USDA Natural Resources
Conservation Service

Ecological site R030XC033NV
SANDY LOAM 9-11 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 inset fans. Slope gradients of 2 to 8 percent are most typical. Elevations range from 5900 to 6600 feet. The soils associated with this site are very deep soils that formed in alluvium derived from limestone.

This is a group concept and provisional STM that also covers R030XC012NV, R030XC013NV.

Associated sites

R030XC034NV	**SHALLOW GRAVELLY LOAM 9-11 P.Z.**

Similar sites

R030XC035NV	**LOAMY 9-11 P.Z.** ATCA2 minor species, less productive.
R030XC005NV	**PIEDMONT WASH** FAPA & LELA dominant, less productive.
R030XC012NV	**GRAVELLY CALCAREOUS INSET FAN 9-11 P.Z.** ARTRV dominant.
R030XC032NV	**UPLAND WASH** FAPA & PRFA dominant.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex canescens* (2) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Hesperostipa comata*

Physiographic features

This site occurs on inset fans. Slope gradients of 2 to 8 percent are most typical. Elevations range from 5900 to 6600 feet.

Table 2. Representative physiographic features

Landforms	(1) Inset fan
Elevation	5,900–6,600 ft

Slope	2–8%
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 Great Basin. Average annual precipitation is 9 to 11 inches. Mean annual air temperature is 45 to 50 degrees F. The average growing season is about 90 to 150 days.

Table 3. Representative climatic features

Frost-free period (average)	150 days
Freeze-free period (average)	
Precipitation total (average)	11 in

