USDA Natural Resources Conservation Service

Ecological site R042AB264TX
Igneous Hill and Mountain, Hot Desert Shrub

Accessed: 08/17/2024

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.

Associated sites

R042AC244TX	**Gravelly, Desert Grassland** The Gravelly site is found on fans and basins below the Igneous Hill & Mountain site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The site occurs on igneous hills and mountains. Slopes range from 10 to 70 percent and elevation ranges from 1,800 to 4,000 feet. Rock outcrops are common on slopes of 20 percent or more

Geology has been the greatest influence in the creation of the Igneous Hill & Mountain (Hot Desert Shrub) site. A period of intense volcanic activity began in the region approximately 47 million years ago. The volcanic activity persisted intermittently for about 25 million years and produced vast amounts of igneous formations. Volcanic magma, or molten rock, that crystallizes below the soil surface creates igneous intrusions. Lavas and igneous intrusions are made up of interlocking crystals that are bound together more firmly than the grains in most sedimentary rock. Therefore igneous intrusions break down and erode more slowly than the sedimentary rock that may cover them. Thus, igneous formations stand above sedimentary rocks, such as limestone, in regions that are being eroded.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain
Flooding frequency	None
Ponding frequency	None
Elevation	549–1,219 m
Slope	10–70%
Aspect	N, S

Climatic features

The average annual precipitation ranges from 10 to 13 inches and highly variable from 2 to 21 inches. Most of the precipitation occurs as widely scattered thunderstorms of high intensity and short duration during the summer. Occasional precipitation occurs as light rainfall during the cool season. Negligible amounts of precipitation falls in the form of sleet or snow.

Mean annual air temperature is 70° F. Daytime temperatures exceeding 100° F are common from May through September. Frost free period ranges from 254 to 295 days.

The average relative humidity in mid-afternoon is about 25 percent. Relative humidity is higher at night, and the average at dawn is about 57 percent. The sun shines 81 percent of the time in summer and 75 percent in winter. The prevailing wind is from the southwest. Average wind speed is highest, around 11 miles per hour, in March and April.

The combination of low rainfall and relative humidity, warm temperatures, and high solar radiation creates a significant moisture deficit. The annual Class-A pan evaporation is approximately 94 inches.

Table 3. Representative climatic features

Frost-free period (average)	295 days
Freeze-free period (average)	334 days
Precipitation total (average)	330 mm

Influencing water features

None.

Soil features

The site consists of very shallow and shallow, well drained soils that are moderately rapidly permeable over very slowly permeable bedrock. The soils developed in residuum and colluvium weathered from Tertiary-age siliceous igneous bedrock. Soils are typically very gravelly and loamy. The representative soils and their associated map units are:

Rock outcrop-Terlingua complex, 20-70 percent slopes. (Terlingua component)
Studybutte-Rock outcrop complex, 10-30 percent slopes. (Studybutte component)
Studybutte-Rock outcrop complex, 20-60 percent slopes. (Studybutte component)

Table 4. Representative soil features

Parent material	(1) Residuum–rhyolite (2) Colluvium–trachyte
Surface texture	(1) Very gravelly loam (2) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow
Soil depth	10–51 cm
Surface fragment cover <=3"	26–47%
Surface fragment cover >3"	29–39%
Available water capacity (0-101.6cm)	0–2.54 cm

Calcium carbonate equivalent (0-101.6cm)	0–2%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	15–35%
Subsurface fragment volume >3" (Depth not specified)	15–25%

Ecological dynamics

The Historic Climax Plant Community (HCPC) on the Igneous Hill & Mountain (Hot Desert Shrub) site consists of bunch and stoloniferous grasses along with a variety of perennial forbs and woody shrubs.

Probably the factor that most influenced the historic vegetative composition of the site was extended dry weather. High rainfall events did occur but were episodic. However, insects and grazers such as rodents, deer, and infrequent fire certainly played a part. Bison were not documented in the historical record as being present in any significant amount. A lack of water was probably a contributing factor. The perennial grasses dominating the site could survive the periodic droughts as long as the density of woody plants did not become excessive, and top-removal of the grass plants did not occur too frequently. Over grazing amplifies the effects of drought.

