USDA Natural Resources Conservation Service

Ecological site R078BY090TX
Shallow Clay 19-26" PZ

Last updated: 9/15/2023
Accessed: 05/13/2025

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.

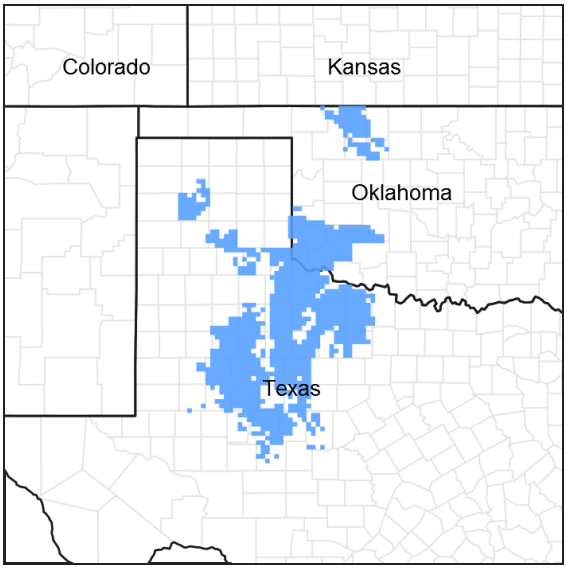


Figure 1. Mapped extent

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): 078B–Central Rolling Red Plains, Western Part

MLRA 78B is characterized by strongly dissected, rolling plains with prominent ridges and valleys and rolling to steep irregular topography. Loamy soils are generally well drained, range from shallow to deep, and developed in sediments of Triassic and Permian age.

LRU notes

NA

Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296.

Ecological site concept

These sites occur on shallow clay soils on uplands. The reference vegetation is short and midgrasses with forbs and scattered woody plants. Abusive grazing practices can lead to a shift in the plant community. Without periodic

fires or alternative brush management, woody species may increase on the site.

Associated sites

R078BY072TX	**Clay Loam 19-26" PZ** Deep clay loam soils on uplands
R078BY076TX	**Gyp 19-26" PZ** Very shallow soils over gypsum
R078BY091TX	**Very Shallow 19-26" PZ** Very shallow loams on uplands

Similar sites

R078BY092TX	**Very Shallow Clay 19-26" PZ** Very Shallow site in MLRA 78B. Both sites have similar physiographic positions on the landscape.

Table 1. Dominant plant species

Tree	(1) *Prosopis glandulosa*
Shrub	Not specified
Herbaceous	(1) *Bouteloua gracilis* (2) *Bouteloua curtipendula*

Physiographic features

This site occurs as small ridges or knolls on gently undulating terrain. Portions of the site may occur as small drainages. Slopes are gentle to steep sloping. It is an upland site.

Table 2. Representative physiographic features

Landforms	(1) Plains > Ridge (2) Plains > Hill (3) Plains > Pediment
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	305–914 m
Slope	1–30%
Water table depth	152–203 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of the western rolling plains is dry, sub-humid with hot summers and mild winters. Temperatures often reach 100 degrees F for several consecutive days during summer. Cold spells with temperatures less than 20 degrees F only last short periods of time. The soil is not frozen below the 3-inch depth for more than 2 to 3 days. Humidity is low during the winter and early spring months. Sometimes relative humidity is high enough to make summer days uncomfortable. Most of the precipitation comes in the form of rain and occurs during the spring and early summer principally. May is the wettest month followed by June. July and August are dryer and much hotter. Rainfall often comes as intense showers of relatively short duration. Rainfall rate per hour is often high and runoff is significant. Infiltration is diminished due to lack of opportunity time. The growing season begins in April and ends with the first killing frost in Nov. There is little snowfall with the average being about 10 inches. Rainfall averages about 22 inches.

There is a 70% chance that yearly precipitation will fall between 16 and 24 inches. About 55% of the time, the yearly rainfall is below the mean. Dry spells during the growing season are common and long-term droughts occur in cycles of about 20 years. Native vegetation is principally warm season.

Table 3. Representative climatic features

Frost-free period (characteristic range)	189-194 days
Freeze-free period (characteristic range)	204-222 days
Precipitation total (characteristic range)	584-610 mm
Frost-free period (actual range)	184-201 days
Freeze-free period (actual range)	202-223 days
Precipitation total (actual range)	559-635 mm
Frost-free period (average)	192 days
Freeze-free period (average)	213 days
Precipitation total (average)	584 mm

Climate stations used

- (1) JAYTON [USC00414570], Jayton, TX
- (2) ROBERT LEE [USC00417669], Robert Lee, TX
- (3) SNYDER [USC00418433], Snyder, TX
- (4) PADUCAH [USC00416740], Paducah, TX
- (5) WELLINGTON [USC00419565], Wellington, TX

Influencing water features

Moderate to moderately rapid runoff. Moderately slow infiltration. High evaporation rates.