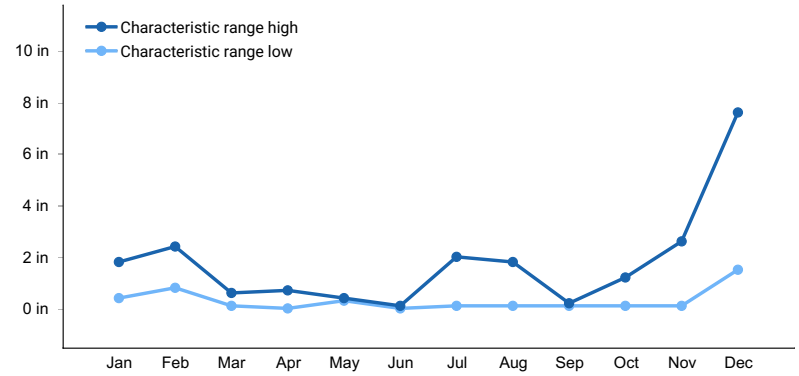


Figure 1. Monthly precipitation range

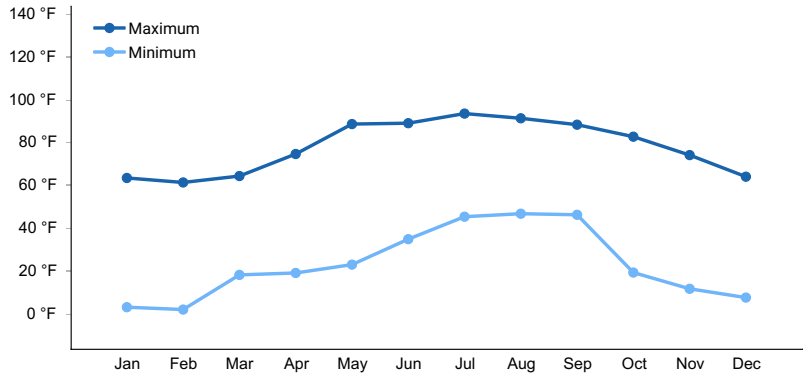


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are very deep soils that formed in alluvium derived from limestone. Soils are well drained, have high saturated hydraulic conductivity and low runoff. Soils are characterized by an ochric epipedon and a cambic horizon. The soil series correlated to this site is Nilesval, a coarse-loamy, carbonatic, mesic Ustic Haplocambid.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone
Surface texture	(1) Gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Rapid
Soil depth	72–84 in
Surface fragment cover <=3"	10–15%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	4.41–6.69 in
Calcium carbonate equivalent (0-40in)	40–60%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	7.9–8.2
Subsurface fragment volume <=3" (Depth not specified)	10–60%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The plant communities on this site are dynamic in response to changes in weather patterns and disturbance regimes. Temperature, solar radiation and nutrient inputs in deserts are fairly continuous in this system. Precipitation usually comes in infrequently having large effects on the biotic components on the community (Noy-Meir 1973). Pulses of precipitation have large influence on production, germination and nutrient cycling. Native shrubs and perennial bunchgrasses increase infiltration and elevate organic matter contributing to increased ecological resilience. Patches of vegetation have increased organic carbon and nutrient inputs as well as greater water storage capacity (Puigdefábregas 2005). Periodic and long-term drought is a natural disturbance affecting this system. Prolonged drought will result in a decrease of perennial grass cover and favor an increase of shrubs.

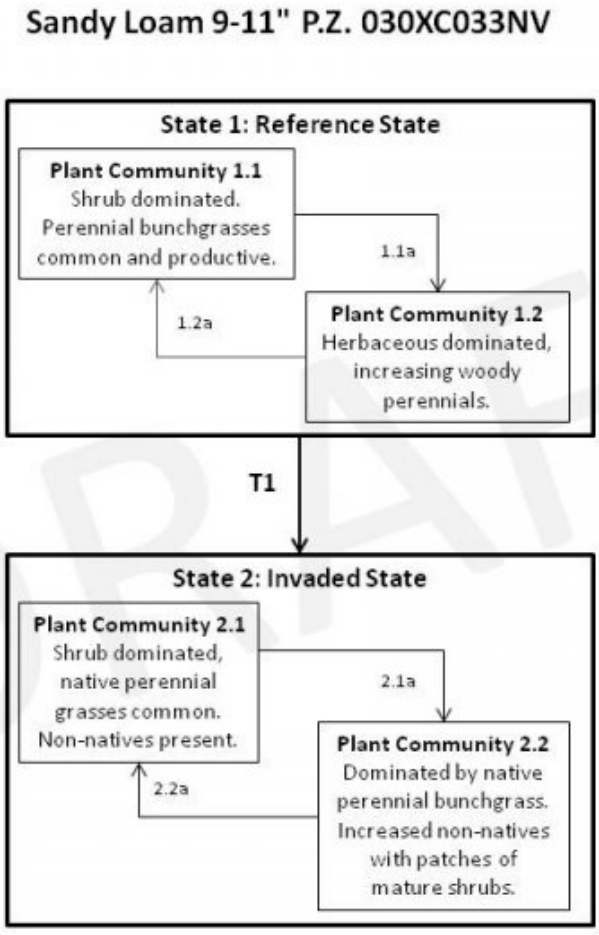
Fourwing saltbush can persist throughout the successional process and often serves as a nurse plant for late successional species. Populations remain stable or increase in open, relatively undisturbed rangelands (Howard 2003). Fourwing saltbush is well adapted to desert environments. It is tolerant of drought conditions, metal toxicity and saline soils. On saline sites, fourwing saltbush is capable of increasing the soil pH as rains wash the salt accumulation from its leaves (Howard 2003). Plants are mainly dioecious and flowers are pollinated by wind. Seedling emergence is greater with microtopography that provides partial shade. Seedlings can achieve rapid growth on favorable sites and only require 3 to 4 years to fully establish. Few populations are capable of reproducing through tillering.

Mountain big sagebrush usually occurs in montane valleys and on foothills, slopes and high ridges. It is often considered the climax species throughout much of its range. However, drastic changes to historic fire regimes have resulted in major successional changes in the mountain big sagebrush zone (Johnson 2000). Plants usually flower and set seed in late summer or early fall. Yearly seed production is strongly tied to precipitation. Sagebrush seeds do not persist in the soil and successful seedling establishment is strongly tied to climatic patterns. Seedling survival requires adequate soil moisture through the first growing season and for at least 2 additional years.

