USDA Natural Resources
Conservation Service

Ecological site R042AB586TX
Sandstone Hill and Mountain, Hot Desert Shrub

Accessed: 05/12/2025

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

R042AB734TX	**Salty Clay Hill, Hot Desert Shrub** This site is found on sideslopes, benches, and valley floors.
R042AB735TX	**Gravelly, Hot Desert Shrub** This site is found mostly higher than the Sandstone Hill and Mountain Site.
R042AB738TX	**Loamy, Hot Desert Shrub** This site is found on valleys and drainageways.

Similar sites

R042AB585TX	**Flagstone Hill, Hot Desert Shrub** Similar vegetation composition and landform but soil is derived from platy limestone.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The site is located on knolls, ridges, cuestas, broad rolling uplands, and side slopes of hills and mountains. The interbedded sandstone and shale materials from which these soils formed have been uplifted and tilted, forming ridges with common sandstone ledges and outcrops above badlands. Slopes are convex and are mostly 3 to 10 percent, but range up to 40 percent. Runoff is low on 3 to 5 percent slopes, medium on 5 to 20 percent slopes, and high on slopes greater than 20 percent.

Table 2. Representative physiographic features

Landforms	(1) Knoll (2) Ridge (3) Cuesta
Flooding frequency	None
Ponding frequency	None
Elevation	1,800–3,500 ft

Slope	3–40%
Aspect	Aspect is not a significant factor

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)	13 in

Influencing water features

N/A.

Soil features

The site consists of shallow and very shallow, well drained, moderately permeable soils that formed over soft sandstone. The soils are calcareous and formed in loamy materials weathered from sandstone (Cretaceous Aguja Formation). Stones and boulders cover approximately 38 percent of the surface area. Subsurface fragments within the “A” horizon ranges from 8-23 percent by volume. Runoff is low on 3 to 5 percent slopes, medium on 5 to 20 percent slopes, and high on slopes greater than 20 percent. Soil temperature regime is hyperthermic (mean annual soil temperature to depth of 20 inches is greater than 72º Fahrenheit).

The representative soil series is Solis.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone
Surface texture	(1) Fine sandy loam (2) Gravelly loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	4–20 in
Surface fragment cover <=3"	10–35%
Surface fragment cover >3"	0–3%

Available water capacity (0-40in)	0.5–1.5 in
Calcium carbonate equivalent (0-40in)	5–25%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	8–20%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

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

Existing plant species composition and production varies with the interaction of yearly weather conditions, location, aspect, elevation, geologic attributes, and the natural variability of the soils. 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. 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. Overgrazing amplifies the effects of drought. Insects, rodents, infrequent fire, and herbivores such as mule deer and desert bighorn sheep were also present. Bison were not documented in the historical record as being present in any significant amount. A lack of water was probably a contributing factor.

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. In 1944 the southernmost portion of the Trans-Pecos area was set aside as Big Bend National Park. Grazing activities with cattle ceased. In 1944, most of the Sandstone Hill and Mountain (Hot Desert Shrub) sites were probably degraded and dominated by woody shrubs. After 60 years of no grazing, the majority of sites have not recovered to the historic plant community which provides insight into 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 steeper slopes. 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