Early historical records do not always provide information specific to a site but can provide insight as to conditions existing in a general vicinity. Accounts suggest cattle, sheep, and horses were introduced into the southwest from Mexico in the mid-1500's. However, extensive ranching did not begin in the Trans-Pecos region until the 1880s. Early explorers described the vegetation as they traveled over parts of the Trans-Pecos. For instance, Captain John Pope in 1854 described a portion of the Trans-Pecos area as “…destitute of wood and water, except at particular points, but covered with a luxuriant growth of the richest and most nutritious grasses known to this continent…”. Other early travelers describe the scattered springs and water sources that were found in the region. Wagon travel could only be accomplished, along trails that had both water and forage sufficient for overnight stops. Livestock numbers peaked in the late 1880’s following the arrival of railroads. Some historical accounts document ranches with stocking rates as high as one animal unit per four acres; however, this was far from sustainable in this environment.

Decades of overgrazing with loss of vegetation and erosion make it a slow process to return to the HCPC community. For example, in 1944 the southernmost portion of the Trans-Pecos area was set aside as Big Bend National Park. Grazing activities with Livestock ceased. In 1944, most of the Igneous Hill and Mountain Hot Desert Shrub sites were probably degraded and dominated by woody shrubs. After 60 years of no grazing in the hyperthermic zone, the majority of sites have not recovered to the historic plant community. This provides insight as to the length of time it takes for recovery in this environment.

The large livestock herds brought in during the favorable years, mainly sheep, could not be sustained during the drought. Overgrazing became a major issue as the extended dry weather was a harsh taskmaster to the early stock growers.

Cattle use on rangeland declines significantly on slopes steeper than 15 percent, however cattle numbers were never very large. Sheep and goats however are able to utilize slopes up to about 45 percent. It should be noted that abusive grazing by different kinds and classes of livestock will result in different impacts on the site. One effect of the removal of vegetated cover was to expose bare ground to erosion. Another effect was the deterioration of perennial grasses which removed the source of fine fuel to sustain periodic fires. More than likely, fires were not very frequent and when they did occur, the burn pattern was a mosaic governed by terrain and vegetative features.

The following diagram suggests general pathways that the vegetation on this site might follow. 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

Figure 4. Igneous Hill & Mountain (Hot Desert Shrub) - STM

State 1
Grass/Shrub State

Community 1.1
Chino Grama/Shrub Community

Figure 5. 1.1 Chino Grama/Shrub Community

The Historic Climax Plant Community (HCPC) on the Igneous Hill & Mountain (Hot Desert Shrub) site consists of bunch and stoloniferous grasses along with a variety of perennial forbs and woody shrubs. This is the reference plant community. The HCPC, also known as the Chino Grama/Shrub Community (1.1), contains about 65% grasses, including 30% Chino grama (*Bouteloua ramosa*). Forbs such as menodora (Menodora spp.), bushsunflower (*Simsia calva*), mustards (Brassica spp.), croton (Croton spp.), and various annual forbs make up about 10% of the HCPC. Twenty five percent of the HCPC is composed of woody plants such as skeletonleaf goldeneye (*Viguiera stenoloba*), feather dalea (*Dalea formosa*), range ratany (*Krameria erecta*), whitethorn (*Acacia constricta*), pricklypear (Opuntia), and ocotillo (*Fouquieria splendens*). Shrubs such as skeletonleaf goldeneye are more common on rough broken slopes. Bare ground is less than 10% which does not include rock cover. Interspaces between plants are lightly covered with litter. The small amount of erosion is significant due to the shallow nature of the soil. Erosion is kept to a minimum due to the moderate amount of plant and rock cover. Runoff occurs during heavier rainfall, but is slowed by rocks covering the soil and vegetative ground cover. Concentrated water flow patterns are very rare. Rare periodic fire, climatic patterns, and grazing by deer and other herbivores were natural processes that maintained this historic plant community. This plant community is useful for grazing cattle on the lower slopes, but stocking rates must remain very conservative to maintain the HCPC. During drought years, livestock should be carefully managed on the site to avoid severe overgrazing. Wildlife will continue to graze the site under drought conditions. The grazing/browsing impact can cause permanent changes from the Chino Grama/Shrub Community (1.1) to the Mixed Shrub Dominated Community (2.1). Therefore, both livestock and wildlife should be managed within the carrying capacity to sustain the plant community. If not, the community will be driven toward the Mixed Shrub Dominated Community (2.1) and probably not be able to return to the Chino grama/shrub community (1.1).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	254	328	401
Shrub/Vine	99	126	154
Forb	39	50	62
Tree	–	–	–
Total	**392**	**504**	**617**