Fire Ecology:
Salt-desert shrub communities with fourwing saltbush historically experienced infrequent, stand-replacement fires. The mean fire return interval for salt-desert shrub communities ranges from 35 to 100 years. Fire top-kills or kills

fourwing saltbush, depending upon ecotype. Fourwing saltbush probably establishes primarily from seed after fire, with some populations also regenerating vegetatively. Mountain big sagebrush is highly susceptible to injury from fire. It is often top-killed by fire and will not resprout. Winterfat is either killed or top-killed by fire, depending on fire severity. Severe fire can kill the perennating buds located several inches above the ground surface and thus kills the plant. In addition, severe fire usually destroys seed on the plant. Low-severity fire scorches or only partially consumes the aboveground portions of winterfat and thus does not cause high mortality. 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. Needleandthread is top-killed by fire. It may be killed if the aboveground stems are completely consumed. Needleandthread is slightly to severely damaged by fire. Needleandthread sprouts from the caudex following fire, if heat has not been sufficient to kill underground parts. Recovery usually takes 2 to 10 years. Bottlebrush squirreltail's small size, coarse stems, and sparse leafy material aid in its tolerance of fire. Postfire regeneration occurs from surviving root crowns and from on- and off-site seed sources. Frequency of disturbance greatly influences postfire response of bottlebrush squirreltail. Undisturbed plants within a 6 to 9 year age class generally contain large amounts of dead material, increasing bottlebrush squirreltail's susceptibility to fire.

State and transition model



State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. Plant community phase changes are primarily driven by infrequent wildfire, prolonged drought and insect attack or disease. Atriplex plant communities are stable and long-lived.

Community 1.1
Reference Plant Community

Figure 3. Sandy Loam

The reference plant community is characterized by high shrub diversity and productive perennial bunchgrasses. It is dominated by fourwing saltbush, mountain big sagebrush, winterfat and Indian ricegrass. Community phase changes are primarily driven by long term drought and periodic wildfire. Increased cover of perennial herbaceous plants increase infiltration and elevate organic matter resulting in increased ecological resilience. Potential vegetative composition is about 35 percent grasses, 10 percent annual and perennial forbs and 55 percent shrubs. Approximate ground cover (basal and crown) is 40 to 55 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	385	468	550
Grass/Grasslike	245	297	350
Forb	70	85	100
Total	**700**	**850**	**1000**

Community 1.2
Plant Community 1.2

This plant community is representative of a post-disturbance plant community phase. Initially early-seral plant communities are heavily dominated by herbaceous vegetation. Sprouting shrubs (Douglas rabbitbrush, green ephedra) quickly recover and provide favorable conditions for the establishment of shrub seedlings. Composition of the post-fire plant community may vary depending on season and severity of burn. This plant community is ‘at-risk’ of invasion by non-native annuals. Non-natives take advantage of increased availability of critical resources following a disturbance.

Pathway 1.1a
Community 1.1 to 1.2

Wildfire, prolonged drought and/or insect/disease 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. Ecological processes are not compromised at this time, however, the presence of non-natives reduces ecological resilience of the site. 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 natural range of variability. Introduced annuals such as red brome and cheatgrass have invaded the reference plant community. These non-natives annuals are highly flammable and promote wildfires where fires historically have been infrequent. Following a disturbance, this state relies on the availability of a nearby seed source for reestablishment of non-sprouting native species.

Community 2.1
Invaded Plant Community 2.1

This plant community is compositionally similar to the reference plant community with a trace of non-native species in the understory. At this time the ecological function of this site has not changed. However, the ecological resilience has been reduced by the presence of weedy non-natives. Management decisions should focus on limiting human impacts in order to protect perennial vegetation and prevent further degradation.