No wetlands occur within the ecological site.

Wetland description

NA

Soil features

The soils for this site are shallow clays and clay loams that are moderately to slowly permeable. Soil depth is less than 14 inches over shaley to clayey redbed deposits. Slopes range from 1 % to as much as 30%. If the soil surface is not protected by vegetation, runoff can be very rapid and water erosion can be severe. Fertility is moderate and water holding capacity is moderately low. These soils tend to be droughty and have only a moderate productive capacity.

Major Soil Taxonomic Units correlated to this site include: Vernon Clay Loam, Vernon-Quinlan complex, Vernon-Weymouth complex

Table 4. Representative soil features

Parent material	(1) Residuum–shale and siltstone
Surface texture	(1) Clay loam (2) Clay
Family particle size	(1) Clayey
Drainage class	Well drained

Permeability class	Very slow to slow
Soil depth	51–102 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	3.56–12.95 cm
Calcium carbonate equivalent (0-101.6cm)	0–20%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–15
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–9%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

This mid and short grass site is characterized by blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), with smaller amounts of buffalograss (Buchloe dactyloides), little bluestem (*Schizachyrium scoparium*), tobosa (Hilaria mutica), slim tridens (*Tridens muticus*) and sand dropseed (*Sporobolus cryptandrus*). Forbs are generally few with the major species being Indian blanket (*Gaillardia pulchella*), scarlet globemallow (*Sphaeralcea coccinea*), slimleaf scurfpea (Psoralea tenuiflora), primrose spp. (Oenothera spp.), ratany (*Krameria lanceolata*), and many annual forb species. Shrubs are few in historic climax but can increase to moderate amounts with invasion and poor management. Major shrub species include mesquite (*Prosopis glandulosa*), lotebush (Zizyphus obtusifolia), wolfberry (*Lycium berlandieri*), and redberry juniper (*Juniperus pinchotii*). Broom snakeweed (Guterrizea sarothrae) can also invade this site. With poor cover, annual forbs can dominate the site.

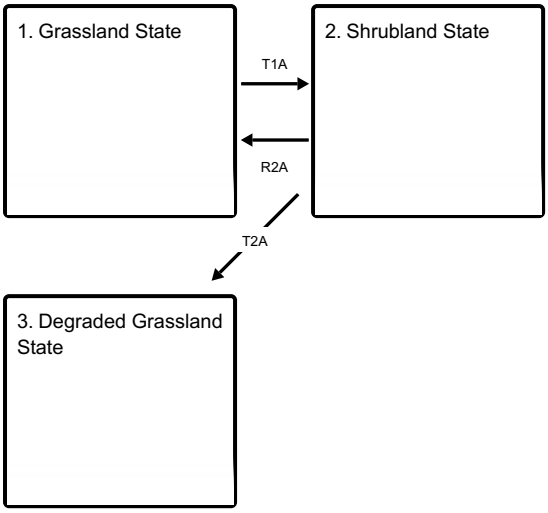
Productivity is low due to shallow, clayey soils which have rather poor soil, plant, water relationships. Bare soil can be as much as 50 % even when the site is in good condition. Fire most likely had a role in shaping vegetation in historic climax and may have helped to suppress woody shrubs that may have had a tendency to invade the site. For fire to be effective in suppressing woody plants, a good grass fuel supply had to prevail. In many cases today, fuel is probably the limiting factor for an effective fire. Once water erosion has stripped away much of the already shallow topsoil, the productivity of the site is vastly lowered. In good rainfall years, the site will produce more forb growth and the few tall grass species growing on the site will be more visible. In drouthy years, shortgrass vegetation will prevail. With excessive runoff, this site will contribute to siltation downstream. Good grazing management is essential to maintaining a sufficient vegetative cover that will positively affect water quality and produce a reasonable amount of high quality forage for livestock grazing. A combination of poor management and dry growing seasons for a period of years can lead to a very degraded plant community that is dominated by annual forbs, woody shrubs, and a few short grasses. Due to its inherent high erosion potential and drouthy nature, this site may be difficult to manage. This site lacks cover needed for habitat for most wildlife species, although scaled quail are often seen feeding. Many small mammals, reptiles, and song birds use the site.

STATE AND TRANSITIONAL PATHWAYS (DIAGRAM):

Narrative:
The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances; it does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

Ecosystem states



T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R2A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

T2A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

State 1 submodel, plant communities

1.1. Mid/Shortgrass Community

State 2 submodel, plant communities

2.1. Shrub/Shortgrass Community

State 3 submodel, plant communities

3.1. Degraded Shortgrass/Annuals Community

State 1
Grassland State

The Grassland State is composed of mid and short warm-season grasses with a few forbs and few woody shrubs. Dominant grass species are blue grama and sideoats grama with small amount of mesquite and a few perennial forb species.

