USDA Natural Resources Conservation Service

Ecological site R035XB220AZ
Shale Upland 6-10" 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.

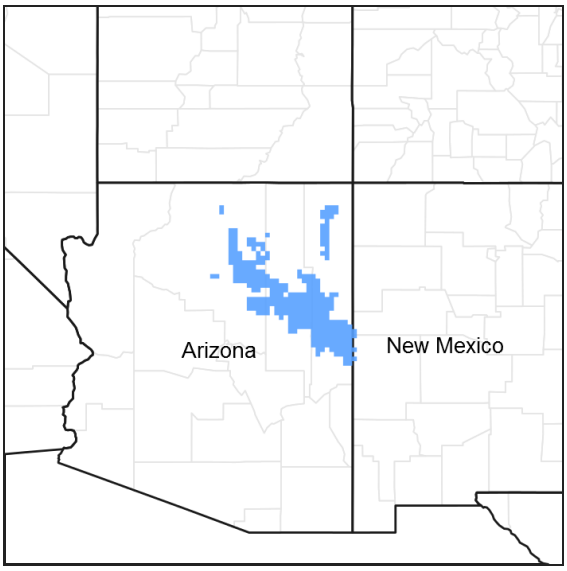

Figure 1. Mapped extent

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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex obovata* (2) *Atriplex confertifolia*
Herbaceous	(1) *Sporobolus airoides* (2) *Pleuraphis jamesii*

Physiographic features

This site occurs on gently sloping plains, plateaus or fan remnants. Also occurs on summits and footslopes of mesas and buttes, hills and escarpments, and pediments. Slopes generally range from 0 to 15 percent, but can reach up to 25 percent for short distances.

This site occurs in an upland position. It neither benefits from run-in moisture nor sustains excessive runoff unless denuded of its vegetation.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Plateau (3) Fan remnant
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Very rare to rare
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	Rare to occasional
Elevation	1,158–1,768 m
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

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

Soil features

Soils in this site are shallow and well drained to the parent material. Highly weathered clayey shale is the parent material. The surface layer is clay, silty clay, or clay loam. The substratum is clay or silty clay. The soils are typically saline/sodic to sodic. Permeability is very slow. Available water capacity is 1 to 3 inches. Salinity is low to high. The water erosion hazard is moderate to severe and the wind erosion hazard is slight. Effective rooting depth is typically shallow into the fractured parent material.

Typical taxonomic units include:

SSA 631 Coconino County Central MU 19 Epikom; SSA 633 Navajo County Central MU's 3 Torriorthents, 13 Claysprings, 59 Shalet;

SSA 635 Apache County Central MU's CcC & CDB Claysprings, RO Rough Broken Land,
SSA-707 Little Colorado Area MU's 6-Huerfano, 38-Hanksville;
SSA 713 Navajo Mt. MU 28-Claysprings;
SSA 714 Hopi MU 1 Bacobi.
SSA 715 Ft. Defiance MU's 8-Torriorthents, 23 & 24-Claysprings family, 24 & 94-Somorent family.

Table 4. Representative soil features

Parent material	(1) Alluvium–clayey shale
Surface texture	(1) Clay (2) Silty clay (3) Clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to moderately rapid
Soil depth	25–51 cm
Surface fragment cover <=3"	5–80%
Available water capacity (0-101.6cm)	2.54–7.62 cm
Electrical conductivity (0-101.6cm)	4–16 mmhos/cm
Soil reaction (1:1 water) (0-101.6cm)	7.4–9

