USDA Natural Resources
Conservation Service

Ecological site R030XB111NV
GRAVELLY 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 occurs on mountain sideslopes, primarily on the south and west exposures. Slopes range from 15 to over 75 percent, but slope gradients of 30 to 50 are typical. Elevations are 1800 to 4500 feet. The soils are shallow to very shallow and well drained. They are formed in residuum and colluvium derived from limestone and dolomite.

Please refer to group concept R030XB123NV to view the provisional STM.

Associated sites

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

Similar sites

R030XB101NV	**TABLELAND 5-7 P.Z.** More productive site; slopes less than 4 percent
R030XB123NV	**LIMESTONE SLOPE 5-7 P.Z.** PLRI3 dominant plant; MOUT minor shrub; more productive site
R030XB106NV	**GRAVELLY SLOPE 5-7 P.Z.** PLRI3 dominant plant; ATCO dominant shrub; more productive site
R030XB105NV	**BOULDERY LIMESTONE SLOPE 5-7 P.Z.** KRLA2-MOUT codominant shrubs; more productive site

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Ambrosia dumosa* (2) *Mortonia utahensis*
Herbaceous	Not specified

Physiographic features

This site occurs on mountain sideslopes, primarily on the south and west exposures. Slopes range from 15 to over 75 percent, but slope gradients of 30 to 50 are typical. Elevations are 1800 to 4500 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Elevation	549–1,372 m
Slope	15–75%

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 65 degrees F. The average growing season is about 180 to 270 days.

Table 3. Representative climatic features

Frost-free period (average)	270 days
Freeze-free period (average)	
Precipitation total (average)	178 mm

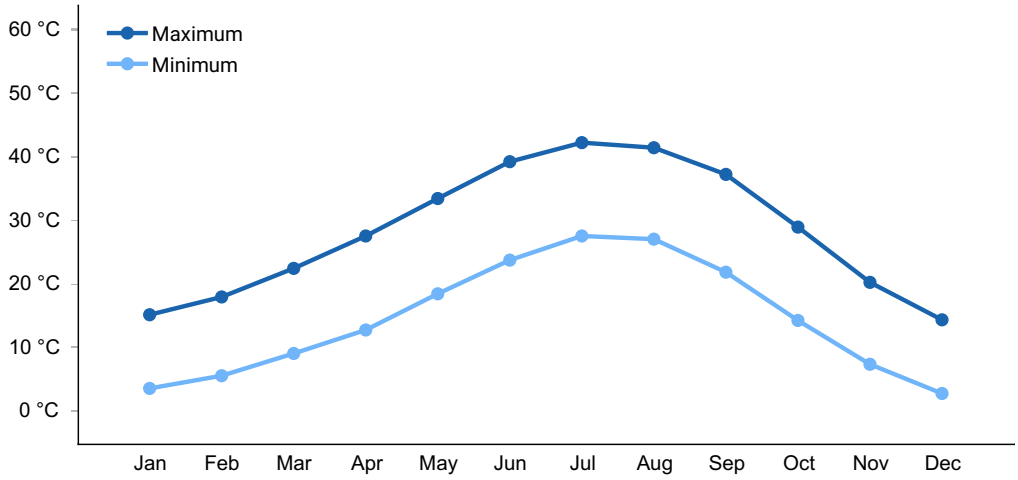


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

Please refer to group concept R030XB123NV to view the provisional STM.

The soils are shallow to very shallow and well drained. They are formed in residuum and colluvium derived from limestone and dolomite. The soil associated with this site have a high amount of stones, cobbles and gravels on the surface and in profile. The soils are strongly to moderately alkaline. Soil series associated with this site include St. Thomas.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone (2) Colluvium–dolomite
Surface texture	(1) Very cobbly fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	10–36 cm
Surface fragment cover <=3"	15–70%
Surface fragment cover >3"	5–25%
Available water capacity (0-101.6cm)	1.02–1.27 cm
Calcium carbonate equivalent (0-101.6cm)	25–40%

Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1–5
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	20–24%
Subsurface fragment volume >3" (Depth not specified)	25–30%

Ecological dynamics

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.

