USDA Natural Resources
Conservation Service

Ecological site R030XC023NV
SHALLOW GRAVELLY FAN 11-15 P.Z.

Last updated: 2/25/2025
Accessed: 05/10/2025

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.

Ecological site concept

This site occurs on fan remnants. Slopes range from 4 to 30 percent, but slope gradients from 4 to 15 percent are most typical. Elevations range from 6000 to 8000 feet. The soils associated with this site are shallow and well drained. They have a restrictive petrocalcic layer within the main rooting depth. The soils are formed in alluvium from limestone and dolostone.

This site is part of group concept R030XC043NV

Associated sites

F030XC243NV	**Pinus monophylla-Juniperus osteosperma/Purshia stansburiana-Artemisia nova/Bouteloua gracilis** Forest site, higher elevation.
R030XC007NV	**SHALLOW GRAVELLY LOAM 7-9 P.Z.** Blackbrush site, lower elevation.

Similar sites

F030XC243NV	**Pinus monophylla-Juniperus osteosperma/Purshia stansburiana-Artemisia nova/Bouteloua gracilis** Forest site, similar soils and landform at higher elevations.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia nova* (2) *Purshia stansburiana*
Herbaceous	(1) *Bouteloua gracilis* (2) *Poa fendleriana*

Physiographic features

This site occurs on fan remnants. Slopes range from 4 to 30 percent, but slope gradients from 4 to 15 percent are most typical. Elevations range from 6000 to 8000 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant
Flooding frequency	None

Elevation	6,000–8,000 ft
Slope	4–30%
Aspect	Aspect is not a significant factor

Climatic features

The climate is semiarid with cool, moist winters and warm intermittently moist summers. Precipitation is greatest in the winter with a lesser secondary peak in the summer, typical of the Mojave Desert transitional to the Great Basin. The mean annual precipitation is about 11 to 15 inches and mean annual air temperature is 45 to 50 degrees F., and the frost-free season is 90 to 130 days.

Table 3. Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	
Precipitation total (average)	15 in

