

Ecological site R087AY002TX Sandstone Hill

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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.

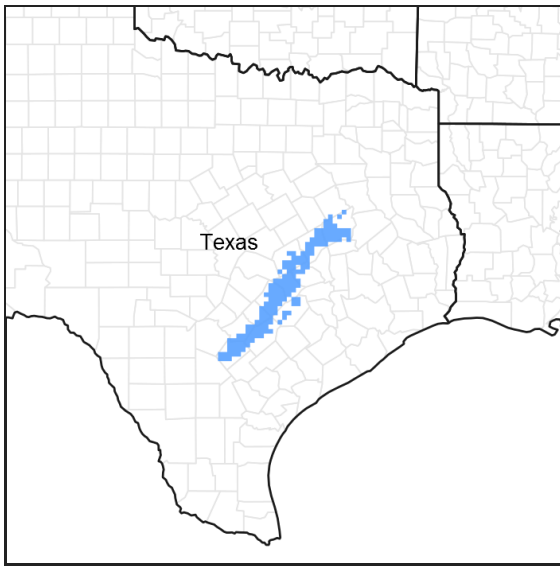


Figure 1. Mapped extent

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): 087A–Texas Claypan Area, Southern Part

This area is entirely in south-central Texas. It makes up about 10,535 square miles (27,295 square kilometers). The towns of Bastrop, Bryan, Centerville, College Station, Ennis, Fairfield, Franklin, Giddings, Gonzales, Groesbeck, La Grange, Madisonville, and Rockdale are in this MLRA. Interstate 45 crosses the northern part of the area, and Interstate 10 crosses the southern part. A number of State Parks are located throughout this area. The parks are commonly associated with reservoirs.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 87A

Ecological site concept

The site is characterized by large sandstone and ironstone cobbles and boulders on the surface. The sites are unique to the area and have been relatively free of plowing due to these restrictions.

Associated sites

R087AY003TX	Claypan Savannah Claypan Savannah
R087AY004TX	Deep Redland Deep Redland
R087AY005TX	Sandy Loam Sandy Loam
R087AY006TX	Sandy Sandy

Similar sites

R087AY005TX	Sandy Loam Sandy Loam
R087AY006TX	Sandy Sandy

Table 1. Dominant plant species

Tree	(1) <i>Quercus stellata</i> (2) <i>Quercus marilandica</i>
Shrub	(1) <i>Ilex vomitoria</i> (2) <i>Callicarpa americana</i>
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Sorghastrum nutans</i>

Physiographic features

This site occurs on steep ridges and breaks that are usually long and narrow in shape. Slopes range from 1 to 25 percent and the runoff ranges from high to very high.

Table 2. Representative physiographic features

Landforms	(1) Plains > Ridge
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	61–229 m
Slope	1–25%
Aspect	Aspect is not a significant factor

Climatic features

The climate for MLRA 87A is humid subtropical and is characterized by hot summers, especially in July and August, and relatively mild winters. The summer months have little variation in day-to-day weather except for occasional thunderstorms that dissipate the afternoon heat. The moderate temperatures in spring and fall are characterized by long periods of mild days and cool nights. The average annual precipitation in this area is 41 inches. Most of the rainfall occurs in spring and fall. The freeze-free period averages about 276 days and the frost-free period 241 days.

Table 3. Representative climatic features

Frost-free period (average)	241 days
Freeze-free period (average)	276 days

Precipitation total (average)	1,041 mm
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Climate stations used

- (1) BELLVILLE 6NNE [USC00410655], Bellville, TX
- (2) ELGIN [USC00412820], Elgin, TX
- (3) LA GRANGE [USC00414903], La Grange, TX
- (4) SMITHVILLE [USC00418415], Smithville, TX
- (5) CROCKETT [USC00412114], Crockett, TX
- (6) FAIRFIELD 3W [USC00413047], Fairfield, TX
- (7) SOMERVILLE DAM [USC00418446], Somerville, TX
- (8) BARDWELL DAM [USC00410518], Ennis, TX
- (9) FRANKLIN [USC00413321], Franklin, TX
- (10) MADISONVILLE [USC00415477], Madisonville, TX
- (11) GONZALES 1N [USC00413622], Gonzales, TX
- (12) COLLEGE STN [USW00003904], College Station, TX

Influencing water features

This site is not influenced by a stream.

