Ecological site R042AE277TX
Igneous Hill and Mountain, Mixed Prairie

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.

Associated sites

R042AE275TX	**Gravelly, Mixed Prairie** This site is occurs downslope on lower piedmont slopes.

Similar sites

R042AF286TX	**Igneous Hill and Mountain, Mountain Savannah** This site occurs in higher elevations on igneous soils but differs in dominant species composition and production.
R042AE695TX	**Basalt Hill, Mixed Prairie** The site occurs on basalt rather than rhyolite/trachyte. This site is less productive.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The site occurs on mostly steep igneous hills and mountains. Slopes range from 5 to 45 percent, but are mostly 20-40 percent. Rock outcrops are common. Aspect influences vegetation composition and production. Runoff is medium on 5 to 20 percent slopes, and high on slopes greater than 20 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,372–1,981 m
Slope	5–45%
Aspect	N, S

Climatic features

The average annual precipitation ranges from 15 to 17 inches and the annual total is highly variable from 8 to 30 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. Annual snowfall ranges from 1-3 inches.

Mean annual air temperature is 61° F. Frost-free period ranges from 199 to 215 days (April-October). However, the optimal growing season occurs July through September as this period coincides with greater rainfall.

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 annual Class-A pan evaporation is approximately 82 inches.

Table 3. Representative climatic features

Frost-free period (average)	215 days
Freeze-free period (average)	230 days
Precipitation total (average)	432 mm

Influencing water features

Soil features

The site consists of very shallow to shallow, well drained, noncalcareous, gravelly to cobbly soils with a loamy surface texture. The soils formed in residuum weathered from igneous bedrock. Depth to bedrock ranges from 4-20 inches. Available water holding capacity is low. The representative soils and their associated map units are:

Big Bend National Park Soil Survey:
Rock outcrop-Brewster complex, 20 to 60 percent slopes. (Brewster component only)

Brewster County Main Part Soil Survey:
Brewster very gravelly loam, 5 to 10 percent slopes.
Brewster-Rock outcrop complex, 20 to 45 percent slopes. (Brewster component only)
Brewster-Rock outcrop complex, 20 to 70 percent slopes. (Brewster component only)
Mainstay-Brewster complex, 10 to 30 percent slopes. (Brewster component only)

Jeff Davis County Soil Survey:
Brewster-Rock outcrop association, steep. (Brewster component only)
Mainstay-Brewster association, hilly. (Brewster component only)
Rock outcrop-Brewster association, steep. (Brewster component only)

Presidio County Soil Survey:
Brewster very gravelly loam, 5 to 10 percent slopes.
Brewster-Rock outcrop complex, 10 to 30 percent slopes. (Brewster component only)
Brewster-Rock outcrop complex, 20 to 45 percent slopes. (Brewster component only)
Brewster-Rock outcrop complex, 20 to 70 percent slopes. (Brewster component only)

Table 4. Representative soil features

Parent material	(1) Residuum–trachyte
Surface texture	(1) Gravelly loam (2) Very cobbly loam (3) Stony loam

Drainage class	Well drained
Permeability class	Very slow
Soil depth	10–51 cm
Surface fragment cover <=3"	20–50%
Surface fragment cover >3"	20–45%
Available water capacity (0-101.6cm)	2.54 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	25–40%
Subsurface fragment volume >3" (Depth not specified)	8–30%

Ecological dynamics

The distribution of vegetation within the site is highly dependent on local environment. Elevation, soil moisture, aspect, slope, latitude, variability of the soils, and amount of rock outcrop are the major factors driving species composition and distribution. The Historic Climax Plant Community (HCPC) for the site is composed primarily of a diversity of short and midgrasses, numerous perennial forbs, and a few trees and shrubs.

Historically, the site has evolved with native herbivores such as mule deer, desert bighorn sheep, and pronghorn antelope (on low relief areas). Bison were not documented in the historical record as being present in any significant amount. A lack of water and steep topography was probably a contributing factor. Small lightning induced fires were mostly likely common mainly because of the adequate amount of fine fuels present.