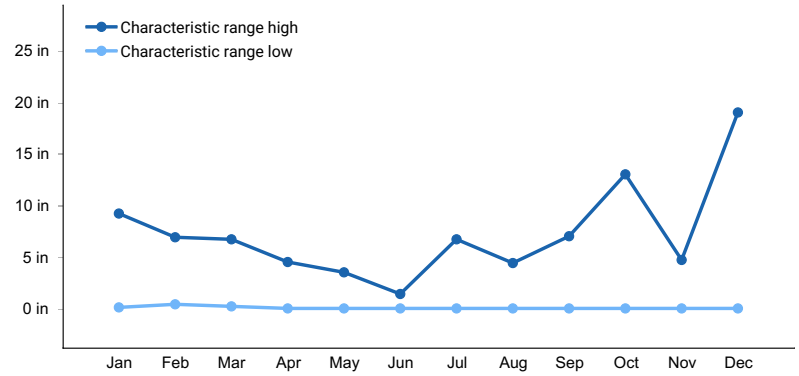


Figure 1. Monthly precipitation range

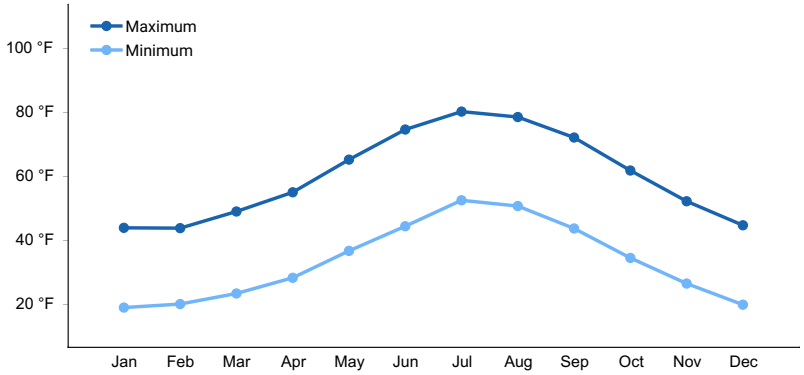


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are shallow and well drained. They have a restrictive petrocalcic layer within the main rooting depth. The soils are formed in alluvium from limestone and dolostone. The soil profile is modified with high amounts of rock fragments. The mollic horizon occurs from 7 to 10 inches. The soils have a calcic and petrocalcic horizon. The available water holding capacity is very low. The soil moisture regime is aridic bordering on ustic. Soil series associated with this site include Leecanyon a loamy-skeletal, carbonatic, mesic, shallow Petrocalcic Calciustolls and Wamp a loamy-skeletal, carbonatic, mesic, shallow Calcic Petrocalcids.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone (2) Alluvium–dolomite
Surface texture	(1) Very gravelly loam (2) Very gravelly fine sandy loam (3) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	14–20 in
Surface fragment cover <=3"	60–80%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	1.81–4.76 in
Calcium carbonate equivalent (0-40in)	25–70%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	25–60%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

Plant communities of the site are dynamic in response to changes in disturbance patterns and weather events. Plant community structure is controlled in part by infrequent wildfire and in part by pulses of seedling recruitment. Black sagebrush occurs throughout the successional process, it is highly light tolerant and shade intolerant (Fryer 2009). Black sagebrush is an evergreen, aromatic shrub that is low-growing and decumbent. It is the widest distributed cold-desert, dwarf-shrub and is more closely associated with salt-desert shrub communities than other Artemisia species. Beetle (1960) reported that black sagebrush seeds disperse too late in fall to germinate. Seeds typically overwinter and germinate the spring after production. Overwintering seeds germinate as early as April on some sites. Vegetative growth may also start in April. Ephemeral leaves are shed during summer drought, while persistent leaves remain on the branches through winter. Black sagebrush flowers from midsummer to mid-fall across its range. Seeds have no morphological adaptations for dispersal and commonly fall close to the parent plant (Fryer 2009). Survival of sagebrush seedlings is dependent on adequate moisture conditions. Young plants are susceptible to less than desirable condition for several years following germination (Fryer 2009). Mature plants are slightly salt tolerant and flood intolerant.

Black sagebrush has a taproot and wide-spreading lateral roots. Roots can be deep on favorable sites, but shallow soils prevent deep root development on most sites where black sagebrush is dominant. Black sagebrush tends to have a larger number of fibrous roots than big sagebrush species. Black sagebrush is highly drought tolerant; it is more likely to endure drought than most sagebrush taxa. The root systems of black sagebrush maximizes water uptake with a deep taproot and shallow branching roots. The combination of deep and shallow roots also provides excellent soil stabilization. The breakdown of aging roots also contributes to organic matter and nutrient cycling in the sagebrush system. Carbon and nitrogen concentration are higher under sagebrush canopies when compared to interspaces (Chen and Stark 2000).