Wetland description

Wetlands are not associated with this site.

Soil features

The soils are very shallow to very deep fine sandy loams with reddish clayey subsoils over stratified slightly indurated sandstone and/or ironstone with interbedded acid loamy materials. Some sites may not have any subsoil horizons and be extremely stony. The soils have a low to medium water holding capacity with moderate to low fertility levels which somewhat limits production. Sandstone and ironstone boulders and gravel cover 10 to 35 percent of the surface. Soils correlated to this site include: Hearne, Jedd, and Koether.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone
Surface texture	(1) Gravelly fine sandy loam (2) Cobbly sandy loam (3) Stony loamy sand
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Slow to very slow
Soil depth	18–203 cm
Surface fragment cover <=3"	5–10%
Surface fragment cover >3"	10–35%
Available water capacity (0-101.6cm)	2.54–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm

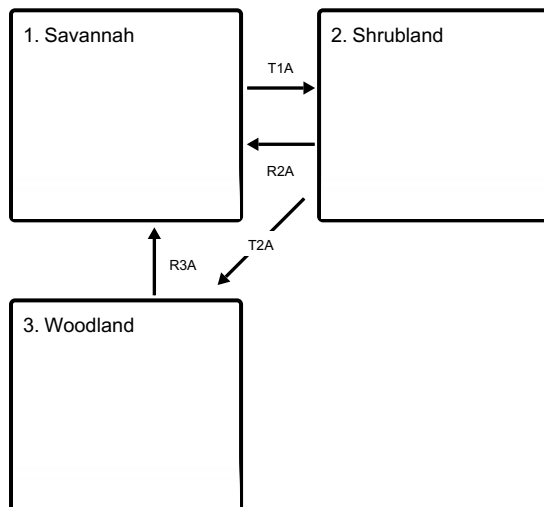
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	5–25%
Subsurface fragment volume >3" (Depth not specified)	1–20%

Ecological dynamics

The plant community composition and structure of the Sandstone Hill site evolved and was maintained by the grazing and herding effects of native wild large ungulates, periodic fires, and extreme climatic fluctuations. Continuous grazing by domestic livestock and the suppression of fire removes little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), tick clovers (*Desmodium* spp.), yellow neptunia (*Neptunia lutea*), and gayfeather (*Liatris* spp.). Less productive perennial and annual grasses and forbs will replace these plants. With continued continuous grazing, no brush management, and the absence of periodic fires, a community dominated by winged elm (*Ulmus alata*), eastern persimmon (*Diospyros virginiana*), mesquite (*Prosopis glandulosa*), yaupon (*Ilex vomitoria*), post oak (*Quercus stellata*), and eastern red cedar (*Juniperus virginiana*) will replace the savannah. The presence of large sandstone and ironstone boulders, as well as other rock fragments, coupled with landform position precluded the site from conversion to cropland and pastureland. These factors also limit treatment choices for land management decisions.

State and transition model

Ecosystem states



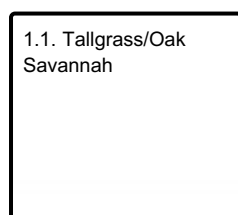
T1A - Abandonment, no fire, and/or no grazing management

R2A - Prescribed grazing, fire, and/or brush management

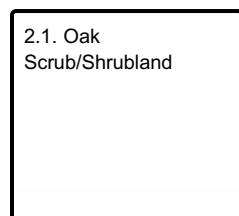
T2A - Abandonment, no fire, and/or no grazing management

R3A - Extensive brush management and/or herbicide applications

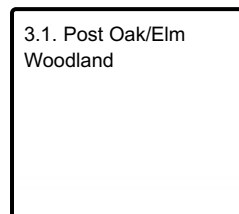
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1 Savannah

One community exists in the Savannah State, the 1.1 Tallgrass/Oak Savannah Community. The State is dominated by warm season perennial grasses and the overstory canopy cover is less than 20 percent.