Figure 7. Plant community growth curve (percent production by month). TX0009, Chino Grama/Creosotebush Complex Community. Shortgrasses and shrubs dominate – Growth is predominately shortgrasses and shrubs from May through October with peak growth from July to September..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	2	2	2	8	8	20	25	15	15	1

State 2
Mixed-Shrub State

Community 2.1
Mixed Shrub Dominated Community

Figure 8. 2.1 Mixed Shrub Dominated Community

Shrubs are replacing grasses and palatable forbs in the Mixed Shrub Dominated Community (2.1). Drought, when combined with overgrazing can exacerbate the change. The historically dominant grass species decline and are replaced by perennial threeawns (Aristida spp.) and other short grasses. Shrubs such as lechuguilla (*Agave lechuguilla*), creosote bush (*Larrea tridentata*), and pricklypear increase within the site until there is approximately 40% woody species present. This is due to the collective influence of several factors. Ground cover by litter decreases. Loss of vegetation is significant and exposes the surface. More bare ground causes increases in soil temperature, soil crusting, and the potential for erosion; and a decrease in water infiltration. Water runoff increases and signs of erosion become more apparent. The steep slopes found on many of these sites make erosion likely when vegetative cover is not present. Annual production ranges from 200 - 400 lb per acre. This plant community is still useful for grazing cattle, but stocking rates must be kept lower than under the HCPC or grass decline will continue. Brush management of some form may be necessary in addition to prescribed grazing to slow woody encroachment although the choice of viable treatments in this arid climate is very limited. The site also contains food and cover for mule deer, dove, quail, and other types of wildlife. Application of prescribed grazing can arrest the decline of high quality grasses and forbs. Small woody plants, once established, will be persistent rendering this community unable to return to the HCPC.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	112	168	224
Grass/Grasslike	90	135	179
Forb	22	34	45
Tree	–	–	–
Total	**224**	**337**	**448**

Figure 10. Plant community growth curve (percent production by month). TX0010, Mixed Shrub Dominated Community (Shortgrasses/Shrubs). Shrubs and shortgrasses dominate – Growth is predominately shrubs and shortgrasses from May through October with peak growth from July to September..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	2	2	2	8	8	20	25	15	15	1

Transition T1A
State 1 to 2

Due to heavy continuous grazing and no droughts, the Chino Grama/Shrub State will transition irreversibly to the Mixed Shrub Dominated State.

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	**Mid, bunchgrass**			157–219	
	Chino grama	BORA4	*Bouteloua ramosa*	157–219	–
2	**Short, stoloniferous**			34–62	
	black grama	BOER4	*Bouteloua eriopoda*	34–62	–
3	**Mid, bunchgrass**			34–62	
	Arizona cottontop	DICA8	*Digitaria californica*	17–34	–
	tanglehead	HECO10	*Heteropogon contortus*	17–34	–
4	**Mid/shortgrasses**			30–59	
	slim tridens	TRMU	*Tridens muticus*	16–25	–
	threeawn	ARIST	*Aristida*	12–19	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	8–12	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	3–7	–
Shrub/Vine					
5	**Shrubs**			59–93	
	resinbush	VIST	*Viguiera stenoloba*	20–31	–
	ocotillo	FOSP2	*Fouquieria splendens*	16–25	–
	Texas lignum-vitae	GUAN	*Guaiacum angustifolium*	12–19	–
	escobilla butterflybush	BUSC	*Buddleja scordioides*	8–12	–
	creosote bush	LATR2	*Larrea tridentata*	3–11	–
	whitethorn acacia	ACCO2	*Acacia constricta*	3–7	–
6	**Subshrubs**			20–31	
	littleleaf ratany	KRER	*Krameria erecta*	12–19	–
	featherplume	DAFO	*Dalea formosa*	8–12	–
7	**Fibrous/Succulent**			20–31	
	lechuguilla	AGLE	*Agave lechuguilla*	3–7	–
	sotol	DASYL	*Dasylirion*	3–7	–
	leatherstem	JADI	*Jatropha dioica*	3–7	–
	pricklypear	OPUNT	*Opuntia*	3–7	–
	yucca	YUCCA	*Yucca*	3–7	–
Forb					
8	**Perennial**			39–56	
	Forb, perennial	2FP	*Forb, perennial*	6–11	–
	croton	CROTO	*Croton*	3–7	–
	prairie clover	DALEA	*Dalea*	3–7	–
	buckwheat	ERIOG	*Eriogonum*	3–7	–