Destructive impacts such as land clearing can reduce long-lived creosotebush. The opportunistic perennials such as rayless goldenhead, white burrobush, and wire lettuce will increase. With a loss of perennial cover, non-native annual grasses and forbs such as red brome, Mediterranean grass, and redstem stork's bill will readily invade this site

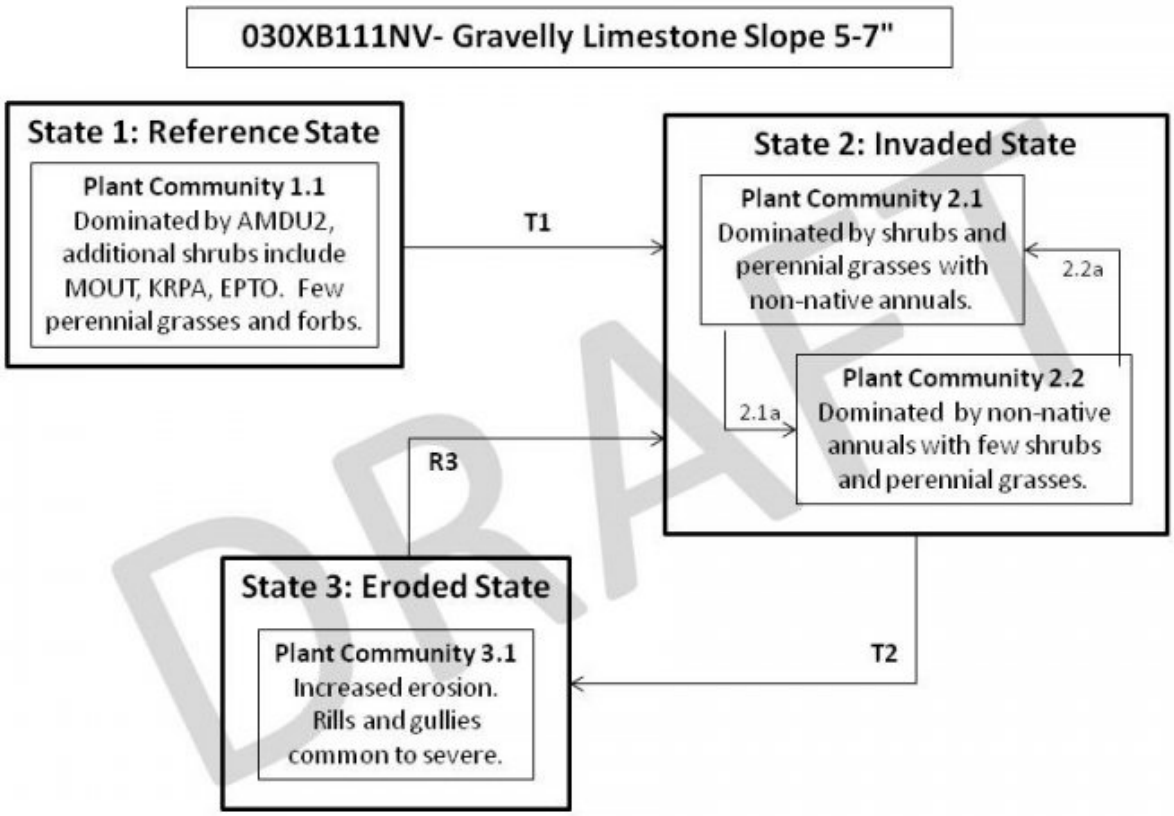
This ecological site is very sparsely vegetated with only about 10-20 percent canopy cover, making the spread of wildfire unlikely. Due to the lack of available fuels a low intensity fire is the most likely, which would result in minimum plant mortality with several species resprouting from the surviving root crown. Presettlement fire regimes in Mojave Desert shrub communities are characterized by relatively infrequent, stand-replacement fires with return intervals in the range of 35 years to several centuries.