Dominant plant species

- honey mesquite (*Prosopis glandulosa*), tree
- blue grama (*Bouteloua gracilis*), grass

- sideoats grama (*Bouteloua curtipendula*), grass

Community 1.1
Mid/Shortgrass Community

Figure 8. 1.1 Mid/Shortgrass Community

The Mid/Shortgrass Community (1.1) is the interpretive or "reference" plant community for this site. This plant community is composed of mid and short warm-season grasses; traces of a few tallgrass species, good forb population, along with a few shrubs. Dominant grasses for this community include blue grama and sideoats grama. There is also a small amount of mesquite and perennial forbs found in this site.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	616	1143	1345
Forb	67	135	146
Shrub/Vine	28	62	84
Microbiotic Crusts	–	17	22
Tree	–	–	–
Total	**711**	**1357**	**1597**

Figure 10. Plant community growth curve (percent production by month). TX2040, Midgrass/Shortgrass Community with Forbs and Shrubs. Warm season mid and shortgrasses along with traces of tallgrasses, forbs, and shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	4	8	25	25	14	6	8	5	2	1

State 2
Shrubland State

The Shrub/Shortgrass Community (2.1) is composed of warm-season shortgrasses with mesquite. This community is also dominated by increasing woody canopy of shrubs such as mesquite and redberry juniper.

Dominant plant species

- mesquite (*Prosopis*), shrub
- Pinchot's juniper (*Juniperus pinchotii*), shrub

Community 2.1

Shrub/Shortgrass Community

Figure 11. 2.1 Shrub/Shortgrass Community

The Shrub/Shortgrass Community (2.1) is composed of warm-season shortgrasses with mesquite. This community is also dominated by increasing woody canopy of shrubs such as mesquite and redberry juniper. There are annuals invading the community as well. There is a dramatic increase in bare soil and water erosion.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	560	785	897
Forb	112	224	280
Shrub/Vine	112	168	202
Microbiotic Crusts	6	17	22
Tree	–	–	–
Total	**790**	**1194**	**1401**

Figure 13. Plant community growth curve (percent production by month). TX2041, Woody Shrubs and Shortgrasses. Mesquite, Juniper, and shortgrasses..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	5	15	25	22	10	6	8	5	1	1

State 3
Degraded Grassland State

The Degraded Grassland State is composed of degraded annuals and shortgrasses. Shortgrasses will continue to dominate the site with large components of annual grasses and forbs. There are also shrubs and half-shrubs present in this plant community.

Dominant plant species

- purple threeawn (*Aristida purpurea*), grass
- hairy grama (*Bouteloua hirsuta*), grass

Community 3.1
Degraded Shortgrass/Annuals Community

Figure 14. 3.1 Degraded Shortgrass/Annuals Community

The Degraded Shortgrass/Annuals Community is composed of degraded annuals and shortgrasses. Shortgrasses will continue to dominate the site with large components of annual grasses and forbs. There are also shrubs and half-shrubs present in this plant community. There are visible signs of accelerated surface erosion and gullies. This site has a low production potential and will not be able to be restored back to the Shrubland or Grassland State.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	224	392	560
Forb	224	336	336
Shrub/Vine	62	101	168
Microbiotic Crusts	6	22	22
Tree	–	–	–
Total	**516**	**851**	**1086**

Figure 16. Plant community growth curve (percent production by month). TX2022, Shortgrasses/Annual grasses/Shrubs . Shortgrasses, shrubs, and annuals having low production and being degraded..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	16	27	25	7	4	10	5	1	0

Transition T1A
State 1 to 2

With heavy continuous grazing pressure, no fires, and brush invasion of mesquite and juniper, the Grassland State will transition into the Shrubland State.

Restoration pathway R2A
State 2 to 1

With the use of various conservation practices such as Prescribed Grazing, Brush Management, and Prescribed Burning, the Shrubland State may be able to be restored back to the Grassland State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Transition T2A
State 2 to 3