Sagebrush species are 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

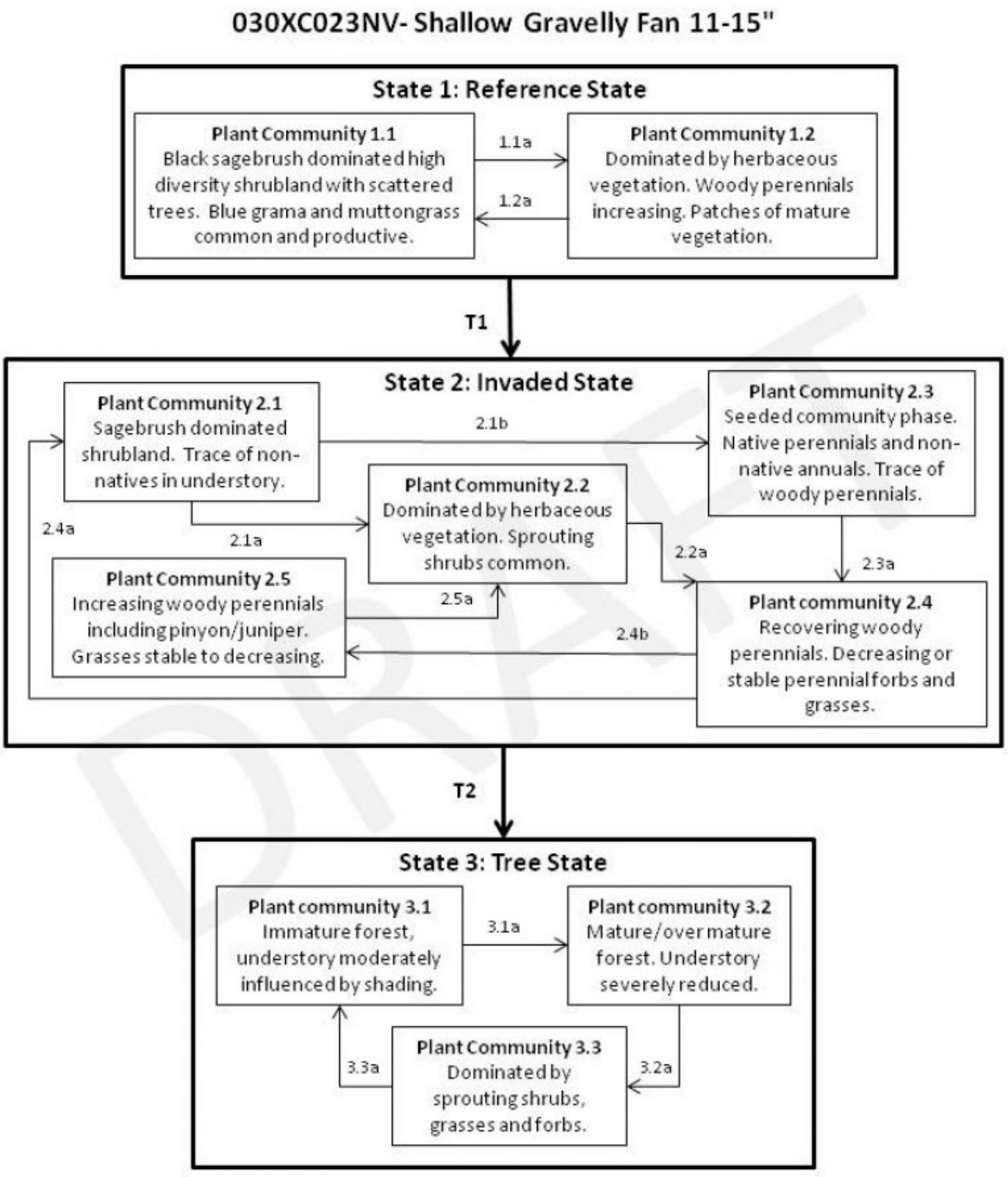
foundation of population maintenance (Noy-Meir 1973). Mature properly functioning sagebrush communities have higher infiltration rates and lower sediment production, than degraded systems. Reoccurring disturbances, natural or anthropogenic, will result in decreased sagebrush cover and increased cover of disturbance tolerant shrubs and non-natives. Loss of structural and functional groups effects ecosystem functioning and can result in soil loss. Improper grazing or recreation management can result in the reduction, or potential loss, of black sagebrush degrading ecosystem function.

Fire Ecology:

There are limited records of historic fire frequencies or fire regimes for black sagebrush communities. Black sagebrush communities tend to occupy unproductive sites that have little fuel build-up, so they likely experienced extended fire return intervals. Black sagebrush plants are readily killed by all fire intensities. Reestablishment of sagebrush occurs through wind-dispersed seed sources. Black sagebrush requires 15 to 60 years post fire to regain dominance. Therefore, frequent and repeated fires can eliminate it from a site. Following wildfire, black sagebrush will be initially replaced by sprouting species. Pinyon and juniper trees encroachment may occur with alteration of the natural fire regime.