Early records suggest cattle, sheep, and horses were introduced into the southwest from Mexico in the mid-1500's. However, extensive ranching began in the Trans-Pecos region in the 1880s. Direct fire suppression and overgrazing in some areas most likely began during this time.

The impact of improper grazing within this site specifically will lead to a reduction of palatable grasses and forbs and an increase of woody plants such as juniper and catclaw mimosa. In addition, direct fire suppression will also allow for woody plants to increase.

The following diagram suggests general pathways that the vegetation on this site might follow. There are other plant communities and 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

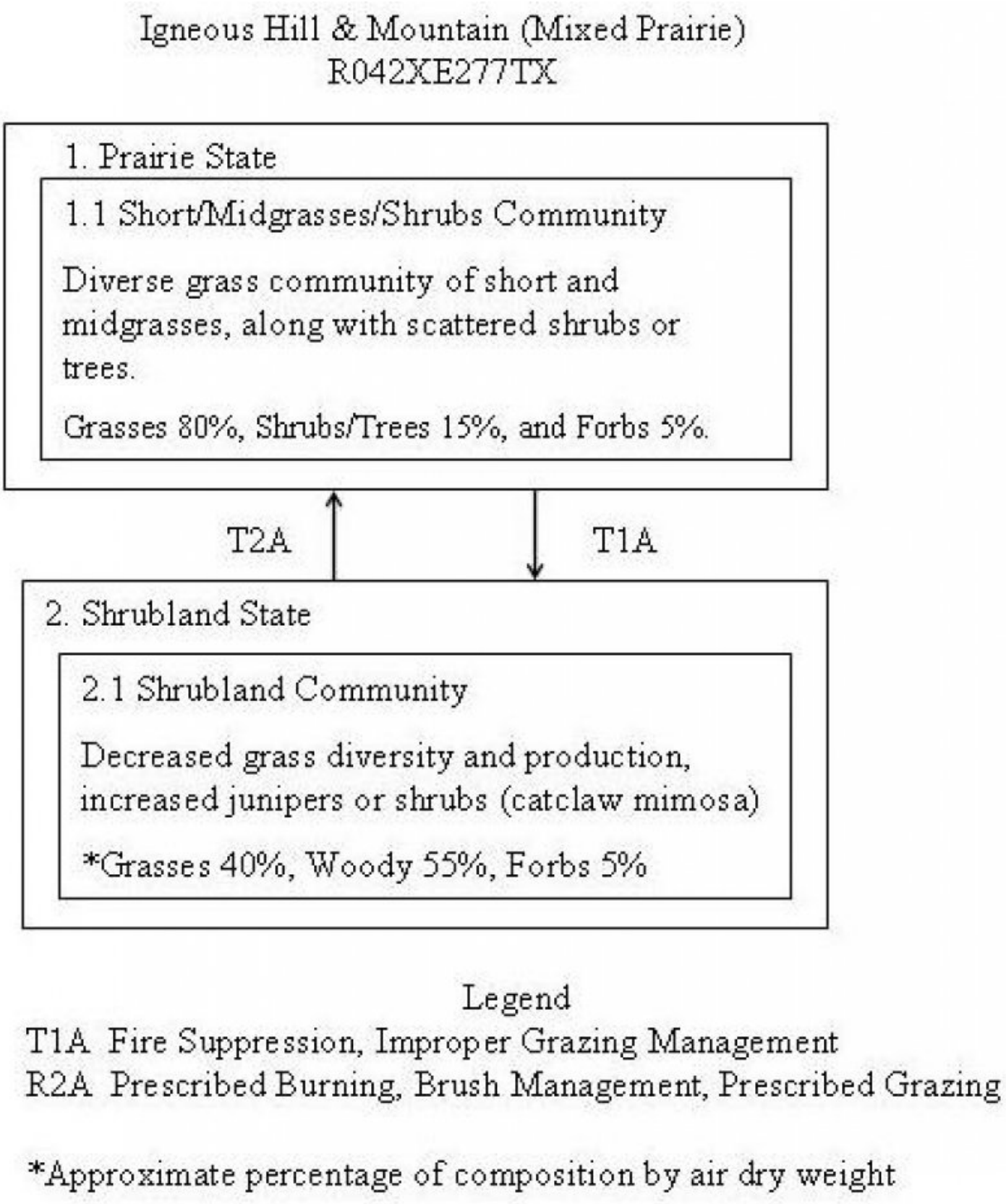

Figure 4. MLRA 42 - Mixed Prairie - Igneous Hill & Mtn - STM

State 1
Prairie State

Community 1.1
Short/Midgrasses/Shrubs Community

Figure 5. 1.1 Short/Midgrasses/Shrubs Community

The distribution of vegetation within the site is highly dependent on local environment. Elevation, soil moisture, aspect, slope, latitude, variability of the soils, and amount of rock outcrop are the major factors driving species composition and distribution. The Historic Climax Plant Community (HCPC) for the site is composed primarily of a diversity of short and midgrasses, numerous perennial forbs, and a few trees and shrubs and is the reference plant community. Areas lacking significant rock outcrops are predominately a grassland plant community with very few woody plants (mostly isolated shrubs). Areas with significant rock outcrops generally support more woody plants such as oaks, junipers, and a higher diversity of shrubs and forbs. Cooler, north facing slopes will generally support more oaks and junipers than south facing slopes. Retrogression resulting from livestock overgrazing will result in a reduction of palatable grasses and ultimately litter accumulation. This will reduce the likelihood of natural fires because of the reduction of fine fuels. Direct fire suppression will also continue to allow woody plants such as catclaw mimosa and juniper to increase. The plant communities will eventually transition to a juniper woodland or a catclaw shrubland.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	628	986	1255