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

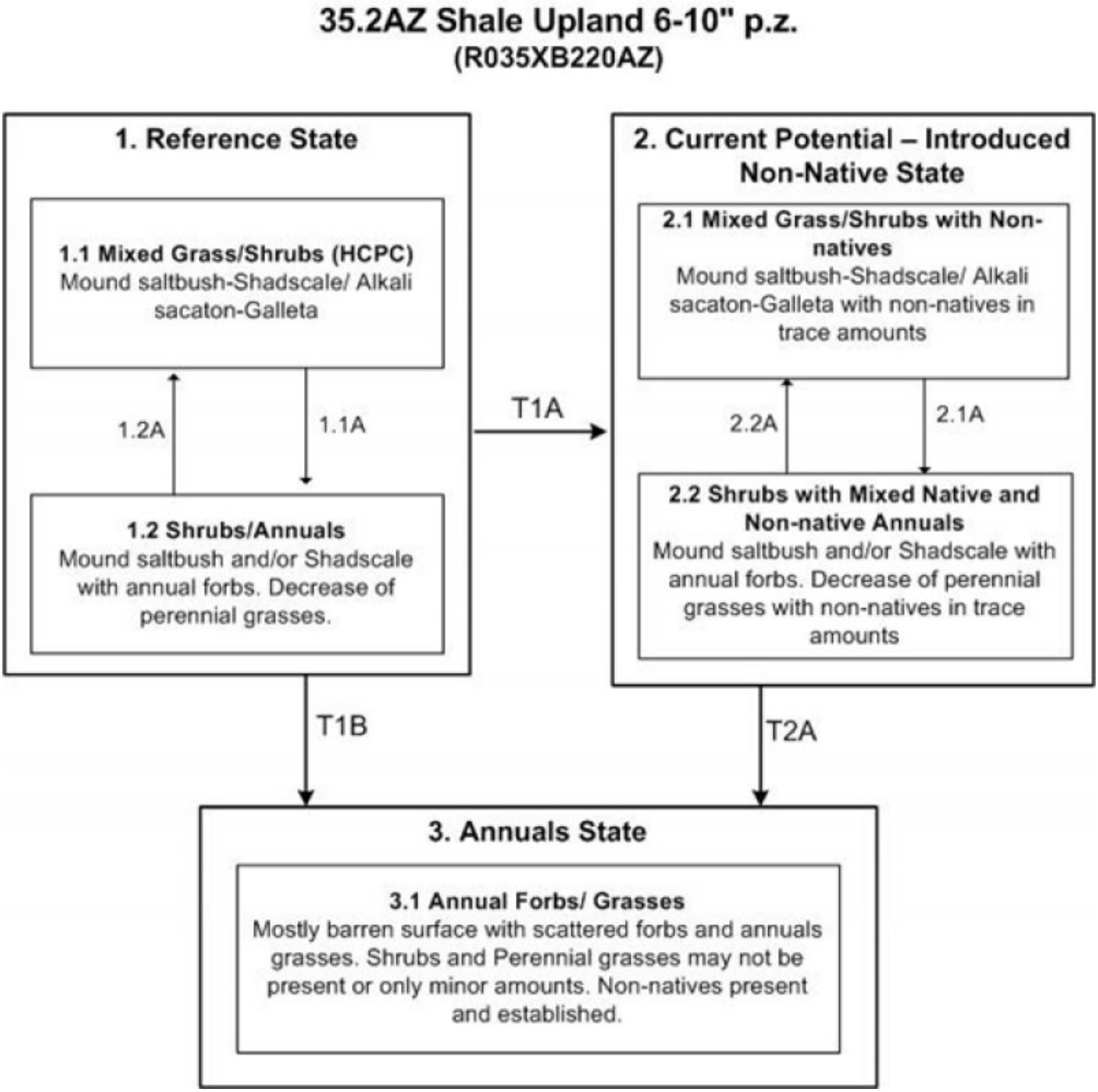

Figure 4. Shale Upland 6-10"p.z.

State 1
Reference State

The general aspect of the site is made up of primarily mid and short grasses with a significant percentage of cold desert shrubs and a few forbs. In the original plant community there is a mixture of both cool and warm season grasses. Plant species most likely to invade or increase on this site when it deteriorates are saltbushes, broom

snakeweed and annuals. Continuous grazing during the winter and spring periods will decrease the cool season grasses, which are replaced by warm season, lower forage value grasses and shrubs.

