

Ecological site R035XB223AZ **Sandy Upland 6-10" p.z. Sodic**

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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.

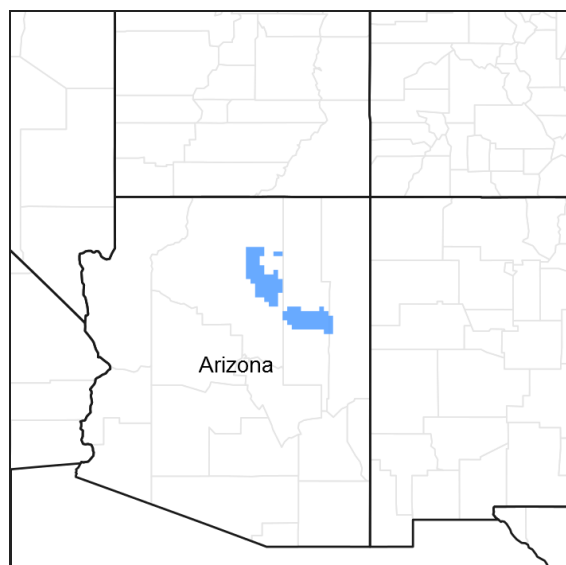


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 035X–Colorado Plateau

This ecological site occurs in Common Resource Area 35.2 - the Colorado Plateau Shrub – Grasslands

Elevations range from 3800-5800 feet and precipitation averages 6 to 10 inches per year. Vegetation includes shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. The soil temperature regime is mesic and the soil moisture regime is typic aridic. This unit occurs within the Colorado Plateau Physiographic Province and is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin.

Associated sites

R035XB201AZ	Mudstone/Sandstone Hills 6-10" p.z. Mudstone/Sandstone Hills 6-10" This site occurs in the hills above the site
R035XB215AZ	Sandstone/Shale Upland 6-10" p.z. Sandstone/Shale Upland, 6-10" p.z. This site occurs in the hills above the site, and the shale parent material may be contributing to the sodic qualities of the site below

R035XB217AZ	Sandy Upland 6-10" p.z. Sandy Upland 6-10" p.z. Occurs on geographically similar areas, but without a dominance of sodic indicator plants such as alkali sacaton
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Similar sites

R035XB219AZ	Sandy Loam Upland 6-10" p.z. Sandy Loam Upland 6-10" p.z. This site has a sandy loam surface, but none of the problems of excessive salt and wind scouring.
R035XB217AZ	Sandy Upland 6-10" p.z. Sandy Upland 6-10" p.z. This site occurs on similar topography but does not have the presence of excessive sodium

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex canescens</i>
Herbaceous	(1) <i>Achnatherum hymenoides</i> (2) <i>Sporobolus airoides</i>

Physiographic features

This site occurs as deep sandy sodic soils on stabilized dunes, undulating plateaus and fan remnants. Slopes on the site range from 1-15%.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Plateau (3) Dune
Flooding frequency	None
Ponding frequency	None
Elevation	1,158–1,768 m
Slope	1–15%
Aspect	Aspect is not a significant factor

Climatic features

This area has a very dry and windy climate that is hot in the summer and cold in the winter. Average annual precipitation is from 6 to 10 inches. Soil moisture regime is typic aridic and the soil temperature regime is mesic. A slight majority of the precipitation arrives during the late fall, winter, and early spring. This winter season moisture originates in the Pacific Ocean and arrives as rain, or sometimes snow, during widespread frontal storms of generally low intensity. The majority of the snow falls from December through February, but rarely lasts more than a few days. The driest period is from late May to early July. Summer rains occur from July through September during brief intense local thunderstorms. The rain is sporadic in intensity and location. Windy conditions are common year round with the strongest most frequently in the spring.

Table 3. Representative climatic features

Frost-free period (average)	181 days
Freeze-free period (average)	207 days
Precipitation total (average)	254 mm

Influencing water features

The soil moisture on this ecological site comes from precipitation. The site does not benefit significantly from run-on moisture. The sandy surface texture of the soil allows the site to capture all of the moisture from winter storms and intense summer thunderstorms with little or no runoff. The waterholding capacity of the soil is low because of the sandy soil texture throughout the soil profile.