	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	3–7	–
	menodora	MENOD	*Menodora*	3–7	–
	Parry's wild petunia	RUPA3	*Ruellia parryi*	3–7	–
	awnless bushsunflower	SICA7	*Simsia calva*	3–7	–
	noseburn	TRAGI	*Tragia*	3–7	–
9	**Annual**			0–17	
	Forb, annual	2FA	*Forb, annual*	0–6	–

Animal community

The historic Chino Grama/Shrub Community (1) is habitat for mule deer, songbirds, birds of prey, small mammals, and predators such as coyote, bobcat, and mountain lion. As the site changes toward the Mixed Shrub Dominated Community (2), it becomes less suitable to many species and more suitable for others. This shift created habitat for various songbirds and tree nesting birds.

Cattle, sheep, and goats can use this site, but the rocky ground and slopes make it difficult for livestock, especially cattle, to reach some forage areas. Cattle find the best forage in the Chino Grama/shrub Community (1). As this site reaches the Mixed Shrub Dominated Community (2), cattle usually cannot find enough forage to be thrifty. An assessment of vegetation is needed to determine the site's current carrying capacity in order to avoid overgrazing. Carrying capacity in the Trans-Pecos will vary greatly from year to year depending on the episodic precipitation.

Mule deer find good overall habitat on the Igneous Hill and Mountain Hot Desert Shrub site. They need to eat high protein forbs and browse to survive. They cannot utilize the lower protein grasses. They generally eat a wide variety of browse and forbs and a small amount of grass. Quail and dove prefer a combination of low shrubs, bunchgrass, bare ground, and forbs. Game bird species such as dove and scaled quail are usually present on the site. Smaller mammals present include rodents, jackrabbit, cottontail rabbit, raccoon, and skunk. Numerous species of snakes and lizards are native to the site.

Achieving a balance between brushy cover and more open plant communities on this and adjacent sites is important to wildlife management. Non-game species of birds found on this site include songbirds and birds of prey. Habitat on this site that provides a large diversity of grasses, forbs and shrubs will support a variety and abundance of songbirds. Birds of prey are important to keep the numbers of rodents, rabbits and snakes in balance.

Please Note: The following tables are provided as a general guide based on historic plant community species composition, not a month-to-month blueprint. Beside time of year, preferences can be influenced by other variables such as soils, range health, grazing management, associated species and weather patterns.

Legend:
P = Preferred
D = Desirable
U = Undesirable
N = Not consumed
T = Toxic
X = Used, but degree of utilization unknown

Hydrological functions

The Igneous Hill and Mountain Hot Desert Shrub site is a well-drained, shallow, stony upland. Its soils are moderately to very slowly permeable. Under historic climax condition the mix of grasses and shrubs intercepted and utilized much of the incoming rainfall. There was some runoff during extended rains. The presence of stones and rock outcrops enhance the effectiveness of rainfall, especially small rainfall events, by concentrating it on a smaller surface area. When the site changes to the Mixed Shrub Dominated Community (2) there is a loss of vegetated cover resulting in faster runoff that carries soil particles away. Less of the rainfall is intercepted and infiltrated into the soil for groundwater recharge.

Recreational uses

The Igneous Hill and Mountain Hot Desert Shrub site is well suited for many outdoor recreational uses including hunting, hiking, and bird watching. Its scenic beauty and topography make it a unique site, and colorful forbs can be found on or near the site throughout the spring and summer.

Wood products

None.

Other products

None.

Other information

None.

