam (2) Very gravelly sandy loam (3) Gravelly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained

Permeability class	Slow to moderately rapid
Soil depth	10–20 in
Surface fragment cover <=3"	15–60%
Surface fragment cover >3"	2–40%
Available water capacity (0-40in)	0.6–3 in
Calcium carbonate equivalent (0-40in)	0–40%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–30
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	4–75%
Subsurface fragment volume >3" (Depth not specified)	0–50%

Ecological dynamics

Creosotebush scrub is a long lived, stable plant community that rarely varies in annual production. Variation in yearly production can be largely attributed to annual species. Nutrient concentrations in this shrub community are spatially variable. Nutrient resources are concentrated under shrub canopy relative to the interspaces, called islands of fertility (Kieft et al. 1998). The frost-free season can last 360 days; however, vegetation is limited by nutrient availability. Limy soils found within these ecological sites generally have low organic matter, moderate alkalinity and a coarse texture.

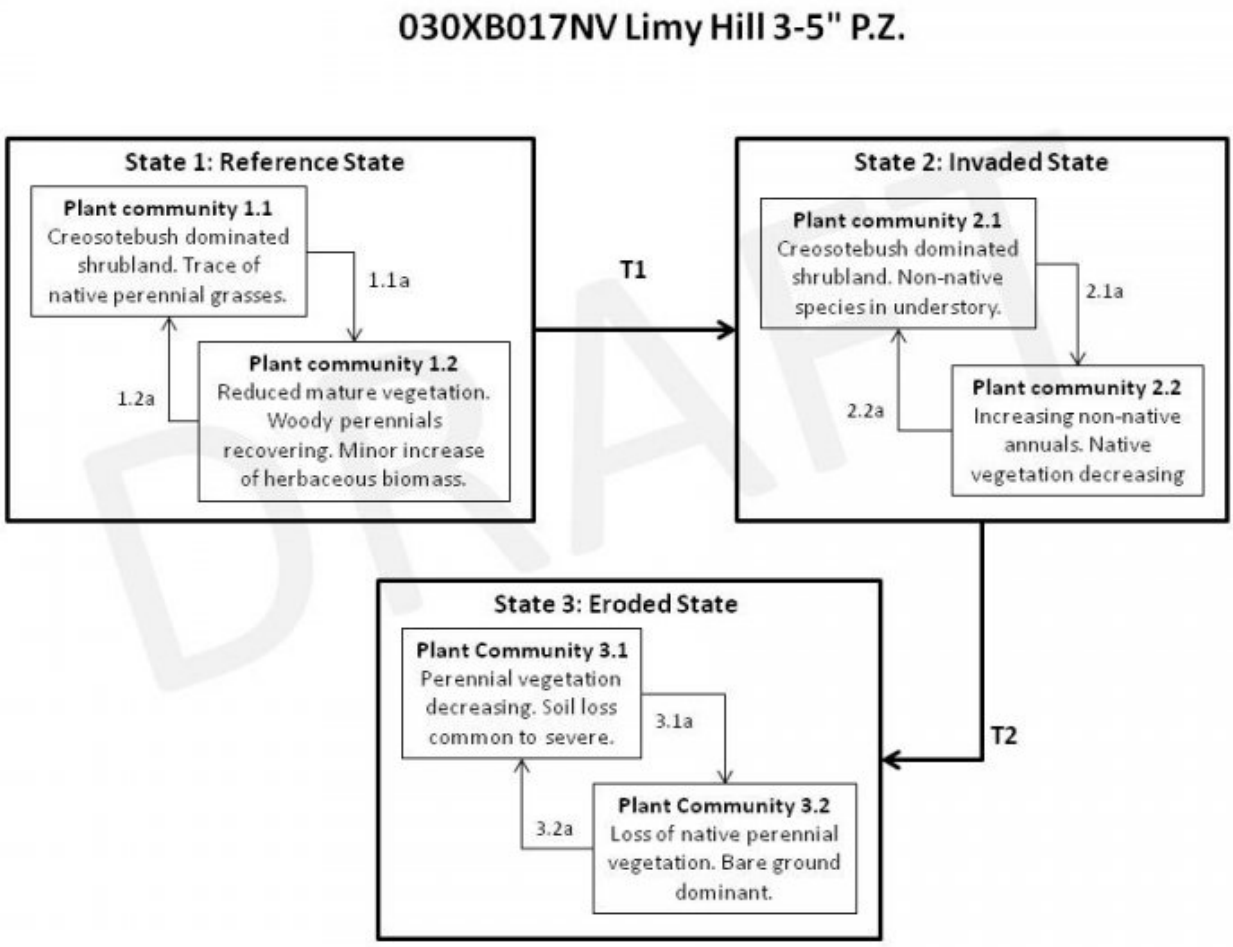
At a landscape scale, topography in the mountains and hills is the major factor modifying the distribution of insolation. Variability in elevation, surface orientation (steep slope and southerly aspect), and shadows cast by topographic features create strong local gradients of insolation. This leads to high spatial and temporal heterogeneity in local energy and water balance, which determines micro environmental factors such as air and soil temperature regimes, evapotranspiration, soil moisture, and light available for photosynthesis.