Soil features

Soil is moderately deep to very deep (>40"). These soils are slightly to moderately sodic with sodicity increasing with depth. Surface textures range from course sand to course sandy loam. Hazard of erosion by water is slight to moderate. Hazard of erosion by wind is very high.

Soil survey map unit components correlated to this ecological site include:

Navajo County Central Part (AZ633) Soil Map Unit's - 8 & 37 Marcou;

Little Colorado Area (AZ707) Soil Map Unit's - 6 & 62 Tuba, 57 Sheppard;

Hopi Area (AZ714) Soil Map Unit's -30 & 34 Sheppard;

Fort Defiance Area AZ/NM (AZ715) Soil Map Unit's - 21 & 57 Marcou family

Table 4. Representative soil features

Parent material	(1) Eolian sands–sandstone
Surface texture	(1) Sand (2) Fine sand (3) Coarse sandy loam
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	102–203 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0–101.6cm)	2.54–12.7 cm
Electrical conductivity (0–101.6cm)	8–16 mmhos/cm
Sodium adsorption ratio (0–101.6cm)	5–30
Soil reaction (1:1 water) (0–101.6cm)	7.9–9
Subsurface fragment volume ≤3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

An ecological site is not a precise assemblage of species for which the proportions are the same from place to place or from year to year. In all plant communities, variability is apparent in productivity and occurrence of individual species. Spatial boundaries of the communities; however, can be recognized by characteristic patterns of species composition, association, and community structure. The historic climax plant community for this ecological site has

been described by sampling relict or relatively undisturbed sites and/or reviewing historic records. The historic climax plant community is the plant community that evolved over time with the soil forming process and long term changes in climatic conditions of the area. It is the plant community that was best adapted to the unique combination of environmental factors associated with the site.

Natural disturbances, such as drought, fire, grazing of native fauna, and insects, are inherent in the development and maintenance of these plant communities. The effects of these disturbances are part of the range of characteristics of the ecological site. Fluctuations in plant community structure and function caused by the effects of natural disturbances help establish the boundaries and characteristics of an ecological site. They are accounted for as part of the range of characteristics of the ecological site. Recognizable plant community phases are identified in the reference state of the ecological site. Some sites may have a small range of variation, while others have a large range. Some plant community phases may exist for long periods of time, while others may only occur for a couple of years after a disturbance.

Deterioration of the plant community, hydrology, or soil site stability on an ecological site can result in crossing a threshold or potentially irreversible boundary to another state, or equilibrium. This can occur as a result of the loss of soil surface through erosion, the loss of the stability of the site due to disturbances that cause active erosion on the site, increases in the amounts and/or patterns or runoff from rainstorms, changes in availability of surface and subsurface water, significant changes in plant structural and functional types, or the introduction of non-native species. When these thresholds are crossed, the potential of the ecological site to return to the historic climax plant community can be lost, or restoration will require significant inputs. There may be multiple states possible for an ecological site, determined by the type and or severity of disturbance.

The known states and transition pathways for this ecological site are described in the state and transition model. Within each state, there may be one or more known plant community phases. These community phases describe the different plant community that can be recognized and mapped across this ecological site. The state and transition model is intended to help land users recognize the current plant community on the ecological site, and the management options for improving the plant community to the desired plant community.

Plant production information in this site description is standardized to the annual production on an air-dry weight basis in near normal rainfall years.