With continual heavy grazing pressure, brush invasion of mesquite and juniper, no brush management, and no pest management, the Shrubland State will transition into the Degraded Grassland State.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Shortgrasses**			224–504	
	blue grama	BOGR2	*Bouteloua gracilis*	168–404	–
	buffalograss	BODA2	*Bouteloua dactyloides*	39–95	–
2	**Midgrasses**			168–364	
	sideoats grama	BOCU	*Bouteloua curtipendula*	112–269	–
	little bluestem	SCSC	*Schizachyrium scoparium*	45–101	–
3	**Tallgrasses**			45–101	
	big bluestem	ANGE	*Andropogon gerardii*	22–56	–
	Indiangrass	SONU2	*Sorghastrum nutans*	22–50	–
4	**Midgrasses**			73–157	
	tobosagrass	PLMU3	*Pleuraphis mutica*	34–78	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	22–56	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	11–34	–
5	**Mid/Shortgrasses**			73–157	
	purple threeawn	ARPU9	*Aristida purpurea*	6–22	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	6–22	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	6–22	–
	tumble windmill grass	CHVE2	*Chloris verticillata*	6–22	–
	ear muhly	MUAR	*Muhlenbergia arenacea*	6–22	–
	Hall's panicgrass	PAHA	*Panicum hallii*	6–22	–
	vine mesquite	PAOB	*Panicum obtusum*	6–22	–
	bristlegrass	SETAR	*Setaria*	6–22	–
6	**Cool Season Grasses**			34–78	
	Grass, annual	2GA	*Grass, annual*	11–28	–
	foxtail barley	HOJU	*Hordeum jubatum*	11–28	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11–28	–
Forb					
7	**Forbs**			67–146	
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–11	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–11	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–11	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–11	–

	Engelmann's daisy	ENGEL	*Engelmannia*	0–11	–
	Indian blanket	GAPU	*Gaillardia pulchella*	0–11	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–11	–
	stiffleaf false goldenaster	HEST3	*Heterotheca stenophylla*	0–11	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–11	–
	dotted blazing star	LIPU	*Liatris punctata*	0–11	–
	evening primrose	OENOT	*Oenothera*	0–11	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–11	–
	Drummond's skullcap	SCDR2	*Scutellaria drummondii*	0–11	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–11	–
	woodland germander	TESC	*Teucrium scorodonia*	0–11	–
	stiff greenthread	THFIF	*Thelesperma filifolium var. filifolium*	0–11	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	0–11	–
Shrub/Vine					
8	**Shrubs/Vines**			28–84	
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–17	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–17	–
	jointfir	EPHED	*Ephedra*	0–17	–
	Berlandier's wolfberry	LYBE	*Lycium berlandieri*	0–17	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–17	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	0–17	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–17	–
Tree					
9	**Trees**			0–6	
	Pinchot's juniper	JUPI	*Juniperus pinchotii*	0–6	–
	hackberry	CELTI	*Celtis*	0–1	–

Animal community

Native animals that occupy this site include Scaled quail, Bobwhite quail, Dove, small mammals, reptiles, and various predators such as coyotes, skunks, bobcats, and avian predators. This site lacks the cover aspect that whitetail deer and turkey may need, but nearby sites may furnish this element.

Hydrological functions

This is an upland site that contributes runoff to small streams and drainages. Good vegetative cover will lessen silt load into creeks and major streams.

Recreational uses

Hunting, Camping, Hiking, Birdwatching, Photography, and Horseback Riding.

Wood products

None.

Other products

None.

Other information

None.

Inventory data references

Based on long-term observation of well-managed ranges, range inventory data, and numerous historical accounts of vegetation present at time of settlement.

Inventory Data References: Several years of clipping data and numerous old range inventories have been reviewed.

Other references

J.R. Bell, USDA-NRCS Rangeland Management Specialist (retired)
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Hatch, Brown and Ghandi, Vascular Plants of Texas (An Ecological Checklist)
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Approval

Bryan Christensen, 9/15/2023

Acknowledgments

Site Development and Testing Plan:

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

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.

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Date	09/04/2007
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slight to moderate.

2. **Presence of water flow patterns:** Slight to moderate.

3. **Number and height of erosional pedestals or terracettes:** Slight to moderate.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 35 to 40% bare ground.

5. **Number of gullies and erosion associated with gullies:** Slight to moderate.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Slight to moderate.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Water erosion hazards are moderate to severe.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Clay to clay loam surfaces; moderate fine subangular blocky structure; very hard; firm; very sticky, plastic; many fine and common medium roots; moderate SOM.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Low vegetative cover and percent slopes makes this site susceptible to erosion.

This site is a very slowly permeable soil, runoff is medium to high depending on slope and available water holding capacity is moderate to high.

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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 shortgrasses >

    Sub-dominant: Warm-season midgrasses >

    Other: Forbs > Warm-season tallgrasses > Shrubs/Vines > Trees

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Plant mortality and decadence is minimal.

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14. **Average percent litter cover (%) and depth (in):** Litter is dominantly herbaceous.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 650 to 1,400 pounds per acre.

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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:** Mesquite, lotebush and pricklypear can be invasive.

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17. **Perennial plant reproductive capability:** All plant species should be capable of reproduction, except during periods of prolonged drought conditions, heavy natural herbivory, or intense wildfires.