Community 1.1 Tallgrass/Oak Savannah



The characteristic plant community of this site is the reference plant community. This community is an open savannah of moderate-sized post oak and blackjack oak (*Quercus marilandica*) associated with little bluestem, purpletop tridens (*Tridens flavus*), and Indiangrass. Forbs and legumes are components of the herbaceous community while shrubs and woody vines occupy space beneath the tree canopies. Large sandstone and ironstone boulders, as well as smaller rock fragments and gravel, cover 10 to 35 percent of the surface. Periodic fire and prescribed grazing are needed for the maintenance of the reference plant community. Continuous grazing and fire suppression tends to move the reference plant community towards an Oak Scrub/Shrubland Community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1569	2354	3138
Tree	336	504	673
Forb	224	336	448
Shrub/Vine	112	168	224
Total	2241	3362	4483

State 2 Shrubland

One community exists in the Shrubland State, the 2.1 Oak Scrub/Shrubland Community. The herbaceous production is not as great compared to the Savannah State, and overstory canopy has increased between 20 and 50 percent.

Community 2.1 Oak Scrub/Shrubland



This plant community is a transitional community between the Savannah and Woodland States. It develops in the absence of fire or mechanical or chemical brush management treatments. It is usually the result of abandonment following yearly continuous grazing. Trees and shrubs begin to replace the grassland component of the savannah community. In addition to the naturally occurring oaks, other woody species such as eastern persimmon, winged elm, and eastern red cedar increase in density and canopy coverage (20 to 50 percent). Remnants of little bluestem and Indiangrass may still occur, but the herbaceous component of the community becomes dominated by lesser producing grasses and forbs. Initially, species such as brownseed paspalum (*Paspalum plicatulum*), tall dropseed (*Sporobolus compositus*), and fall witchgrass (*Digitaria cognata*) replace the taller grasses. As the site continues to deteriorate, the plants which increase or invade on the site include sandbur (*Cenchrus* spp.), red lovegrass (*Eragrostis secundiflora*), Yankeeweed (*Eupatorium compositifolium*), bullnettle (*Cnidioscolus texanus*), croton (*Croton* spp.), snake cotton (*Froelichia* spp.), prickly pear (*Opuntia* spp.), Queen's delight (*Stillingia texanus*), beebalm (*Monarda* spp.), and baccharis (*Baccharis* spp.). Prescribed burning on a three to five year interval in conjunction with prescribed grazing may be a viable option for returning this site to a Tallgrass/Oak Savannah provided woody canopy cover is less than 50 percent and adequate herbaceous fine fuel exists. When this threshold is exceeded, mechanical or chemical brush control becomes necessary to move this community back towards the Savannah State.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	628	942	1255
Tree	538	807	1076
Shrub/Vine	314	471	628
Forb	291	437	583
Total	1771	2657	3542

State 3 Woodland

One community exists in the Woodland State, the Post Oak/Elm Woodland Community. The site is characterized by little herbaceous production. The overstory canopy is over 50 percent and shrubs also limit light to the surface.

Community 3.1 Post Oak/Elm Woodland



This plant community is a closed overstory (50 to 80 percent) woodland dominated by post oak, winged elm, blackjack oak, black hickory (*Carya texana*), and eastern red cedar. Understory shrubs and sub-shrubs include yaupon (*Ilex vomitoria*), farkleberry, possumhaw (*Ilex decidua*), and American beautyberry (*Callicarpa americana*). Woody vines also occur and include poison ivy (*Toxicodendron radicans*), grape (*Vitis* spp.), greenbriar (*Smilax* spp.), Virginia creeper (*Parthenocissus quinquefolia*), and peppervine (*Ampelopsis arborea*). A herbaceous understory is almost nonexistent, but shade tolerant species including longleaf woodoats (*Chasmanthium sessiliflorum*), cedar sedge (*Carex planostachys*), ironweed (*Veronia baldwinii*), and goldenrod (*Solidago* spp.) may occur in small amounts. Prescribed fire may be used to convert this site back to the Savannah State, but may require many consecutive years of burning due to light fine fuel loads. Chemical brush control on a large scale is usually not a treatment option on this site due to the herbicide resistance of yaupon. Individual plant treatment with herbicides on small acreage may be a viable option. Mechanical treatment and planting options on this site are limited due to the presence of large sandstone and ironstone boulders.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	785	1177	1569
Shrub/Vine	673	1009	1345
Grass/Grasslike	157	235	314
Forb	112	168	224
Total	1727	2589	3452

Transition T1A State 1 to 2

The Savannah State will transition to the Shrubland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 20 percent and grasses shift composition to more shade-tolerant species.