Community 2.2
Invaded Plant Community 2.2

This plant community is characteristic of a post-disturbance plant community. Wildfire favors native perennial grasses by reducing competition from the shrubs and releasing limiting resources. Many perennial grasses have root crowns that easily survive fire. Shrub cover is only temporarily decreased, fourwing saltbush readily establishes from seed. Douglas rabbitbrush and threadleaf snakeweed are disturbance tolerant perennials and quickly return post disturbance. Ephedra, desert peach and Anderson’s wolfberry are capable of sprouting from the root crown.

Pathway 2.1a
Community 2.1 to 2.2

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

Pathway 2.2a
Community 2.2 to 2.1

Absence from disturbance and natural regeneration over time, However, it may take many years for shrubs to reach pre-fire densities.

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.

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**			213–341	
	needle and thread	HECO26	*Hesperostipa comata*	85–128	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	85–128	–
	squirreltail	ELEL5	*Elymus elymoides*	43–85	–
2	**Secondary Perennial Grasses**			1–26	
	blue grama	BOGR2	*Bouteloua gracilis*	1–17	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	1–17	–
Forb					
3	**Perennial Forbs**			17–85	
	desert larkspur	DEPA	*Delphinium parishii*	4–26	–
	buckwheat	ERIOG	*Eriogonum*	4–26	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	4–26	–
	birdcage evening primrose	OEDE2	*Oenothera deltoides*	4–26	–
	firecracker penstemon	PEEA	*Penstemon eatonii*	4–26	–
	brightwhite	PREX	*Prenanthella exigua*	4–26	–
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	4–26	–
4	**Annual Forbs**			1–68	
	gilia	GILIA	*Gilia*	1–17	–
	blazingstar	MENTZ	*Mentzelia*	1–17	–
	phacelia	PHACE	*Phacelia*	1–17	–
Shrub/Vine					
5	**Primary Shrubs**			442–554	
	fourwing saltbush	ATCA2	*Atriplex canescens*	255–298	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	170–213	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	17–43	–
6	**Secondary Shrubs**			35–59	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	4–26	–
	mormon tea	EPVI	*Ephedra viridis*	4–26	–
	threadleaf snakeweed	GUMI	*Gutierrezia microcephala*	4–26	–
	water jacket	LYAN	*Lycium andersonii*	4–26	–
	desert almond	PRFA	*Prunus fasciculata*	4–26	–
	Joshua tree	YUBR	*Yucca brevifolia*	4–26	–

Animal community

Livestock Interpretation:
This site is suitable for livestock grazing. Grazing management should be keyed to dominant grasses and palatable shrub production. Fourwing saltbush is one of the most palatable shrubs in the West. Its protein, fat, and carbohydrate levels are comparable to alfalfa. It provides nutritious forage for all classes of livestock. Palatability is rated as good for domestic sheep and domestic goats; fair for cattle; fair to good for horses in winter, poor for horses in other seasons. Mountain big sagebrush is eaten by domestic livestock but has long been considered to be of low palatability, and a competitor to more desirable species. Winterfat is an important forage plant for livestock,

especially during winter when forage is scarce. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Effects depend on severity and season of grazing. 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. Needleandthread provides highly palatable forage, especially in the spring before fruits have developed. Needlegrasses are grazed in the fall only if the fruits are softened by rain. Bottlebrush squirreltail is very palatable winter forage for domestic sheep of Intermountain ranges. Domestic sheep relish the green foliage. Overall, bottlebrush squirreltail is considered moderately palatable to livestock.