Community 1.1
Historic Climax Plant Community

The mixed shrubs/grass plant community is made up of primarily mid and short grasses with a significant percentage of cold desert shrubs and a few forbs. The plant composition for the site is typically 65-70% grasses, 5-10% forbs and 20-25% shrubs. Plant species most likely to invade or increase on this site when it deteriorates are broom snakeweed and annuals. Continuous grazing during the winter and spring periods will decrease the cool season grasses, which are replaced by warm season, lower forage value grasses and shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	55	110	219
Shrub/Vine	17	34	67
Forb	7	12	26
Total	**79**	**156**	**312**

Figure 6. 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

Figure 7. Plant community growth curve (percent production by month). AZ5201, 35.2 6-10" p.z. galleta. Growth begins in spring, most growth occurs during summer rains..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	10	15	35	5	0	0	0

Figure 8. Plant community growth curve (percent production by month). AZ5203, 35.2 6-10" p.z. alkali sacaton. Growth begins in the spring, most growth occurs in the summer, goes dormant in the fall..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	10	20	20	10	5	0	0

Community 1.2
Shrubs with annuals

Figure 9. Shrubs with annual forbs with scattered grass

Mound saltbush and/or shadscale dominate with an increase of annual forbs. There is a decrease of perennial grasses such as alkali sacaton, gallata. Common forbs include mealy goosefoot, spring parsley, annual buckwheats, globemallow and spectaclepod

Pathway 1.1A
Community 1.1 to 1.2

Drought, Continuos grazing/improper grazing

Pathway 1.2A
Community 1.2 to 1.1

Favorable climate (wet), Time with lack of surface disturbance, prescribed grazing.

State 2
Current Potenial, Introduced Non-Native State

Community 2.1
Mixed Grass/Shrubs with Non-Natives

This plant community is very similar to the Mixed Shrubs/Grasses plant community except with trace amounts of non-native annuals such as cheatgrass and Russian thistle

Community 2.2
Shrubs with Mixed Natives and Non-native Annuals

Mound saltbush and/or shadscale dominate with an increase of native and non-native annual forbs and grasses. There is a decrease of perennial grasses such as alkali sacaton, gallata. Common annuals include mealy goosefoot, spring parsley, annual buckwheats, globemallow, spectaclepod, cheatgrass and Russian thistle.

Pathway 2.1A
Community 2.1 to 2.2

Drought, Continuous grazing/improper grazing management

Pathway 2.2A
Community 2.2 to 2.1

Favorable climate (wet), Time with lack of surface disturbance, prescribed grazing.

State 3
Annuals State

(3.1) Annual Forbs/Grasses - This plant community is characterized by a dominance of scattered native and non-native forbs and annuals with mostly barren surface. Shrubs and perennial grasses may not be present or only present in minor amounts.

Transition T1A
State 1 to 2

Introducting of non-native annuals create a irreversible change in the plant community.

Transition T1B
State 1 to 3

Severe drought, sometimes followed by large storm events, continuous improper grazing management, off-road vehicle traffic, invasion/establishment of annuals.

Transition T2A
State 2 to 3

Severe drought followed by large storm events, continuous improper grazing and management, off-road vehicle traffic, invasion/establishment of annuals.