Shrub/Vine	63	99	126
Tree	55	86	110
Forb	39	62	78
Total	**785**	**1233**	**1569**

Figure 7. Plant community growth curve (percent production by month). TX0023, Mid/Shortgrass/Shrubs Community - Mixed Prairie. Prairie with cool and warm-season mid and shortgrasses with scattered shrubs and trees..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	2	3	8	8	18	23	15	15	2

State 2
Shrubland State

Community 2.1
Shrubland Community

Figure 8. 2.1 Shrubland Community

These plant communities are the result of livestock overgrazing and direct fire suppression. Overgrazing reduces the amount of palatable midgrasses and fine fuels needed for natural fires to occur. This provides a competitive advantage to woody plants. The most prevalent woody plant to increase is redberry and/or rosefruited juniper. Increases in shrubs and forbs such as catclaw mimosa, cutleaf goldenweed and broomweed are also observed. Proper grazing management (adequate rest to allow recovery of some grasses) followed by prescribed fire and/or brush management will help transition the community back to composition similar to the reference. Brush management strategies may include grubbing and/or chemical herbicide application. Poor accessibility may limit management methods on steep slopes.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	314	493	762
Shrub/Vine	233	367	565
Tree	198	312	482
Forb	39	62	95
Total	**784**	**1234**	**1904**

Figure 10. Plant community growth curve (percent production by month). TX0015, Shrub/Shortgrass Community. Shrubs dominant with few shortgrasses present..

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

With fire suppression and improper grazing management, the Grassland State will shift to the Shrubland State.