Creosotebush, a long-lived sclerophyllous evergreen shrub, generally performs best in weakly developed soils of relatively young deposits. This observation is largely a function of the hydrological behavior of the soil (Hamerlynck et al. 2002). In poorly developed, coarse textured soils water can infiltrate and be stored deep in the soil profile. This allows deep rooted shrubs like creosotebush to extract water throughout the growing season as the upper soil profile becomes extremely dry. However, because creosotebush is dependent on soil moisture being available throughout the year it lacks the ability to become dormant during extended periods of drought (Hamerlynck et al. 2002). Extended periods of drought can cause entire branches or whole plants to die. In addition to having well developed root systems, creosotebush also experiences hydraulic lift. Hydraulic lift occurs when plants absorb water from deep in the profile and transfers this moisture to the shallow roots in the dry topsoil (Yoder and Nowak 1999). This process occurs when stomata are closed and plants are not experiencing transpiration. Once the water is available to the shallow roots it remains there until stomata open and plant begins to transpire.

Fire Ecology:
Historically, fires are rare on these sites and therefore have long-term impacts on the structure and composition of the community (Brown and Minnich 2006). This site is most susceptible to fire following years of heavy precipitation that contribute to increased annual biomass. Disturbances resulting in the loss of native vegetation can be followed by invasion of non-native annual forbs and grasses. However, the creosotebush dominated ecotone has a low potential of conversion to an annual grassland. Creosotebush has limited resprouting after fire and is usually severely scorched and experiences high rates of mortality. Creosotebush has higher chances of survival in more water limiting environments, due to the lack of fine fuels in the understory (Brooks and Minnich 2006). White

bursage, however, can rapidly re-establish from off-site seed. Fluffgrass is reported to have greater cover on recently burned sites, than unburned sites (Abella et al. 2009). Damage to big galleta from fire varies. 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.

State and transition model



State 1
Reference State

The reference state is representative of 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 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

The reference plant community is dominated by creosotebush. White bursage is an important but relatively minor species. Potential native vegetative composition is about 10 percent grasses, 5 percent perennial and annual forbs and 85 percent shrubs. Approximate ground cover (basal and crown) is less than 7 percent. This plant community is stable and long-lived under natural conditions.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	22	64	107
Grass/Grasslike	2	7	12
Forb	1	4	6
Total	**25**	**75**	**125**

Community 1.2
Plant Community 1.2

This plant community is characteristic of a post disturbance plant community. Herbaceous biomass may initially increase, disturbance primarily removes mature woody vegetation. Sprouting shrubs quickly recover and provide favorable sites for the establishment of shrub seedlings. Post-disturbance plant community composition may vary depending on season of disturbance. This plant community is ‘at-risk’ of invasion by non-native species. Non-natives are able to take advantage of increased availability of critical resources following disturbance.

Pathway 1.1a
Community 1.1 to 1.2

Prolonged drought, insect attack, low intensity, patchy wildfire or other localized disturbance.

Pathway 1.2a
Community 1.2 to 1.1

Absence from disturbance and natural regeneration over time

State 2
Invaded

The invaded state is characterized by the presence of non-native species. A biotic threshold is crossed with the introduction of non-native annuals that are difficult to remove from the system and have the potential to alter disturbance regimes significantly from their historic range of variability. Theses non-native annuals are highly flammable and promote wildfire where fires historically have been infrequent.

Community 2.1
Plant Community Phase 2.1

This plant community is characterized by the presence of non-native species. Species composition and ecological function is similar to the reference plant community. However, ecological resilience is reduced by the presence of non-natives. This plant community will respond differently following disturbance, when compared to non-invaded plant communities.

Community 2.2
Plant Community 2.2

This plant community is characterized by the reduction of native perennials and an increase of non-native annuals. Native shrubs persist through the invasion but experience reduced vigor and seedling 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

Prolonged drought, wildfire, insect/disease attack or other localized disturbance.