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					
0				101–118	
	alkali sacaton	SPAI	*Sporobolus airoides*	43–67	–
	James' galleta	PLJA	*Pleuraphis jamesii*	26–43	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–9	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	0–9	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–9	–
1				0–9	
	sixweeks grama	BOBA2	*Bouteloua barbata*	0–6	–
	Madagascar dropseed	SPPY2	*Sporobolus pyramidatus*	0–3	–
Forb					
2				9–17	
	globemallow	SPHAE	*Sphaeralcea*	3–7	–
	Forb, annual	2FA	*Forb, annual*	3–7	–
	touristplant	DIWI2	*Dimorphocarpa wislizeni*	2–3	–
	nodding buckwheat	ERCE2	*Eriogonum cernuum*	0–2	–
	divergent buckwheat	ERDI5	*Eriogonum divaricatum*	0–2	–
	mealy goosefoot	CHIN2	*Chenopodium incanum*	0–2	–
	springparsley	CYMOP2	*Cymopterus*	0–2	–
Shrub/Vine					
3				17–43	
	mound saltbush	ATOB	*Atriplex obovata*	9–26	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	9–17	–
4				0–2	
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–2	–
	Whipple cholla	CYWH	*Cylindropuntia whipplei*	0–2	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–2	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–2	–

Animal community

These are vry unproductive sites which require very large acreages to spport a livestock operation. Problems of proper stock distribution occur primarily because of the lack of water developments. This site will seldom be used as a key management area for livestock.

This site has a fair diversity in the plant community, however it is primarily adapted to grassland wildlife species.

Recreational uses

The stark bareness of this site provides an interesting scene.
Winters are cold. However, moderate spring, summer and fall temperatures make the site attractive to recreationists.
Potential activities are cross-country riding, rockhounding, and photography.

Type locality

Location 1: Coconino County, AZ	
General legal description	On the Turquoise Ranch located 8 miles north of Winslow Radio Station.

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

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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)	Kenneth Gishi
Contact for lead author	State Rangeland Management, NRCS-Arizona State Office
Date	07/02/2012
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Somewhat common, especially on steepest slopes. Rills less than 10 feet long due to fine-textured soils and scattered perennial plant cover. Sites armored with coarse fragments (gravels and channers) will have shorter rills and less frequent.

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2. **Presence of water flow patterns:** Somewhat common throughout site. Water flow patterns may be long with low sinuosity and connected on steeper slopes. On sites armored with coarse fragments will have less evidence of flow patterns, but still common. Water flow patterns will show some signs of deposition.

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3. **Number and height of erosional pedestals or terracettes:** Some long-lived plants may show some slight pedestals of less than a ½" on slopes. Terracettes are few.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Expected bare ground range 25-50 depending on surface fragments. Well developed, intact biological crust should not be counted as bare ground.

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5. **Number of gullies and erosion associated with gullies:** None to very few. When site is well vegetated and covered with rock fragments gullies are stable and will only show minor signs of active erosion.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Deposition and blowouts by wind are not expected.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement or redistribution by water is common and expected in water flow patterns. Some litter removal in water flow patterns is expected.

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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):** The expected average soil stability is 3 or 4. Surface fragments, litter, and vegetation cover aid in reducing erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon is 2 to 4 inches deep. Structure is mostly weak thin platy parting to moderate very fine granular structure. See specific soil survey for additional site information.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** This site is characterized by a relatively even distribution of perennial grasses with scattered half-shrubs and is well distributed across the site and lends to slowing runoff and allowing for moderate 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):** None

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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 (Alkali sacaton & galleta) > Salt tolerant Shrubs (Mound saltbush & Shadscale saltbush)

    Sub-dominant: Cool season perennial grasses > other half-shrubs > 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):** All plant functional groups are adapted to survival in all but the most severe droughts. Severe winter droughts affect the shrubs the most. Severe summer droughts affect grasses the most.

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14. **Average percent litter cover (%) and depth (in):** Herbaceous litter is not persistent on the site.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** The expected annual total production in an average year is 125 – 175 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:** Mound saltbush, annual buckwheats, scorpionweed and whitestem blazingstar are native to the site but may have the potential to increase with continued disturbance. Cheatgrass, annual wheatgrass, and Russian thistle are non-native annuals that have the potential to invade the site with or without disturbance.

17. **Perennial plant reproductive capability:** All plants native to the site are adapted to the climate and are capable of producing seeds, stolons, and/or rhizomes during the most severe droughts.