Fire generally kills white bursage. However, most white bursage plants burned because their canopies contained numerous small branches in proximity to herbaceous fuels. Range ratany is top-killed by fire. Range ratany resprouts from the root crown after fire. Torrey’s ephedra has medium fire tolerance and is similar to Nevada ephedra.

Post fire there will be a decrease in creosotebush while species such as white bursage, ephedra, and broom snakeweed (*Gutierrezia sarothrae*) will increase in abundance. Frequent repeated fire is unlikely on this ecological site, due to the lack of a continuous fuel load. However, years of exceptionally heavy winter rains can generate fuels by producing a heavy stand of annual forbs and grasses. When fires do occur, the effect on the ecosystem may be extreme due to the harsh environment and the slow rate of recovery. This site is highly susceptible increased erosion resulting from heavy

anthropogenic use. Continued and severe disturbance will result in decreased vegetative cover and increased soil compaction. Ecological process including infiltration and nutrient cycling will be negatively affected.

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

The reference plant community is dominated by white bursage and Utah mortonia. Torrey's ephedra and range ratany are important species associated with this site.

Potential vegetative composition is about 5% grasses, 5% annual and perennial forbs, and 90% shrubs. Approximate ground cover (basal and crown) is 2 to 6 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	50	101	202
Grass/Grasslike	3	6	11
Forb	2	6	11
Total	**55**	**113**	**224**

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. 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. AMDU and MOUT shrubs persist after invasion by non-native annuals, but other shrubs and desirable grasses may be unsuccessful competing with the non-natives.

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.

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 (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Perennial Grasses**			1–9	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	1–3	–
	threeawn	ARIST	*Aristida*	1–3	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1–3	–
	big galleta	PLRI3	*Pleuraphis rigida*	1–3	–
2	**Annual Grasses**			1–6	
Forb					
3	**Perennial Forbs**			1–6	
4	**Annual Forbs**			1–6	
Shrub/Vine					
5	**Primary Shrubs**			78–118	
	burrobush	AMDU2	*Ambrosia dumosa*	39–50	–
	Utah mortonia	MOUT	*Mortonia utahensis*	22–34	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	6–17	–
6	**Secondary Shrubs**			6–17	
	catclaw acacia	ACGR	*Acacia greggii*	1–6	–
	brittlebush	ENFA	*Encelia farinosa*	1–6	–
	ocotillo	FOSP2	*Fouquieria splendens*	1–6	–
	creosote bush	LATR2	*Larrea tridentata*	1–6	–
	Schott's pygmycedar	PESC4	*Peucephyllum schottii*	1–6	–
	woody crinklemat	TICA3	*Tiquilia canescens*	1–6	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the 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. 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. Torrey's ephedra is important winter forage for cattle and sheep. Torrey's ephedra is moderately palatable to all domestic livestock especially as winter browse.

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. 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. Torrey's ephedra is an important browse species for big game. Torrey's ephedra is moderately palatable to many big game species, especially as winter browse.

Hydrological functions

Runoff is very high 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. 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

White bursage may be used to revegetate disturbed sites in southwestern deserts.

Type locality

Location 1: Clark County, NV	
Latitude	36° 7′ 40″
Longitude	114° 3′ 33″
General legal description	About 1.5 miles northeast of Devil's Cove. Lake Mead National Recreation Area, Clark County, Nevada. W Longitude 114º03’33” N Latitude 36º07’40”

Other references

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.

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

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

Contributors

CJT

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	07/16/2010
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 soil surface.

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2. **Presence of water flow patterns:** Water flow patterns none to rare.

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

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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 20%; surface rock fragments to 70%; shrub canopy 6%.

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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

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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 distance of slope length during intense summer storms. Persistent litter (large woody material) will remain in place except during catastrophic 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 1 to 4 on the sandy 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 platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically less than 1 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants slow runoff and increase infiltration. 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

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: Mojave Desert shrubs

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

    Other:

    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; some of the mature bunchgrasses (<20%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (5%) and depth of litter is <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 ±100 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:** Invaders on this site include Mediterranean grass, red brome, and filaree.

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