Restoration pathway R2A
State 2 to 1

Prescribed Burning, Brush Management, and Prescribed Grazing should lead back to Grassland State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-season mid/tallgrasses**			157–314	
	sideoats grama	BOCU	*Bouteloua curtipendula*	84–224	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	73–168	–
2	**Warm-season mid/tallgrasses**			157–314	
	tanglehead	HECO10	*Heteropogon contortus*	56–140	–
	Texas bluestem	SCCI2	*Schizachyrium cirratum*	56–140	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	45–112	–
3	**Warm-season midgrasses**			118–235	
	black grama	BOER4	*Bouteloua eriopoda*	56–140	–
	blue grama	BOGR2	*Bouteloua gracilis*	56–140	–
4	**Warm-season midgrasses**			118–235	
	Arizona cottontop	DICA8	*Digitaria californica*	34–84	–
	green sprangletop	LEDU	*Leptochloa dubia*	34–84	–
	streambed bristlegrass	SELE6	*Setaria leucopila*	17–34	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	17–34	–
	spidergrass	ARTE3	*Aristida ternipes*	17–34	–
5	**Warm-season mid/shortgrasses**			39–78	
	hairy grama	BOHI2	*Bouteloua hirsuta*	17–45	–
	woolyspike balsamscale	ELBA	*Elionurus barbiculmis*	17–45	–
	sprucetop grama	BOCH	*Bouteloua chondrosioides*	11–28	–
6	**Warm-season midgrasses**			31–63	
	common wolfstail	LYPH	*Lycurus phleoides*	13–28	–
	fall witchgrass	DICO6	*Digitaria cognata*	11–22	–
	slim tridens	TRMU	*Tridens muticus*	6–17	–
7	**Cool-season grasses**			8–16	
	southwestern needlegrass	ACEM4	*Achnatherum eminens*	3–7	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	2–6	–

	squirreltail	ELEL5	*Elymus elymoides*	1–2	–
Forb					
8	**Forbs**			39–78	
	Forb, annual	2FA	*Forb, annual*	3–8	–
	Forb, dicot, perennial	2FDP	*Forb, dicot, perennial*	3–8	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	3–8	–
	croton	CROTO	*Croton*	3–8	–
	golden prairie clover	DAAU	*Dalea aurea*	3–8	–
	buckwheat	ERIOG	*Eriogonum*	3–8	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	3–8	–
	lacy tansyaster	MAPI	*Machaeranthera pinnatifida*	3–8	–
	small Indian breadroot	PEPE27	*Pediomelum pentaphyllum*	3–8	–
	polygala	POLYG	*Polygala*	3–8	–
	awnless bushsunflower	SICA7	*Simsia calva*	3–8	–
	branched noseburn	TRRA5	*Tragia ramosa*	3–8	–
Shrub/Vine					
9	**Shrubs**			63–126	
	resinbush	VIST	*Viguiera stenoloba*	11–28	–
	featherplume	DAFO	*Dalea formosa*	11–22	–
	black prairie clover	DAFR2	*Dalea frutescens*	11–22	–
	littleleaf ratany	KRER	*Krameria erecta*	9–17	–
	rough menodora	MESC	*Menodora scabra*	6–11	–
	brickellbush	BRICK	*Brickellia*	6–11	–
	fragrant sumac	RHAR4	*Rhus aromatica*	6–11	–
	sage	SALVI	*Salvia*	6–11	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	4–9	–
	Texas sacahuista	NOTE	*Nolina texana*	4–9	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	2–7	–
	catclaw acacia	ACGR	*Acacia greggii*	2–7	–
	yucca	YUCCA	*Yucca*	2–7	–
Tree					
10	**Trees**			55–110	
	Emory oak	QUEM	*Quercus emoryi*	17–39	–
	Chisos red oak	QUGR2	*Quercus gravesii*	17–39	–
	gray oak	QUGR3	*Quercus grisea*	17–39	–
	redberry juniper	JUCO11	*Juniperus coahuilensis*	11–22	–
	Pinchot's juniper	JUPI	*Juniperus pinchotii*	11–22	–
	Mexican pinyon	PICE	*Pinus cembroides*	0–17	–

Animal community

The site is suitable for properly managed (appropriate stocking rates) livestock grazing. Cattle are generally limited to slopes gradients less than 15 percent, while sheep and goats can utilize steeper, rockier slopes. Improper grazing management causes a gradual decline in range health reducing livestock nutrition and habitat quality for wildlife. Livestock should be stocked at or below carrying capacity in proportion to the grazeable grass, forbs, and browse.

