USDA Natural Resources
Conservation Service

Ecological site R030XA053NV
CALCAREOUS LOAM 3-5 P.Z.

Last updated: 2/18/2025
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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 fan remnants, alluvial flats and lake terraces. Slopes range from 0 to 15 percent. Elevations are 2400 to about 3200 feet. The soils of this site are moderately deep to deep, well drained, and have formed in alluvium from mixed sources.

This site is part of group concept R030XB006NV.

Similar sites

R030XA051NV	**COBBLY CLAYPAN 5-7 P.Z.** MESP2 & AMDU2 major shrubs
R030XA050NV	**LOAMY 3-5 P.Z.** LATR2 minor shrub, if present
R030XA066NV	**CALCAREOUS LOAM 5-7 P.Z.** AMDU2-ATCO codominant shrubs
R030XA061NV	**LOAMY 5-7 P.Z.** Greater shrub diversity
R030XA056NV	**LOAMY HILL 3-5 P.Z.** On hill landscapes; soils not alluvial
R030XA044NV	**LOAMY HILL 5-7 P.Z.** On hill landscapes; soils not alluvial; LYAN & EPHED major shrubs
R030XA068NV	**CALCAREOUS HILL 5-7 P.Z.** On hill landscapes; soils not alluvial

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Larrea tridentata* (2) *Atriplex confertifolia*
Herbaceous	Not specified

Physiographic features

This site occurs on fan remnants, alluvial flats and lake terraces. Slopes range from 0 to 15 percent. Elevations are 2400 to about 3200 feet.

Table 2. Representative physiographic features

Landforms	(1) Alluvial flat (2) Lake terrace (3) Fan remnant
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	Very rare to rare
Ponding frequency	None
Elevation	732–975 m
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate is hot and arid, with mild winters and very hot summers. Precipitation is greatest in the winter with a lesser secondary peak in summer, typical of the Mojave Desert. Average annual precipitation is 3 to about 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)	127 mm

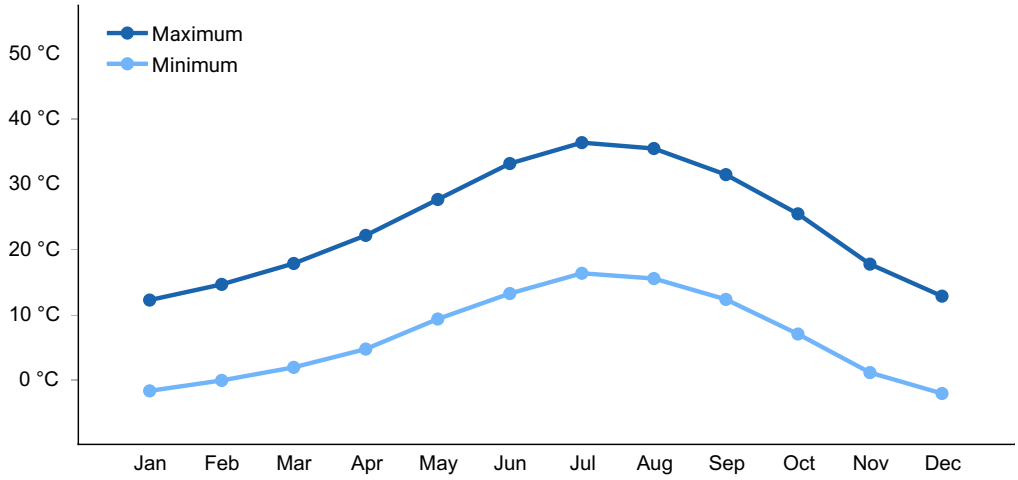


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils of this site are moderately deep to deep, well drained, and have formed in alluvium from mixed sources. Runoff is low, available water capacity is moderate and water intake rates are moderately slow. These soils are characterized by an orhric epipedon from 0 to 5 cm and a calcic horizon from 5 to 107 cm. Reaction is moderately alkaline to very strongly alkaline. The soils have a typic-aridic soil moisture regime. Soil series correlated to this site include Pahrump, a loamy-skeletal, carbonatic, thermic Petronodic Haplocalcid.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone
Surface texture	(1) Gravelly loam (2) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	183–213 cm
Surface fragment cover <=3"	30–45%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.21–18.26 cm

Calcium carbonate equivalent (0-101.6cm)	30–45%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–30
Soil reaction (1:1 water) (0-101.6cm)	8.8–9.4
Subsurface fragment volume <=3" (Depth not specified)	35–60%
Subsurface fragment volume >3" (Depth not specified)	0%