Other references

1. Archer S. 1994. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. In Ecological implications of livestock herbivory in the West, Ed M Vavra, W Laycock, R Pieper, pp13-68, Denver, CO: society for Range Management
2. Brewer, Clay E., Harveson, Louis A. 2005. Diets of Bighorn Sheep in the Chihuahuan Desert, Texas.
3. Downie, A. E. 1978. Terrell County, Texas, its past- its people. San Angelo, Texas: Rangle Printing.
4. Gould F. 1978. Common Texas Grasses: an illustrated guide. College Station, Texas: Texas A & M Press.
5. Hardy, Jean Evans. 1997. Flora and Vegetation of the Solitario Dome, Brewster and Presidio Counties, Texas. A Thesis Presented to the Graduate Council Sul Ross State University.
6. Hart, Charles R. et al. 2003. Toxic Plants of Texas. Texas AgriLife Extension. Texas A&M University System.
7. Heischmidt RK, Stuth, Eds. 1991 Grazing Management: an ecological perspective. Portland, Oregon: Timberline Press
8. Keller, David W. 2005. Below The Escondido Rim: A History of the O2 Ranch in the Texas Big Bend. Alpine, Texas: Center For Big Bend Studies, Sul Ross State University.
9. Langford, JO. 1952. Big Bend: A Homesteader's Story. Austin, Texas: University of Texas Press.
10. MacLeod, William. 2003. Big Bend Vistas: a geological exploration. Austin, Texas: Capital Printing Company.
11. McPherson, Guy R. 1995. The Desert Grassland. Chapter 5: The Role of Fire in the Desert Grasslands. Tucson, Arizona. The University of Arizona Press.
12. Powell, A. Michael. 1998. Trees and Shrubs of the Trans-Pecos and Adjacent Areas. Austin, Texas: University of Texas Press.
13. Thomas, Jack W and D Toweill. 1982. Elk of North America. Mechanicsburg, Pennsylvania: Stackpole Books.
14. Tyler, Ron C. 1996. The Big Bend: a history of the last Texas frontier. College Station, Texas: Texas A&M University Press.
15. USDA/NRCS Soil Survey Manuals for Jeff Davis, Pecos, and Reeves Counties
16. Van Devender, Thomas R. 1995. The Desert Grassland. Chapter 3: Desert Grassland History. Tucson, Arizona: The University of Arizona Press.
17. Warnock, Barton. 1977. Wildflowers of the Davis Mountains and the Marathon Basin. Alpine, Texas: Sul Ross State University.
18. Wauer, Roland H. 1973. Naturalist's Big Bend. Santa Fe, New Mexico: Peregrine Productions.
19. Weniger, D. 1984. The Explorer's Texas: The Lands and Waters, Vol 1. Austin, Texas: Eakin Press

The following individuals assisted with the development of this site description:
Mr. Charles Anderson –Rangeland Management Specialist- NRCS; San Angelo, Texas
Dr. Louis Harveson – Department Chair, Department of Natural Resource Management, Sul Ross State University
Mr. Preston Irwin – Rangeland Management Specialist-NRCS; Fort Stockton, Texas
Dr. Lynn Loomis - Soil Scientist-NRCS; Marfa, Texas
Michael Margo, RMS, NRCS, Marfa, Texas
Wayne Seipp, RTL, NRCS, Marfa, Texas
Mr. Justin Clary – Rangeland Management Specialist – NRCS; Temple, Texas

Dr. AM Powell – Professor Emeritus –Sul Ross State University, Alpine, Texas

Contributors

Duckworth-Cole, Inc., Bryan, Texas, Michael Margo, RMS, NRCS, Marfa, Texas
Technical Staff, Area Office, Pecos, Texas

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)	Michael Margo, RMS, NRCS, Marfa, TX
Contact for lead author	Zone Rangeland Management Specialist, NRCS, San Angelo, Texas 325-944-0147
Date	03/22/2011
Approved by	Mark Moseley, ESI Specialist, NRCS, Texas
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:** None, except following high intesity storms, when short (less than 1 m) and discontinuous flow patterns may appear. Flow patterns in drainages are linear and continuous.

---

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):** 2-5% bare ground.

---

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

---

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

---

7. **Amount of litter movement (describe size and distance expected to travel):** In drainages, there can be significant amounts of litter moved long distances. On most of the site, minimal and short distance (<5ft) of litter movement associated with high intense rainfall.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability values anticipated to be 2-3 in the interspaces and 3-4 under plant canopies. Values need verification at reference sites.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0-3 inches thick, reddish brown surface horizon with a weak medium granular structure. Data from Studybutte soil series description.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** A high canopy cover of midgrass bunch and stoliniferous grasses will help minimize runoff and maximize infiltration. Grasses should comprise approximately 65% of total plant compostion by weight. Shrubs will comprise about 25% by weight.

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 perennial mid bunchgrasses >>

    Sub-dominant: Warm-season perennial short stoloniferous grasses = Warm-season perennial mid and short bunch grasses = Mid/Tall Shrubs >

    Other: subshrubs = Perennial forbs = semi-succulents/succulents > Annual forbs = Shortgrasses

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All grasses will show some mortality and decadence in addition to annual forbs. Mid/tall perennial shrubs will show some mortality or decadence only after prolonged and severe droughts. Subshrubs will be less resistant to severe droughts than mid/tall perennial shrubs.

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 350-550 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: None.

---

17. **Perennial plant reproductive capability:** All species should be capable of reproducing.