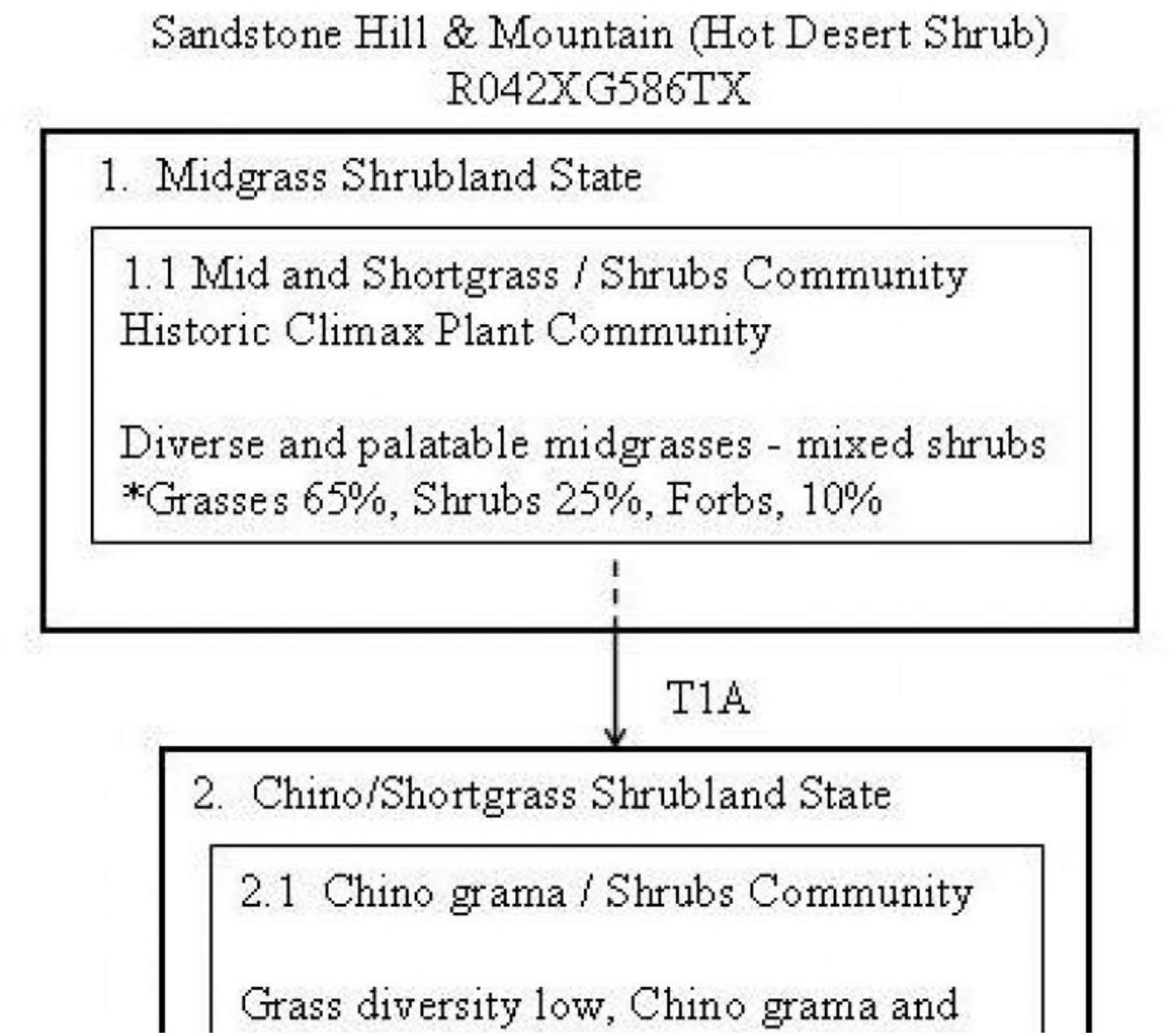
grasses which removed the source of fine fuel to sustain periodic fires. More than likely, fires were not very frequent and when they did occur, the burn pattern was a mosaic governed by terrain and vegetative features.

Due to a combination of climate, soils, and geology, the Sandstone Hill and Mountain Ecological Site is highly susceptible to disturbances and management prescriptions, either alone or in combination. Disturbances may quickly cause one stable community to cross a compositional and functional threshold into an alternative and often nonreversible stable community.

Indication of vegetation change because of disturbance, namely overgrazing, includes a shift from a Mid and Shortgrass/Shrub community (1.1) to a Chino grama/Shrub community (2.1) and ultimately to a nonreversible annual grass (or no grass) Shrub/Shortgrass community (2.2). Drought conditions can hasten this transition. Loss of herbaceous cover caused from frequent disturbance can create more of an inhospitable environment for some woody and forb plants to encroach or even survive. This is probably due to higher soil temperatures and less water infiltration and soil stability. Consequently, the degraded shrub state is a sparse and less diverse plant community