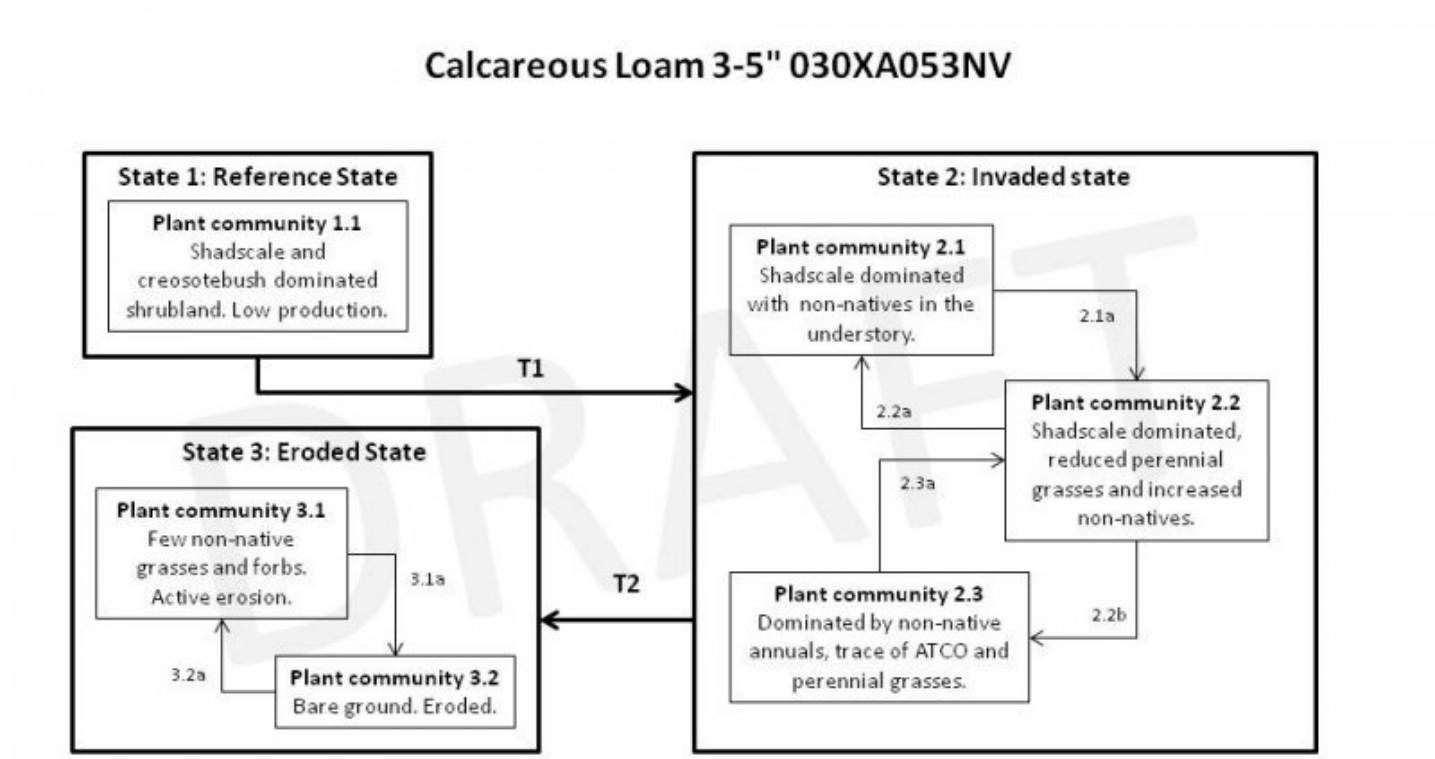
Ecological dynamics

The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns. Community phase changes are primarily driven by long term drought. Historically wildfire was infrequent and patchy, due to widely spaced vegetation and low herbaceous production. Nutrient concentrations in this shrub community are spatially variable. Nutrients resources are concentrated under shrubby canopies, relative to the interspaces and are called islands of fertility (Kieft et al 1998). Creosotebush is a long-lived sclerophyllous shrub, capable of reproducing both vegetatively and sexually. It performs best in weakly developed soils, where water can infiltrate and be stored deep in the profile. Creosotebush has a deep tap-root that allows it to extract water throughout the growing season as the upper soil profile drys out. Shadscale is a partially deciduous, short lived shrub, and is tolerant of alkaline conditions and relatively high pH. Reproduction occurs solely through seed and prolonged drought can result in high mortality of shadscale. Germination can be reduced if salt concentrations become too high. Periods of greater than normal precipitation can also lead to increased mortality. Long periods of high soil moisture leave shadscale susceptible to parasites and diseases.
The spatial distribution of vegetation on this site impacts runoff, infiltration, sediment redistribution and nutrient cycling. Patches of vegetation increase fine sediment deposition and reduce runoff producing positive feedback dynamics in the plant community. Shrub canopies shield the soil from radiation and rainfall (Puigdefabregas 2005). Shrubs partition the rainfall into interception, throughfall and stem flow. Interception diminishes net rainfall, while stemflow concentrates the water and results in deeper infiltration (Puigdefabregas 2005).