Fire effects on Stansbury cliffrose are variable. Fire may kill or severely damage plants. Late-season fire also increases the risk of mortality. Stansbury cliffrose is a weak sprouter that is generally killed by severe fire. Mojave ceanothus, spiny greasebush and green ephedra are favored by fire and may increase is cover following fire. Blue grama has variable fire tolerance; it has fair tolerance when dormant but experiences some damage if burned during active growth, especially during drought. Fire favors blue grama, generally increasing its occurrence, production, and percent cover. Muttongrass is unharmed to slightly harmed by light-severity fall fires. Muttongrass appears to be harmed by and slow to recover from severe fire.

State and transition model



State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions and is dominated by black sagebrush. The plant communities of this state are stable and long lived. Primary natural disturbance mechanisms affecting this ecological site are periodic wildfire, prolonged drought, disease and insect attack. Plant community dynamics are determined by interactions between weather events and disturbance regimes. Departures from the natural disturbance return interval can lead to drastic changes in plant community composition.

Community 1.1
Reference Plant Community

The reference plant community is characteristic of a healthy, mid-seral condition. Dominant species include black sagebrush and blue grama. Stansbury's cliffrose, Mormom tea and muttongrass are important species associated with this site. Potential vegetative composition is 30 percent grasses, 10 percent forbs, 60 percent shrubs and up to 1 percent trees. Approximate ground cover (basal and foliar) is 20 to 30 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	210	349	488
Grass/Grasslike	75	125	175
Forb	15	25	35
Tree	0	1	2
Total	**300**	**500**	**700**

Table 6. Ground cover

Tree foliar cover	0-1%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	5-10%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	1-5%
Surface fragments >0.25" and <=3"	60-80%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	15-30%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	0-1%	1-5%	1-5%	1-5%
>0.5 <= 1	0-1%	1-5%	5-10%	1-5%
>1 <= 2	0-1%	5-10%	–	–
>2 <= 4.5	0-1%	1-2%	–	–
>4.5 <= 13	0-5%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 1.2
Plant Community 1.2

This plant community is characteristic of a post-disturbance, early seral plant community phase. Vegetation is dominated by herbaceous biomass, grasses and forbs benefit from reduced overstory competition. Sprouting shrubs quickly recover and serve as nurse plants for other shrub seedlings, like sagebrush. Desert ceanothus, spiny greasebush, ephedra and snowberry increase post-fire. Black sagebrush will reestablish from an off site seed source, during favorable climatic pulses. Recovery of sagebrush to pre-fire conditions may take a significant amount of time. This plant community is ‘at-risk’ of invasion by non-natives. Non-native species take advantage of increased availability of critical resources following wildfire or other disturbance.

Pathway 1.1a
Community 1.1 to 1.2

Wildfire, prolonged drought, disease or insect attack.

Pathway 1.2a
Community 1.2 to 1.1

Absence from disturbance and natural regeneration over time.

State 2
Invaded State

The invaded state is characterized by the presence of non-native species. A biotic threshold has been crossed with the introduction of non-native species that cannot be easily removed from the plant community and have the potential to significantly alter natural disturbance regimes from the historic range of variation. Ecological resilience is reduced by the presence of non-natives, making it more difficult for this state to recover following a disturbance.

Community 2.1
Invaded Plant Community 2.1

Compositionally this plant community is similar to the reference plant community with a trace of non-native species in the understory. Ecological processes have not been compromised at this time, however, ecological resilience is reduced by the presence of non-natives. Dominant shrubs persist through invasion. However, desirable forbs and native bunchgrasses may be unsuccessful in competing with non-natives. Management should focus on reducing surface disturbances and protecting native vegetation.