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



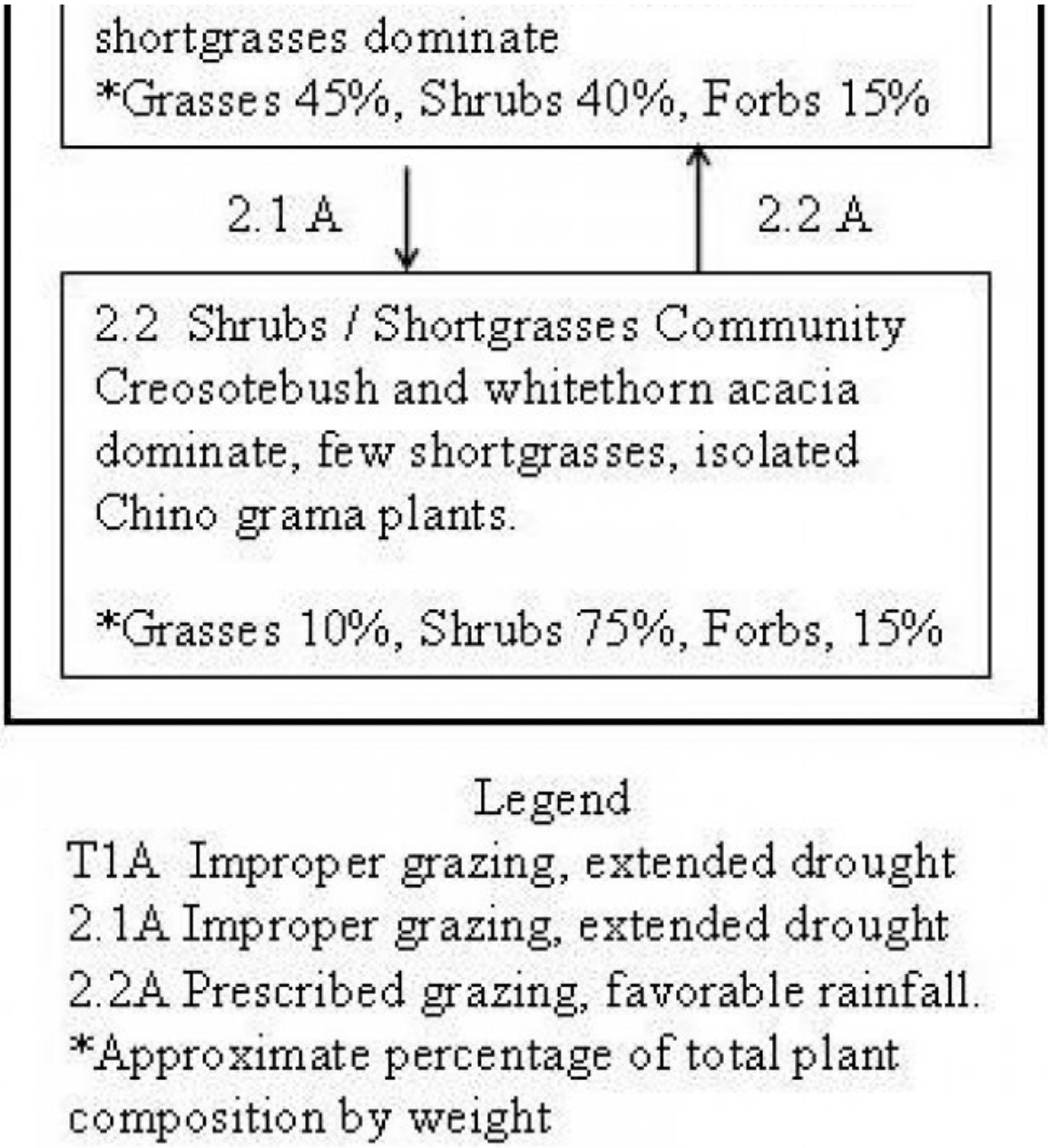


Figure 4. Sandstone Hill & Mtn (Hot Desert Shrub) S&T Diagra

State 1
Midgrass Shrubland State

Community 1.1
Midgrass/Shrub Community

Figure 5. 1.1 Midgrass/Shrub Community

The Midgrass / Shrub Community (1.1) is the reference plant community for the Sandstone Hill and Mountain Ecological Site. Grasses in the HCPC total approximately 65% of the species composition, while mixed shrubs and forbs account for 25% and 10%, respectively. A high diversity of grasses is characteristic of this community. Depending on rainfall and grazing disturbance, average annual production ranges from 200-500 lbs/ac. Plant productivity and diversity are highest in areas with more available moisture such as north facing slopes and depressions or drainages. Variability in soil surface fragments, depth, and geology, affects species composition, richness and productivity. The species diversity of this plant community provides excellent food and cover for wildlife. Extended dry weather causes an overall decline in grass cover and production and can cause some retrogression. However, the HCPC evolved with plants that have drought tolerance. Long term retrogression is triggered primarily by abusive grazing which causes an immediate decrease and eradication of the most palatable plants such as sideoats grama, black grama, bush muhly, menodora, and ratany. This will shift the HCPC to a nonreversible Chino/Shortgrass Shrubland State (2). Although species composition of woody plants will shift slightly, overall canopy cover will not increase greatly. This occurs because of the inherently low productivity of the site. At this point, recovery of the more desirable grasses is doubtful. Long term climate change may favor shrubs over grasses but the impact is still being studied. Lower succession annual forbs or pioneer species increase in highly disturbed areas. Conservation practices such as prescribed grazing can help maintain ecological integrity in the HCPC. Stocking rates need to be flexible and adjusted to carrying capacity because of sporadic rainfall.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	130	225	325
Shrub/Vine	50	90	125
Forb	20	35	50
Tree	0	0	0
Total	**200**	**350**	**500**