State and transition model

35.2 Sandy Upland 6-10" p.z. Sodic

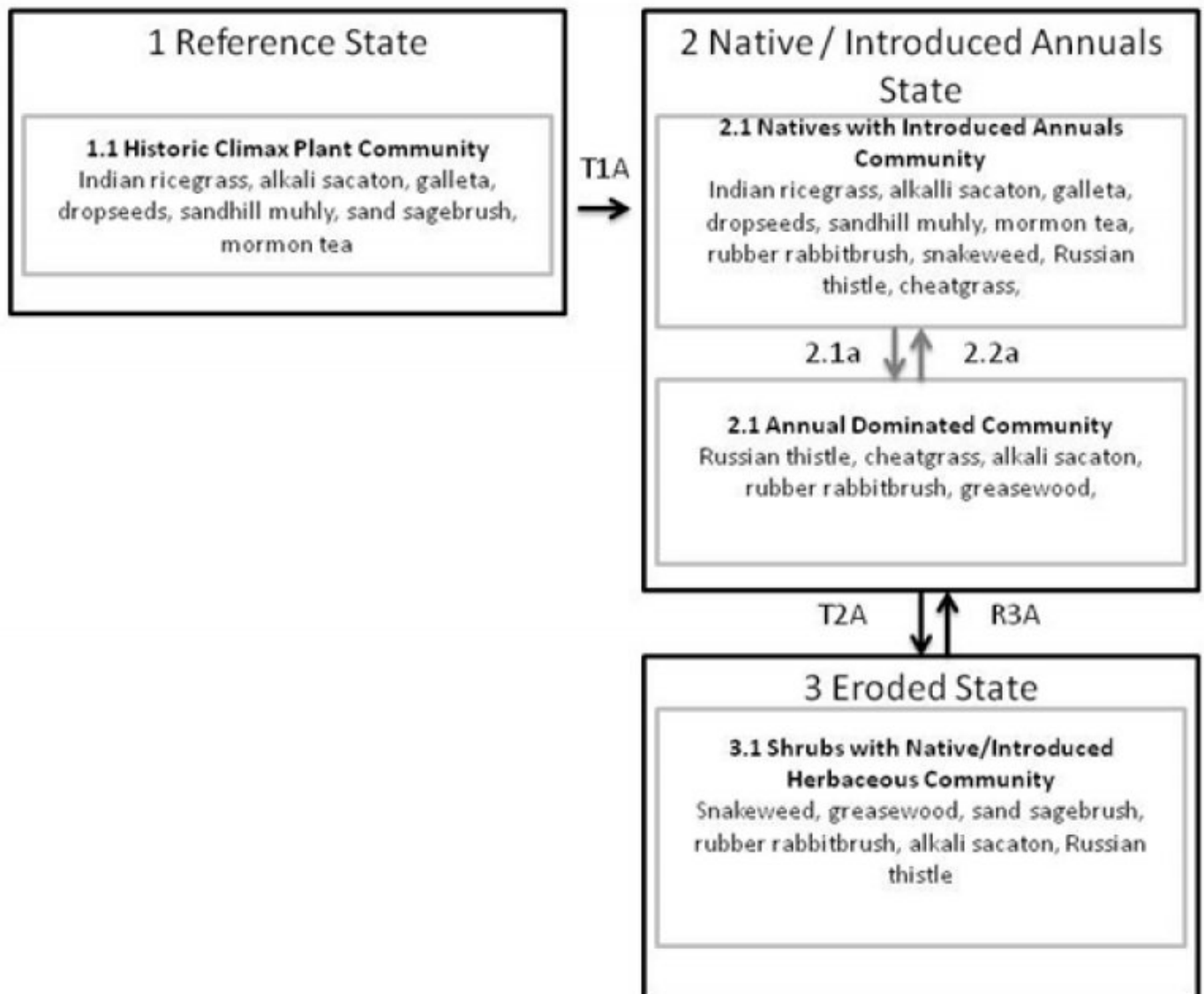


Figure 4. 35.2 SandyUplandSodic S&T

State 1 Reference State

This state includes the Historic Climax Plant Community (HCPC). This site is characterized as a perennial grassland with a few scattered shrubs and forbs.

Community 1.1 Historic Climax Plant Community



Figure 5. Sandy Upland 6-10" p.z. Sodic

This site is characterized as a perennial grassland with both warm and cool season grasses and scattered shrubs and forbs. Dominant warm season grasses are alkali sacaton and dropseeds with some galleta. Cool season grasses present are Indian ricegrass and squirreltail. Fourwing saltbush is the most common shrub, with Mormon tea and rubber rabbitbrush also occurring on the site. This site may have a minor amount of non-native annuals present (<5%) in the community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	280	465	633
Shrub/Vine	28	45	73
Forb	22	34	39
Total	330	544	745

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-15%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	50-75%

State 2
Native with Introduced Annuals State

This plant community is characterized as a perennial grassland with introduced non-native annuals.