Community 2.2
Invaded Plant Community 2.2

This plant community is characteristic of an early seral plant community dominated by herbaceous vegetation. Early successional post-fire plant communities in the invaded state may or may not be dominated by non-native annual grasses. Fire tolerant native species recover quickly. Desert ceanothus, spiny greasebush, ephedra and snowberry readily sprout post-fire and provide favorable conditions for the establishment of shrub seedlings. Fast moving, low intensity fires result in the incomplete removal of sagebrush, allowing for direct reestablishment. Non-native annual grasses contribute to fine fuel loading and increases the risk of reoccurring wildfire. Management should focus on managing fuel loading and encouraging establishment of native vegetation.

Community 2.3
Inavded Plant Community 2.3

This plant community is characterized as a seeded community phase. Following wildfire, rangeland seeding helps stabilize the soil surface, reduce erosion and provide competition for non-native annuals. Native vegetation is dominated by species capable of sprouting such as Prunus, Ephedra and Yucca. Ceanothus readily reproduces from seed following wildfire and increases in cover. Seeded perennial grasses are efficient competitors and have long-term presence in the plant community.

Community 2.4
Inavaed Plant Community 2.4

This plant community is characterized by mid-successional plant community of recovering native woody perennials. Sprouting shrubs, including Ephedra, Ceanothus, Symphoricarpos and Yucca, are common and serve as nurse plants for shrub seedlings. Sagebrush will reestablish provided favorable climatic conditions and available seed source. Abundance of non-native biomass varies annual depending on weather. Droughty conditions can favor native perennials and decrease abundance of non-natives.

Community 2.5
Invaded Plant Community 2.5

This plant community is characterized by encroachment of pinyon and juniper. Non-natives are present in the understory. This plant community is identified as ‘at-risk’, total tree cover is near 20 percent and without fire or other disturbance tree cover will increase. This community phase is in danger of crossing an irreversible biotic threshold into state 3. Management options to keep this community phase from crossing a threshold include cutting trees and reducing dominance by woody vegetation.

Pathway 2.1a
Community 2.1 to 2.2

Wildfire, prolonged drought, disease or insect attack. Site is allowed to recover naturally.

Pathway 2.1b
Community 2.1 to 2.3

Wildfire removes shrubs and other vegetation. Managers conduct a rangeland seeding.

Pathway 2.2a
Community 2.2 to 2.4

Absence from disturbance and natural regeneration over time. Regeneration of sagebrush is dependent on nearby seed source.

Pathway 2.3a
Community 2.3 to 2.4

Natural regeneration over time and the absence of disturbance. Regeneration of sagebrush is dependent on nearby seed source.

Pathway 2.4a
Community 2.4 to 2.1

Absence from disturbance and natural regeneration over time.

Pathway 2.4b
Community 2.4 to 2.5

Lack of fire and other disturbance.

Pathway 2.5a
Community 2.5 to 2.2

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

State 3
Tree State

This state is characterized by the invasion of pinyon and juniper and tree cover greater than 20%. Lack of fire, drought, disease or insect attack allows pinyon and juniper to invade, dominate and eventually change site dynamics. Understory vegetation is reduced through shading, duff accumulation and competition for water and nutrients. The ability of a site to capture, transport and store water is directly related to vegetative cover. Feedbacks contributing to the stability of this alternative state include, reduced infiltration resulting from reduced vegetative cover, leading to lower soil moisture preventing the establishment of vegetation, as well as, the density, the rate of spread and dominance of trees.

Community 3.1
Plant Community 3.1

This plant community is characterized by an immature forest. Trees constitute more than half of the plant community. Understory vegetation is moderately affected by overstory shading, duff accumulation, competition, etc. Shrubs and bunchgrasses are decreasing. Non-natives may or may not be present in the understory. Tree canopy is greater than 20 percent.

Community 3.2
Plant Community 3.2

Figure 4. Invaded tree phase

This plant community is characterized by pinyon and juniper trees that have reached or are near maximal height for the site. Without disturbance, the trees on this site become very old. Remaining understory vegetation is strongly influenced or even absent due to overstory shading, competition and duff accumulation. Dead shrubs are common in the understory, perennial grasses and forbs are mostly absent. Non-native species may or may not be present. Tree canopy ranges from 30-50 percent.