Pathway 2.2a
Community 2.2 to 2.1

Absence from disturbance and natural regeneration over time. Non-natives persist in the plant community.

State 3
Eroded State

The eroded state is characterized by reduced cover of perennial vegetation. Increased cover of bare ground, results in higher levels of water erosion and decreased infiltration rates. Feedbacks keeping this state stable include reduced perennial vegetative cover causing increased runoff, decreased infiltration and reduced run-on moisture preventing establishment of desirable perennial vegetation. An abiotic threshold has been crossed preventing the natural repair of this plant community.

Community 3.1
Plant Community Phase 3.1

This plant community is characterized by decreased perennial native vegetation and increased soil erosion. Patches of vegetation increase water storage capacity and increase organic carbon and nutrient inputs. The loss of patches of vegetation negatively affects soil hydrology, nutrient cycling and vegetation establishment. Careful management is needed to ensure further degradation and loss of ecosystem function.

Community 3.2
Plant Community 3.2

This plant community is characterized by the total loss of perennial vegetation. Soil and soil nutrients are being relocated down slope. All ecological processes have been significantly altered, even truncated in some cases. Non-native annuals persist in the plant community.

Pathway 3.1a
Community 3.1 to 3.2

Prolonged surface disturbance, prolonged drought or both.

Pathway 3.2a
Community 3.2 to 3.1

Changes in management and/or periods of favorable climatic conditions allow for natural regeneration over time.

Transition T1
State 1 to 2

Introduction of non-native species due to a combination of factors including: 1) surface disturbance, 2) changes in the kinds of animals and their grazing patterns, 3) drought and/or 4) changes in fire history.

Transition T2
State 2 to 3

Large scale disturbance removes native perennial vegetation. Triggers include intense rainfall events causing heavy overland flow and soil relocation.

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**			1–4	
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–4	–
2	**Secondary Perennial Grasses**			1–4	
	threeawn	ARIST	*Aristida*	0–2	–
	big galleta	PLRI3	*Pleuraphis rigida*	0–2	–
3	**Annual Grasses**			1–4	
Forb					
4	**Perennial Forbs**			1–4	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	0–2	–
5	**Annual Forbs**			1–8	
	plantain	PLANT	*Plantago*	0–2	–
Shrub/Vine					
6	**Primary Shrubs**			57–79	
	creosote bush	LATR2	*Larrea tridentata*	55–68	–
	burrobush	AMDU2	*Ambrosia dumosa*	2–11	–
7	**Secondary Shrubs**			2–8	

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, because of low forage production, steep slopes and stony surfaces. 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.

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.

Hydrological functions

Runoff is low to very high. Water flow patterns are none to few. Rock fragments armor the soils preventing water flow patterns from developing. Pedestals are none. Sparse shrub canopy and associated litter break raindrop impact and aid in infiltration.

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 for photographers and for nature study.

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.

Other information

Cresosotebush and white bursage may be used to revegetate disturbed sites in southwestern deserts. Once established, these species may improve sites for annuals and other perennials that grow under their canopies by trapping fine soil, organic matter, and symbiont propagules. Water infiltration and storage may also increase.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T24S R63E S34
General legal description	Low hill just south of intersection of US Highway 95 and Nevada Highway 165 (Nelson Road), east side of US Highway 95, Eldorado Valley area, Clark County, Nevada.

Other references

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Contributors

DMP/GKB

Approval

Kendra Moseley, 2/18/2025

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	07/14/2009
Approved by	Kendra Moseley
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 soil surface against erosion.

2. **Presence of water flow patterns:** Water flow patterns are none to few. Rock fragments armor the soils preventing water flow patterns from developing.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is variable (15-40%) depending on surface rock fragments.

5. **Number of gullies and erosion associated with gullies:** Gullies are rare to none. Natural drainages may be observed on steeper side slopes.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Litter typically remains in place. Fine litter (foliage from grasses and annual & perennial forbs) may 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.

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 and varies depending on canopy cover.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically medium to thick platy or weak fine granular. Soil surface colors are light and the soils have an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 1 percent.

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 break raindrop impact.

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

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live**

foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):

Dominant: Reference Plant Community: Long-lived shrubs: creosotebush, white bursage (by above ground production) and associated shrubs >

Sub-dominant: warm-season perennial grasses > perennial and 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 are common and standing dead shrub canopy material may be as much as 25% of total woody canopy.

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14. **Average percent litter cover (%) and depth (in):** Litter is concentrated under shrubs and generally stays in place.

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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 ~75lbs/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, mustards, and Mediterranean grass are invaders on this site.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in normal and above-normal rainfall years.