Community 2.1

Natives with Introduced Annuals Community



Figure 7. Grassland Community with Exotic Annuals

This plant community is characterized as a grassland with a reduction in native perennial grasses and introduced non-native annuals. Shrubs species such as Mormon tea, rubber rabbitbrush and broom snakeweed are likely to increase on the site.

Figure 8. Plant community growth curve (percent production by month). AZ3521, 35.2 6-10" p.z. all sites. Growth begins in the spring and continues through the summer. Most growth in this CRA occurs in the spring using stored winter moisture..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	9	20	27	14	10	11	5	3	0	0

State 3
Eroded State

The factors that may contribute to a disturbed state include prolonged drought, unmanaged grazing, off road vehicle use, and other possible disturbances. There is a loss of soil surface stability and hydrologic function as perennial herbaceous cover is removed. The soil surface has been severely degraded or lost, exposing the more sodic soil layer. This plant community has lower capability to capture and store moisture and now erodes readily.

Community 3.1
Shrubs with Native / Introduced Herbaceous Community



Figure 9. Disturbed Site



Figure 10. Disturbed surface - scattered grasses and annuals

Scattered shrubs and native and non native grasses and forbs occur on the more stable areas. Low site resistance to erosion. The site has active wind erosion and dune forming processes occurring.

Transition T1A
State 1 to 2

Introduction and establishment of of exotic annual grasses and forbs.

Transition T2A
State 2 to 3

Disturbance to soil surface; drought; repeated fire; continuous improper grazing. Loss of soil stability and hydrologic function.

Restoration pathway R3A
State 3 to 2

Normal precipitation patterns for several years good management of grazing, vehicles, and other disturbances that reduce herbaceous cover or disturb the soil on the site will allow the dunes to stabilize and revegetate. Planting may help stabilize critical areas.

Conservation practices

Critical Area Planting
Access Control
Prescribed Grazing

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Grasses			280–656	
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	112–168	–
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–84	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–84	–
	giant dropseed	SPGI	<i>Sporobolus giganteus</i>	0–84	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	28–84	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	28–56	–
	squirreltail	ELELE	<i>Elymus elymoides ssp. elymoides</i>	0–28	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	0–28	–
	Grass-like, perennial	2GLP	<i>Grass-like, perennial</i>	0–17	–
	Grass, annual	2GA	<i>Grass, annual</i>	0–11	–
Forb					
2	All Forbs			22–39	
	Forb, perennial	2FP	<i>Forb, perennial</i>	6–17	–
	Forb, annual	2FA	<i>Forb, annual</i>	6–11	–
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	0–6	–
	small-leaf globemallow	SPPA2	<i>Sphaeralcea parvifolia</i>	0–6	–
Shrub/Vine					
3	Shrubs			28–90	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	6–28	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–17	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–11	–
	Cutler's jointfir	EPCU	<i>Ephedra cutleri</i>	0–11	–
	rubber rabbitbrush	ERNAB2	<i>Ericameria nauseosa ssp. nauseosa var. bigelovii</i>	0–11	–
	rubber rabbitbrush	ERNAC2	<i>Ericameria nauseosa ssp. consimilis</i>	0–11	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–11	–
	common dunebroom	PAFI4	<i>Parryella filifolia</i>	0–6	–
	frosted mint	POIN3	<i>Poliomintha incana</i>	0–6	–
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	0–6	–

Animal community

This site is suitable for yearlong grazing by cows and calves, stocker cattle, sheep, goats and horses and is easily traversed by all classes of livestock.

Prescribed Grazing systems adapt very well to use on this site. Soils on this site have high wind erosion hazard, particularly on overgrazed areas, roads, cattle trails and concentration areas.

This site offers a fair diversity in the vegetative complex for wildlife but has a shortage of available water except in livestock developed water. In higher condition classes the site is most suitable to grassland wildlife species. As retrogression occurs the woody species increase and wildlife species utilizing the site may change.

Hydrological functions

Hydrology at this site is affected by the presence of both annual grasses and forbs and by the presence of sodium salts.