Figure 7. Plant community growth curve (percent production by month). TX0011, Grassland/Shrub Community. Grass Dominant with Shrubs Community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	5	10	15	25	25	10	5	0

State 2
Chino/Shortgrass Shrubland State

Community 2.1
Chino grama/Shrubs Community

Figure 8. 2.1 Chino grama/Shrubs Community

The Chino grama/Shrub Community (2.1) is the result of continuous overgrazing with drought accelerating the transition. Overgrazing initially reduces the most palatable plants and provides a competitive advantage to Chino grama. Although palatable when green, Chino grama's drought tolerance and aggressive nature allows this bunchgrass to persist through initial overgrazing and drought. Chino grama becomes the dominant midgrass within the community. The vast majority of the palatable midgrasses of the HCPC have been eradicated. Relic plants can still be observed in remote and protected areas. Shortgrasses such as fluffgrass and false grama begin increasing. Competitive woody plants such as creosotebush, whitethorn acacia, and lechuguilla begin to increase at the exclusion of other vegetation. Community appearance is slightly sparser. Exposed areas of surface fragments become evident due to displaced plants and decreased litter. Annual forb production increases slightly. Most of the climax perennial forbs persist. This plant community is often seen on soils with large surface fragments including hills and slopes. Large surface fragments especially on steep slopes reduces accessibility by livestock especially cattle. In addition, the fragments help protect plants from excessive herbivory from livestock while also having a positive influence on the site's hydrology. Continued overgrazing would decrease Chino grama and transition the community to a Shrub/Shortgrass Community 2.2. Although some plants species are displaced from HCPC, overall grass and woody plant canopy cover remains similar to HCPC. This results in a site functioning similar ecologically to HCPC. This is important for reducing runoff and increasing resource retention. Soil and climate limitations prevent restoration of grassland community. Food selection for indigenous wildlife decreases because of the loss of plant diversity. Cover is still adequate for some wildlife however. This plant community can be maintained with prescribed grazing.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	100	150	200
Shrub/Vine	70	105	140
Forb	30	45	60
Tree	0	0	0
Total	**200**	**300**	**400**

Figure 10. Plant community growth curve (percent production by month). TX0011, Grassland/Shrub Community. Grass Dominant with Shrubs Community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	5	10	15	25	25	10	5	0

Community 2.2
Shrubs/Shortgrasses Community

Figure 11. 2.2 Shrubs/Shortgrasses Community

The Shrubs/Shortgrasses Community (2.2) is the result of excessive over-utilization of plant resources. Drought

conditions will only worsen the health of the site. Sparse woody plants, specifically creosotebush and whitethorn acacia, dominate the plant community with few shortgrasses and forbs. Fluffgrass is most common shortgrass within the community. Few midgrasses (mostly Chino grama and mesa dropseed) can be found in water receiving areas that have been deferred from grazing. Overall average annual plant production ranges from 100-230 pounds per acre depending upon precipitation. Lack of sufficient herbaceous cover exposes the soil surface creating an inhospitable environment for plant seedlings to survive. Runoff is rapid with decreased infiltration. Surface fragments, to some degree, stabilize the soil surface. The plant community occurs in areas that are most accessible to livestock. The plant community provides little food and shelter for wildlife species. In some locations (such as areas with larger surface fragments that help protect some grasses and higher elevations), Chino grama and may be able to slowly recover to the production potential of plant community 2.1 (Chino grama/Shrub) with prescribed grazing and favorable rainfall. Other areas will smaller rock fragments and/or lower elevation may not be able to recover to the potential of community 2.1.