Community 3.3
Plant Community 3.3

This plant community is characteristic of an early seral, post-disturbance plant community. Vegetation is dominated by grasses and forbs under full sunlight. Early successional plant communities in this state may or may not be dominated by non-native annual grasses. Standing stags remaining after disturbance have little to no effect on the composition and production of herbaceous vegetation. Sprouting shrubs and those that readily establish from seed are the first to recover. Long-lived perennials and late successional species will colonize the site with protection from large scale disturbance and abusive land use practices. Increased availability of critical resources following wildfire or other disturbance may result in increased non-native biomass.

Pathway 3.1a
Community 3.1 to 3.2

Absence of disturbance and continued infilling by pinyon and juniper. Bare ground increasing.

Pathway 3.2a
Community 3.2 to 3.3

Wildfire, insect/disease attack or prolonged drought removes tree canopy.

Pathway 3.3a
Community 3.3 to 3.1

Continued absence from disturbance and 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

Changes in historic wildfire patterns and frequency. Encroachment by pinyon and juniper. Tree canopy is 20 percent or greater and bare ground is increasing.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			105–200	
	blue grama	BOGR2	*Bouteloua gracilis*	50–75	–
	muttongrass	POFE	*Poa fendleriana*	25–50	–
	squirreltail	ELEL5	*Elymus elymoides*	10–25	–
	needle and thread	HECO26	*Hesperostipa comata*	10–25	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	10–25	–
Forb					
3	**Perennial Forbs**			1–25	
	milkvetch	ASTRA	*Astragalus*	3–10	–
	Indian paintbrush	CASTI2	*Castilleja*	3–10	–
	buckwheat	ERIOG	*Eriogonum*	3–10	–
	Cooper's rubberweed	HYCOC2	*Hymenoxys cooperi var. cooperi*	3–10	–
	globemallow	SPHAE	*Sphaeralcea*	3–10	–
4	**Annual Forbs**			1–15	
	bird's-beak	CORDY	*Cordylanthus*	3–10	–
Shrub/Vine					
5	**Primary Shrubs**			210–300	
	black sagebrush	ARNO4	*Artemisia nova*	200–250	–
	mormon tea	EPVI	*Ephedra viridis*	5–25	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	5–25	–
6	**Secondary Shrubs**			25–100	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	5–15	–
	desert ceanothus	CEGR	*Ceanothus greggii*	5–15	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	5–15	–
	spiny greasebush	GLSP	*Glossopetalon spinescens*	5–15	–
	wild crab apple	PERA4	*Peraphyllum ramosissimum*	5–15	–
	desert almond	PRFA	*Prunus fasciculata*	5–15	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	5–15	–
	banana yucca	YUBA	*Yucca baccata*	5–15	–
	buckhorn cholla	CYACA2	*Cylindropuntia acanthocarpa var. acanthocarpa*	1–5	–
Tree					
7	**Evergreen**			1–5	
	Utah juniper	JUOS	*Juniperus osteosperma*	1–3	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	1–3	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production. Grazing management should be keyed to perennial grasses and palatable shrub production. During winter, at lower elevations, black sagebrush is heavily utilized by domestic sheep. Stansbury cliffrose and Mormon tea can provide important winter forage when

other forages are unavailable. Blue grama is valuable forage for all classes of domestic livestock, providing excellent forage for cattle and sheep. Blue grama tends to be most productive following summer rains, but it cures well and provides forage year round. Muttongrass is excellent forage for domestic livestock especially in the early spring. Muttongrass begins growth in late winter and early spring, which makes it available before many other forage plants. Indian ricegrass is highly palatable to all classes of livestock in the green and cured condition. Needleandthread is highly desirable forage, especially in the spring before the fruits develop. Squirreltail is very palatable winter forage.
Stocking rates vary over time depending upon season of use, climate variations, site, kinds and class of grazing animals, 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. Actual use records for individual sites, a determination of the degree to which the sites have been grazed, and an evaluation of trend in the site condition offer the most reliable basis for developing initial stocking rates.