Fire Ecology:
The historic mean fire return interval for shadscale communities ranges from 35 to 100 years. Shadscale communities are usually unaffected by fire because of low fuel loads, although a year of exceptionally heavy winter rains can generate fuels by producing a

heavy stand of annual forbs and grasses. Increased presence of non-native annual grasses, such as red brome, can alter fire regimes by increasing fire frequency under wet to near-normal summer moisture conditions. Shadscale is fire intolerant and it does not readily recover from fire, except from establishment through seed. 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. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. 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

The reference state is representative of the natural range of variability under pristine conditions. The plant community is shrub dominated with a minor component of perennial grasses. Plant community dynamics are primarily driven by long-term drought, insect

outbreaks, and infrequent wildfire. Historically, this state experienced an extended fire return interval due to low fuel loading, which resulted in long-lived stable shadscale plant communities.

Community 1.1
Reference Plant Community

The reference plant community is dominated by shadscale and creosotebush. Potential vegetative composition is about 10 percent grasses, 5 percent forbs and 85 percent shrubs. Approximate ground cover (basal and crown) is 3 to 7 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	48	95	191
Grass/Grasslike	6	11	22
Forb	2	6	11
Total	**56**	**112**	**224**

State 2
Invaded State

The invaded state is characterized by the presence of non-native annuals in the understory. Plant communities in this state function very similarly to the reference state, however, ecological resilience is reduced by the presence of the non-natives. Introduced annuals such as red brome, Mediterranean grass and redstem filaree have invaded the reference plant community and have become a component of the herbaceous cover. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent. Mature shadscale persists after this invasion by non-native annuals, however shrubs seedling and desirable grasses suffer reduced vigor and limited reproductive capability due to increased competition from non-natives. A threshold is crossed with the introduction of non-native annuals that cannot be easily removed from the system. Non-natives can alter disturbance regimes significantly from their natural or historic range and change ecological processes.

Community 2.1
Invaded Plant Community 2.1

This plant community is similar to the reference plant community with a trace of non-natives in the understory. Ecological function has been not compromised at this time. Ecological resilience is reduced by the presence of non-native species and this plant community phase will respond differently following a disturbance when compared to non-invaded plant communities.

Community 2.2
Invaded Plant Community 2.2

This plant community is characteristic of a post-disturbance plant community. It is initially dominated by herbaceous vegetation, which may or may not be non-native, woody perennials are increasing. Sprouting shrubs quickly recover and provide favorable microsites for the establishment of shrubs seedlings.

Community 2.3
Invaded Plant Community 2.3

This plant community is characterized by a short disturbance return interval. Non-native annuals take advantage of the increased availability of resources. This plant community is identified as “at risk”. The loss of vegetative cover has reduced the ecological resistance and resilience. Management should be focused on limiting disturbances and protecting remnants of mature vegetation to ensure a seed source is available in the future.

Pathway 2.1a
Community 2.1 to 2.2

Wildfire, disease, prolonged drought and/or insect attack.

Pathway 2.2a
Community 2.2 to 2.1

Absence from disturbance and natural regeneration over time.

Pathway 2.2b
Community 2.2 to 2.3

Frequent and repeated surface disturbances, wildfire, disease and/or insect attack.

Pathway 2.3a
Community 2.3 to 2.2

Absence from disturbance and natural regeneration over time.

State 3
Eroded State

The eroded state is characterized by a loss of perennial of vegetation and reduced soil stabilization. The loss of vegetation has reduced ecological resilience. Feedbacks keeping this state stable include reduced infiltration and increased runoff during precipitation events. This contributes to reduced soil moisture and prevents establishment of native

perennial vegetation.

Community 3.1
Eroded Plant Community 3.1

This plant community phase is dominated by non-native annuals. Soil stability is severely reduced and active erosion easily occurs, even during typical rainfall events. Ecological processes such as nutrient cycling and infiltration have been reduced.

Community 3.2
Eroded Plant Community 3.2

This plant community is characterized by a total loss of vegetation and soil crust. Ecological processes including, nutrient cycling, infiltration and vegetation establishment, have been greatly altered.

Pathway 3.1a
Community 3.1 to 3.2

Continued disturbance or large rainfall events increase the amount of erosion.