Topographically higher areas which have eolian sand at their surface have an increased demand for water in the early spring as annual grasses and forbs increase. While there is sodium present in these areas, the amount does not limit the pounds per acre production of vegetation as long as suitable vegetation is present.

Areas at the same site which have been scoured of sand and any mineral clay deposits have an increased amount of sodium salts at the surface. This is due to precipitation collecting at the soil surface which may cause salts to collect from other areas on the site and seal due to the sodium. Vegetation is no longer supported at these sites. There is increased evaporation, as precipitation cannot penetrate the soil surface.

Ultimately, as there is an increase in annual grasses and forbs, and increasing wind and water damage on these sites from disturbance, there will be a net decrease in water availability for the site. Ground water recharge will be decreased as the demand for water increases from both non-native and early-season species and increased evaporation from increased sodium salts and soil sealing.

Recreational uses

Site is typically low, gently rolling plains and fans. It produces high desert grasslands which can be very picturesque.

Winters are cold, however, relatively mild spring, fall and summer months are attractive to recreationists.

Activities include hunting, cross-country riding, photography, hiking, rock collecting, and wildlife observation.

Wood products

No useful wood products are readily available from this site.

Type locality

Location 1: Navajo County, AZ	
Township/Range/Section	T25N R13E S22
General legal description	State location is Section 22, T25N, R13E. 2.5 miles west of Garces Mesa on the Hopi Reservation.

Other references

Updates and revisions for this ESD were conducted as part of a 2007-2012 Interagency Technical Assistance Agreement between the Bureau of Indian Affairs–Navajo Region and the NRCS-Arizona.

Contributors

Jennifer Puttere
Larry D. Ellicott
Steve Barker

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)	Steve Cassady, Jennifer Puttere
Contact for lead author	State Rangeland Management Specialist, NRCS-Arizona State Office, Phoenix, AZ
Date	12/13/2010
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Some rills occurring on steeper slopes. An average of 4 or 5 times on a 150 foot tape with an average width of 6 inches is common.

2. **Presence of water flow patterns:** Rarely present, but may occur a few times on a 150 foot tape with an average width of 1 to 2 feet.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 50-75%

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** Common, not continuous wind-scoured areas with a size less than 20x20 feet; area is mostly covered in eolian sand generally no more than about 4 inches thick.

7. **Amount of litter movement (describe size and distance expected to travel):** Grass and shrub litter tends to stay in place; grass seeds tend to disperse further from the plant and there are scattered areas with a small amount of herbaceous litter that has been transported by water or wind.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Average soil surface stability is 1-2, both under canopy and in the interspaces.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil textures are typically sand to loamy sand with a thickness of 1 to 4 inches. Soil surface structure is mostly single grain, loose. Some soils will have weak medium platy. This ecological site is low in organic matter; a typical soil profile in this site lacks diagnostic soil horizons and may have a structureless sodium-affected layer at an average depth of around 20 inches; this layer is difficult to excavate.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Shrubs are scattered throughout the site, but tend to be clumped together. Herbaceous vegetation generally uniformly occurs within the interspaces. In wind-scoured areas devoid of surface sand there is generally no vegetation as this is where the sodium layer may be exposed.
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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):** This site may have a sodium-affected layer between 5 and 20 inches; this layer is structureless and may be mistaken for a compaction layer as it is difficult to excavate. This salt-affected layer may be exposed in areas where the surface sand has been scoured or blown off the soil surface.
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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: Warm season perennial grasses >
- Sub-dominant: >Cool season perennial grasses >>
- Other: Shrub/vine > Forbs
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There may be some evidence of plant mortality in the perennial bunchgrasses such as stem remnants and standing dead; there may also be dead material at the base of actively growing perennial bunchgrasses and shrubs. The total amount of evident plant mortality may reach as high as 10% but should not exceed that amount.
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14. **Average percent litter cover (%) and depth (in):**
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Average annual production on this site is expected to be 450 to 550 lbs/ac in a year of average annual production.
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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:** Invasives that can be expected in minor amounts are Russian thistle.
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17. **Perennial plant reproductive capability:** Natural limitations to reproductive capability are weather-related, herbivory or disease that reduces reproductive capability.