Wildlife Interpretations:
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 and Mormon tea can also provide important winter forage when other forages are unavailable. Blue grama provides important forage for mule deer. Quail and some songbirds eat the seeds of blue grama. Small mammals also eat blue grama seeds and stems. Flower heads and seeds of blue grama are also consumed by grasshoppers, which can all but eliminate an annual seed crop. Deer and elk make heavy use of muttongrass, especially in early spring when other green forage is scarce. Depending upon availability of other nutritious forage, deer may use muttongrass in all seasons. Muttongrass cures well and is an important fall and winter forage in some areas. Wildlife graze Indian ricegrass in the green and cured condition. It is preferred by all classes of wildlife, including pronghorn, rodents, jackrabbits and doves. Needleandthread is moderately important spring time forage for mule deer, but use declines rapidly. Squirreltail is very palatable winter forage for a wide variety of wildlife species.

Hydrological functions

The soils associated with this site are characterized by medium to high runoff and moderate permeability.

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 camping and 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.
Because of its wide adaptation, ease of establishment, and economic value, blue grama is used extensively for conservation purposes, rangeland seeding, and landscaping. Blue grama is useful for reclamation and for erosion control in arid and semiarid regions.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T18 S. R56 E. S36 NE
UTM zone	N
UTM northing	4024655n
UTM easting	0622288e
General legal description	Approximately 10 miles west from the intersection of Highway 95, on the north side of state Highway 156 in Lee Canyon area, Clark County, Nevada.

Other references

Beetle, A.A. 1960. A study of sagebrush: The section of Tridentatae of Artemsia. Bulletin 368. Larmie, WY: U of Wyoming Ag. Experiment Station. 83p.
Chen, J. and J.M. Stark. 2000. Plant species effect and carbon and nitrogen cycling in sagebrush-crested wheatgrass soil. Soil Biology and Biochemistry. 32:47-57.
Clokey, I. 1951. Flora of the Charleston Mountains, Clark County, Nevada. University of California Press, Berkeley and Los Angeles.
Fryer, Janet L. 2009. Artemisia nova. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/
Glenne, G. and D. Johnson. 2002. Guide to Species of Concern in the Spring Mountains National Recreation Area, Clark and Nye Counties, Nevada. USFS, Las Vegas, NV.
Nachlinger, J. and G. Reese. 1996. Plant Community Classification of the Spring Mountains National Recreation Area, Clark and Nye Counties, Nevada. The Nature Conservancy. Reno, Nevada.
Noy-Meir, I. 1973. Desert Ecosystems: Environment and Producers. Annual Review of Ecology and Systematics. 4: 25-51.

Contributors

E. Hourihan
TJW

Approval

Sarah Quistberg, 2/25/2025

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)	TJ WOLFE
Contact for lead author	State Rangeland Management Specialist
Date	06/22/2006
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** A few rills may be present on steeper slopes, especially after summer convection storms.

2. **Presence of water flow patterns:** Water flow patterns are none to few and are located in the interspaces between shrubs, not connected.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 10-20%, depending on amount of rock fragments

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** No wind-scoured or blow out areas. Small depositional areas found up slope of grasses and large shrubs.

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 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. (To be field tested.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is typically medium, subangular blocky. Soil surface colors are dark grayish brown and soils have a mollic epipedon. Soils have low organic matter. “A” horizon averages 1-2% organic material.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants (especially deep-rooted bunchgrasses) slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow and overland flow catchment positively contributing to soil moisture storage.

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. Subsurface calcic or petrocalcic 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: Evergreen shrubs (black sagebrush) >

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

    Other: evergreen tree, succulents

    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):** Within plant interspaces and under canopy 20 to 35% 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 (end of May) ± 500 lbs/ac. Favorable years 700 lbs/ac and unfavorable years <300 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 include cheatgrass, red brome, and annual mustards.

---

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