Cattle, sheep, goats, and horses are susceptible to oak poisoning which can result from consuming large amounts, or at least 6 percent of an animal's body weight of dry plant matter (acorns, young leaves, buds, stems, and/or flowers).

Many types of wildlife use the HCPC of this site. Invertebrates, reptiles, birds, and mammals either use the site as their primary habitat or visit from adjacent sites. Common mammals include mule deer, mountain lions, black-tailed jackrabbit, cottontail rabbit, javelina, coyote, skunk, woodrats, and many nocturnal mice. Historically, desert bighorn sheep most likely grazed this site. Game birds include scaled quail and dove. Numerous songbirds and raptors also occur in the area. Diversity in both plant species and plant communities over short distances is important for healthy wildlife populations.

Plant Preference by Animal Kind:
These preferences are somewhat general in nature as the preferences for plants is dependent upon grazing experience, time of year, availability of choices, and total forage supply.

Legend: P=Preferred D=Desirable U=Undesirable N=Not Consumed T=Toxic X=Used, but not degree of utilization unknown
Preferred – Percentage of plant in animal diet is greater than it occurs on the land
Desirable – Percentage of plant in animal diet is similar to the percentage composition on the land
Undesirable – Percentage of plant in animal diet is less than it occurs on the land
Not Consumed – Plant would not be eaten under normal conditions. Only consumed when other forages not available.
Toxic – Rare occurrence in diet and, if consumed in any tangible amounts results in death or severe illness in animal

Hydrological functions

The existing plant community with representative plant species, current soil conditions (soil health), land management, and climate affect the dynamics of the water cycle. Plant and litter cover are important factors, which protect the site from erosion. However, total production and the types of plant species present have greater impact on hydrologic dynamics (infiltration capacity, runoff, and soil losses).

Water runoff potential is inherently high because of steep slopes. A high perennial grass cover is important for decreasing runoff and increasing water infiltration. The reference plant communities are associated with optimum hydrologic function within this site. The high degree of hydrologic function in state 1 is due to the adequate vegetative cover and dominance of deep-rooted midgrasses compared to more shallow rooted shortgrasses. When properly managed, these species provide adequate cover that will minimize runoff. One of the key concepts to high hydrologic function is the structure and morphology of the root system and other biotic and abiotic factors. During high rainfall periods, water may percolate beyond the immediate surface root zone via fractures in the bedrock. As this water moves downward, it contributes to the recharge of springs or groundwater even though precise amounts have not been measured. The amount of rock cover also helps reduce runoff and protect the soil from erosion. In addition, surface fragments shed water received from precipitation to the fine earth between fragments. Fragments in the soil do not absorb or release water therefore concentrates precipitation into a smaller soil volume. The soil water content on these soils is higher than soils without rock fragments, especially after small rain events. Within this site, woody plants and a high diversity of forbs are often correlated with rock outcrops.

Livestock overgrazing, can potentially influence infiltration rates and overland flow by reducing the amount of perennial, deep rooted mid and tall grasses. Increases in overland flow can lead to soil erosion and decreased infiltration. In the Woody Plant Encroached State (2), increases in junipers and potentially other trees can decrease the amount of water available to other plants by rainfall interception and evapotranspiration and stemflow to the base of the tree.

Recreational uses

The site is suitable for hiking in areas of low relief and hunting.

Wood products

Trees can be used for firewood, posts, and some lumber.

Other products

None.

Other information

None.

Inventory data references

Information presented here has been developed from NRCS clipping, composition, plant cover, and soils data. Where empirical data is limiting, technical interpretations were made based of field experience.

Other references

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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)	
Contact for lead author	
Date	
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

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

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

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

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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

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:

    Sub-dominant:

    Other:

    Additional:

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

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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:**

17. **Perennial plant reproductive capability:**