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:
Fourwing saltbush provides valuable habitat and year-round browse for wildlife. Fourwing saltbush also provides browse and shelter for small mammals. Additionally, the browse provides a source of water for black-tailed jackrabbits in arid environments. Granivorous birds consume the fruits. Wild ungulates, rodent and lagomorphs readily consume all aboveground portions of the plant. Palatability is rated good for deer, elk, pronghorn and bighorn sheep. Mountain big sagebrush is highly preferred and nutritious winter forage for mule deer. Winterfat is an important forage plant for wildlife, especially during winter when forage is scarce. Winterfat seeds are eaten by rodents and are a staple food for black-tailed jackrabbits. Mule deer and pronghorn antelope browse winterfat. Winterfat is used for cover by rodents. It is potential nesting cover for upland game birds, especially when grasses grow up through its crown. Indian ricegrass is eaten by pronghorn in moderate amounts whenever available. 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. 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. Needleandthread is moderately important spring forage for mule deer, but use declines considerably as more preferred forages become available. Bottlebrush squirreltail is a dietary component of several wildlife species.

Hydrological functions

Runoff is low. Permeability is high. Rills are none. Water flow patterns are none to rare. Perennial herbaceous plants (especially deep-rooted perennial grasses) slow runoff and increase infiltration. Shrub canopy and associated bunchgrasses break raindrop impact and provide opportunity for snow catch and accumulation on site.

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

Fourwing saltbush is traditionally important to Native Americans. They ground the seeds for flour. The leaves, placed on coals, impart a salty flavor to corn and other roasted food. Top-growth produces a yellow dye. Young leaves and shoots were used to dye wool and other materials. The roots and flowers were ground to soothe insect bites. Native Americans used big sagebrush leaves and branches for medicinal teas, and the leaves as a fumigant. Bark was woven into mats, bags and clothing. Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used the seed as a reserve food source.

Other information

Fourwing saltbush is widely used in rangeland and riparian improvement and reclamation projects, including burned area recovery. It is probably the most widely used shrub for restoration of winter ranges and mined land reclamation. Winterfat adapts well to most site conditions, and its extensive root system stabilizes soil. However, winterfat is intolerant of flooding, excess water, and acidic soils. Needleandthread is useful for stabilizing eroded or degraded sites. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T16S R61E S12
UTM zone	N
UTM northing	4046703
UTM easting	670124
Latitude	36° 33′ 2″
Longitude	115° 5′ 57″
General legal description	Approximately 13 kilometers north and 23 kilometers east of Corn Creek, at the north end of Peekaboo Canyon, approximately 16 miles south-southwest of Wamp Spring, Desert National Wildlife Refuge, Clark Co., NV.

Other references

Howard, J.L. 2003. Atriplex canescens. 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/ [2011, October 18].
Johnson, K. A. 2000. Artemisia tridentata subsp. vaseyana. 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/ [2011, October 18].
Noy-Mier, I. 1973. Desert Ecosystems: Environment and Producers. Annual Review of Ecology and Systematics. 4:25-51.
Puigdefábregas J. 2005. The role of vegetation patterns in structuring runoff and sediment fluxes in drylands. Earth Surface Processes and Landforms. 30:133-147.
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Contributors

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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)	P. Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	06/28/2011
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

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

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 15 to 30%

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length (<10 ft) during intense summer storms. Persistent litter (large woody material) will remain in place except during catastrophic events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 1 to 3 in the interspaces and 3 to 6 under canopy. (This will be field tested.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically strong, thick platy. Soil surface colors are brown and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 1.5 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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 perennial grasses [i.e. Indian ricegrass and needleand thread] slow runoff and increase infiltration. Shrub canopy and associated bunchgrasses break raindrop impact and provide opportunity for snow catch and accumulation on site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Massive subsoil horizons should not be interpreted as compaction.

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: Tall shrubs (i.e., fourwing saltbush & big sagebrush) >

Sub-dominant: low-statured shrubs > deep-rooted, cool-season, perennial grasses > perennial forbs > warm-season, perennial bunchgrasses > shallow-rooted, cool season, annual forbs

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (±20%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces and under canopy 40-60% and depth of litter is ±¼ inch.

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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 (Feb thru April) ± 850 lbs/ac. Favorable years 1000 lbs/ac and unfavorable years 700 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 cheatgrass, singleleaf pinyon and Utah juniper.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Less reproduction occurs during years of below average precipitation.