Transition R2A State 2 to 1

Restoration back to the Savannah State requires brush management, prescribed grazing and/or prescribed fire. Mechanical or chemical controls can be used to remove the woody overstory species and shrubs. Prescribed grazing may require destocking and/or deferment.

Transition T2A State 2 to 3

The Shrubland State will transition to the Woodland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 50 percent and grasses shift composition to more shade-tolerant species.

Restoration pathway R3A State 3 to 1

Restoration back to the Savannah State requires substantial energy inputs. Brush management and prescribed grazing will be needed to shift the community back. Mechanical or chemical controls can be used to remove the woody overstory species back below 20 percent. Prescribed grazing may require destocking and/or deferment to manage the understory grasses back to those found in the reference community. Prescribed fire may be a viable option if enough fine fuel still exists in the understory. More frequent than natural burns may be required to initiate a burning schedule.

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	Tallgrass			628–1289	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	628–1289	–
2	Tallgrasses			392–869	
	brownseed paspalum	PAPL3	<i>Paspalum plicatulum</i>	392–869	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	392–869	–
	purpletop tridens	TRFL2	<i>Tridens flavus</i>	392–869	–
3	Tallgrasses			157–336	
	beaked panicgrass	PAAN	<i>Panicum anceps</i>	157–336	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	157–336	–
4	Tall/Midgrasses			157–336	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	157–336	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	157–336	–
	sand lovegrass	ERTR3	<i>Eragrostis trichodes</i>	157–336	–
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	157–336	–
5	Mid/Shortgrasses			78–168	
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	78–168	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	78–168	–
	silver beardgrass	BOLAT	<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i>	78–168	–
	sedge	CAREX	<i>Carex</i>	78–168	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	78–168	–
	plains lovegrass	ERIN	<i>Eragrostis intermedia</i>	78–168	–
	purple lovegrass	ERSP	<i>Eragrostis spectabilis</i>	78–168	–
	Texas wintergrass	NALE3	<i>Nassella leucotricha</i>	78–168	–
	Hall's panicgrass	PAHA	<i>Panicum hallii</i>	78–168	–

Forb					
6	Forbs			224–448	
	Virginia dayflower	COVI3	<i>Commelina virginica</i>	224–448	–
	ticktrefoil	DESMO	<i>Desmodium</i>	224–448	–
	Engelmann's daisy	ENPE4	<i>Engelmannia peristenia</i>	224–448	–
	coastal indigo	INMI	<i>Indigofera miniata</i>	224–448	–
	lespedeza	LESPE	<i>Lespedeza</i>	224–448	–
	littleleaf sensitive-briar	MIMI22	<i>Mimosa microphylla</i>	224–448	–
	yellow puff	NELU2	<i>Neptunia lutea</i>	224–448	–
	prairie snoutbean	RHLA5	<i>Rhynchosia latifolia</i>	224–448	–
	fuzzybean	STROP	<i>Strophostyles</i>	224–448	–
7	Forbs			0–28	
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	0–28	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–28	–
	yankeeweed	EUCO7	<i>Eupatorium compositifolium</i>	0–28	–
Shrub/Vine					
8	Shrubs/Vines			112–336	
	American beautyberry	CAAM2	<i>Callicarpa americana</i>	112–336	–
	St. Andrew's cross	HYHY	<i>Hypericum hypericoides</i>	112–336	–
	yaupon	ILVO	<i>Ilex vomitoria</i>	112–336	–
	winged sumac	RHCO	<i>Rhus copallinum</i>	112–336	–
	southern dewberry	RUTR	<i>Rubus trivialis</i>	112–336	–
	cat greenbrier	SMGL	<i>Smilax glauca</i>	112–336	–
	coralberry	SYOR	<i>Symphoricarpos orbiculatus</i>	112–336	–
	farkleberry	VAAR	<i>Vaccinium arboreum</i>	112–336	–
	muscadine	VIRO3	<i>Vitis rotundifolia</i>	112–336	–
Tree					
9	Trees			336–673	
	blackjack oak	QUMA3	<i>Quercus marilandica</i>	336–673	–
	post oak	QUST	<i>Quercus stellata</i>	336–673	–
	gum bully	SILAR2	<i>Sideroxylon lanuginosum ssp. rigidum</i>	336–673	–