Pathway 3.2a
Community 3.2 to 3.1

Non-native annuals germinate and establish even on a severely eroded site.

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

Repeated disturbance, including wildfire, removes perennial vegetation and decreases soil stability.

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**			4–11	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–6	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	2–6	–
2	**Secondary Perennial Grasses**			2–6	
	King's eyelashgrass	BLKI	*Blepharidachne kingii*	1–3	–
Forb					
3	**Perennial forbs**			4–18	
4	**Annual forbs**			1–11	
Shrub/Vine					
5	**Primary shrubs**			73–95	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	45–56	–
	creosote bush	LATR2	*Larrea tridentata*	28–39	–
6	**Secondary shrubs**			6–17	
	burrobush	AMDU2	*Ambrosia dumosa*	1–3	–
	cattle saltbush	ATPO	*Atriplex polycarpa*	1–3	–
	jointfir	EPHED	*Ephedra*	1–3	–
	burrobrush	HYSA	*Hymenoclea salsola*	1–3	–
	desert pepperweed	LEFR2	*Lepidium fremontii*	1–3	–
	desert-thorn	LYCIU	*Lycium*	1–3	–
	pricklypear	OPUNT	*Opuntia*	1–3	–
	Mojave seablite	SUMO	*Suaeda moquinii*	1–3	–

Animal community

Livestock Interpretation:
This site has limited value for livestock grazing, due to the low forage production. Indian ricegrass is highly palatable to all classes of livestock in both green and cured condition. It supplies a source of green feed before most other native grasses have produced much new growth. 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. Shadscale provides good browse for domestic sheep and goats. Shadscale leaves and seeds are an important component of domestic sheep and cattle winter diets. Shadscale tends to be browse tolerant. Heavy grazing during the winter and/or spring reduces shadscale. Die-off can also occur during extended periods of high precipitation. Shadscale is tolerant of early spring light-intensity 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 Interpretation:
Shadscale is a valuable browse species providing a source of palatable, nutritious forage for a wide variety of wildlife. The fruits and leaves are a food source for deer, desert bighorn sheep and pronghorn antelope. Creosotebush is unpalatable to most browsing wildlife. Indian ricegrass is eaten by pronghorn in moderate amounts whenever available. In Nevada it is consumed by desert bighorns. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground. Desert bighorn sheep and feral horses and burros will graze desert needlegrass.

Hydrological functions

Runoff is low. Permeability is moderately slow. Rills and water flow patterns are rare and mainly near inflow areas on lake plains. Sparse vegetation slows runoff and promotes some infilitration.

Other products

Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source. Seeds of shadscale were used by Native Americans for bread and mush. 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

Desert needlegrass may be used for groundcover in areas of light disturbance, but it is susceptible to excessive trampling. 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.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T17S R49E S27
General legal description	Fan remnants northwest of Clay Camp, Ash Meadows area, Clark County, Nevada.
Location 2: Clark County, NV	
Township/Range/Section	T17S R49E S28
General legal description	Fan remnants northwest of Clay Camp, Ash Meadows area, Clark County, Nevada.

Other references

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

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

Kieft, T.L., C.S. White, S.R. Loftin, R. Aguilar, J.A. Craig and D.A. Skaar. 1998. Temporal dynamics in soil carbon and nitrogen resources at a grassland-shrubland ecotone. Ecology 79.2:671-683.

Puigdefabregas, J. 2005. The role of vegetation patterns in structuring runoff and sediment fluxes in drylands. Earth Surface Processes and Landforms. 30:133-147.

Contributors

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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	10/17/2011
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. A few can be expected on steeper slopes in areas subjected to summer convection storms.

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2. **Presence of water flow patterns:** Rills are none to rare. A few can be expected on steeper slopes in areas subjected to summer convection storms.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ±70 depending on amount of surface rock fragments.

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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 (< 20 ft) during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during large rainfall events.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 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, coarse platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is less than 1 percent.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Sparse shrub canopy and associated litter break raindrop impact. Perennial herbaceous plants slow runoff and increase infiltration.

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

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

    Dominant: Reference Plant Community: salt desert shrubs (shadscale) >

    Sub-dominant: Mojave Desert shrubs >> deep-rooted, cool season, bunchgrasses > perennial forbs > annual forbs > warm-season bunchgrasses

    Other: succulents

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

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14. **Average percent litter cover (%) and depth (in):** Under canopy and between plant interspaces up to 10%, <1/4" depth

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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 (February thru April [May]) ± 100 lbs/ac. Favorable years 200 lbs/ac, unfavorable years 50 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:** Potential invaders on this site include red brome, Mediterranean grass, redstem filaree 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. Less reproduction will occur in below-average precipitation years.