Animal community

The historic savannah provided habitat to bison, deer, turkey, migratory birds and large predators such as wolves, coyotes, mountain lions, and black bear. White-tailed deer, turkey, coyotes, bobcats, and resident and migratory birds find suitable habitat in these savannahs today. Domestic livestock and exotic ungulates are the dominant grazers and browsers of this site. As the savannah transitions through the various vegetative states toward the Woodland State, the quality of the habitat may improve for some species and decline for others. Management must be applied to maintain a vegetative state in optimum habitat quality for the desired animal species.

Hydrological functions

Peak rainfall periods occur in May and June from frontal passage thunderstorms and in September and October from tropical systems as well as frontal passages. Rainfall amounts may be high (three to five inches per event) and events may be intense. The site is subject to erosion where adequate herbaceous cover is not maintained and on

heavy use areas such as roads and livestock trails. Extended periods (60 days) of little to no rainfall during the growing season are common. The hydrology of this site may be manipulated through management to yield higher runoff volumes or greater infiltration to groundwater. Management for less herbaceous cover will favor higher surface runoff while dense herbaceous cover and litter will favor ground water recharge. Potential pollution from sediment, pesticides, and both organic and inorganic fertilizers should always be considered when managing for higher volumes of surface runoff.

Recreational uses

Hunting, camping, bird watching, equestrian, and photography are common uses.

Wood products

Oaks are used for firewood. Hickory and mesquite are used for barbecue wood. Yaupon is used for landscaping.

Other products

Fruit from dewberries, grapes, and plums are harvested. Landscape rocks may also be obtained from this site.

Inventory data references

These site descriptions were developed as part a Provisional Ecological Site project using historic soil survey manuscripts, available site descriptions, and low intensity field traverse sampling. Future work to validate the information is needed. This will include field activities to collect low, medium, and high-intensity sampling, soil correlations, and analysis of that data. A final field review, peer review, quality control, and quality assurance review of the will be needed to produce the final document.

Other references

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Contributors

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Approval

Bryan Christensen, 9/21/2023

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)	Mike Stellbauer, David Polk, Bill Deauman
Contact for lead author	Mike Stellbauer, Zone RMS, NRCS, Bryan, Texas
Date	06/08/2004
Approved by	Bryan Christensen
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:** Some water flow patterns are normal for this site due to landscape position and slopes.

3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes are uncommon for this site when occupied by the reference community.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Expect no more than 20 percent bare ground randomly distributed in small patches.

5. **Number of gullies and erosion associated with gullies:** No gullies should be present. Drainageways should be stable and covered with vegetation.

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

7. **Amount of litter movement (describe size and distance expected to travel):** This site has slowly permeable soils and occurs on knolls and side slopes. On sloping sites, small to medium-sized litter will move short distances with intense storms.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface is resistant to erosion. Soil Stability class range is expected to be 3 to 5.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The soil surface structure is less than 10 inches thick with colors from brown fine sandy loam to pale brown fine sandy loam and generally weak fine granular structures. SOM is less than one percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The savannah of trees, shrubs, vines, grasses, and forbs, along with adequate litter and little bare ground, provides for maximum infiltration and little runoff under normal rainfall events.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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 tallgrasses >>

Sub-dominant: Warm-season midgrasses > Trees >

Other: Forbs > Shrubs/Vines

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There should be little mortality or decadence for any functional groups.

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,000 pounds per acre for below average moisture years and 4,000 pounds per acre for above average moisture years.

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 invasive species include bahiagrass, common Bermudagrass, western ragweed, mesquite, elm, eastern red cedar, post oak and yaupon.
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17. **Perennial plant reproductive capability:** All perennial plants should be capable of reproducing, except during periods of prolonged drought conditions, heavy natural herbivory or intense wildfires.
-