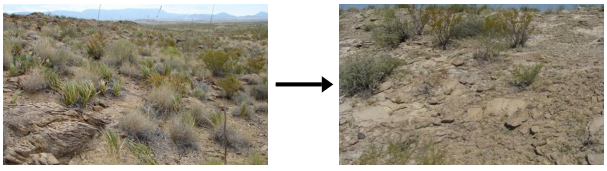
Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	60	85	120
Forb	30	45	60
Grass/Grasslike	10	30	50
Tree	0	0	0
Total	**100**	**160**	**230**

Figure 13. 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

Pathway 2.1A
Community 2.1 to 2.2

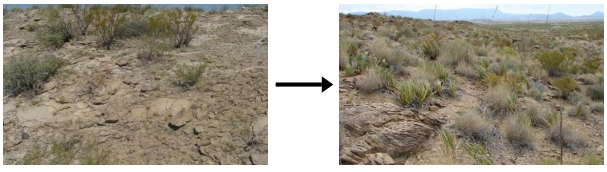


Chino grama/Shrubs Community

Shrubs/Shortgrasses Community

Improper Grazing, Extended drought can lead to shift to Shrubs/Shortgrasses Community.

Pathway 2.2A
Community 2.2 to 2.1



Shrubs/Shortgrasses Community

Chino grama/Shrubs Community

Prescribed grazing and favorable rainfall are needed to restore back to Chino grama/Shrubs Community.

Conservation practices

Prescribed Grazing

Transition T1A
State 1 to 2

Improper Grazing and extended drought can transition to Chino/Shortgrass Shrubland State.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrass**			24–65	
	Chino grama	BORA4	*Bouteloua ramosa*	24–65	–
2	**Midgrasses**			28–70	
	spike dropseed	SPCO4	*Sporobolus contractus*	10–40	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	10–40	–
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	10–40	–
3	**Midgrasses**			30–70	
	sideoats grama	BOCU	*Bouteloua curtipendula*	10–40	–
	Arizona cottontop	DICA8	*Digitaria californica*	10–35	–
	streambed bristlegrass	SELE6	*Setaria leucopila*	5–20	–
4	**Shortgrasses**			24–60	
	black grama	BOER4	*Bouteloua eriopoda*	12–40	–
5	**Shortgrasses**			14–35	
	threeawn	ARIST	*Aristida*	5–15	–
	Hall's panicgrass	PAHA	*Panicum hallii*	5–15	–
	fall witchgrass	DICO6	*Digitaria cognata*	5–10	–
6	**Shortgrasses**			10–25	
	false grama	CAER2	*Cathestecum erectum*	5–15	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	5–10	–
Shrub/Vine					
7	**Mid/Tall shrubs**			20–50	
	ocotillo	FOSP2	*Fouquieria splendens*	5–15	–
	resinbush	VIST	*Viguiera stenoloba*	5–15	–
	jointfir	EPHED	*Ephedra*	5–10	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	5–10	–
	creosote bush	LATR2	*Larrea tridentata*	2–8	–
	whitethorn acacia	ACCO2	*Acacia constricta*	2–8	–
8	**Subshrubs**			20–50	
	Big Bend barometerbush	LEMI4	*Leucophyllum minus*	5–12	–
	rough menodora	MESC	*Menodora scabra*	4–10	–
	plumed crinklemat	TIGR	*Tiquilia greggii*	4–10	–
	American threefold	TRCA8	*Trixis californica*	4–10	–
	featherplume	DAFO	*Dalea formosa*	4–10	–
	littleleaf ratany	KRER	*Krameria erecta*	4–10	–
	white ratany	KRGR	*Krameria grayi*	4–10	–
9	**Semi-succulents**			10–25	

9	**Semi-succulents**			10–25	
	pricklypear	OPUNT	*Opuntia*	4–12	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	2–10	–
	lechuguilla	AGLE	*Agave lechuguilla*	2–8	–
	Big Bend pricklypear	GRSC6	*Grusonia schottii*	2–5	–
Forb					
10	**Perennial forbs**			20–40	
	trailing windmills	ALIN	*Allionia incarnata*	2–5	–
	desert marigold	BAMU	*Baileya multiradiata*	2–5	–
	croton	CROTO	*Croton*	2–5	–
	downy prairie clover	DANE	*Dalea neomexicana*	2–5	–
	buckwheat	ERIOG	*Eriogonum*	2–5	–
	bractless blazingstar	MENU	*Mentzelia nuda*	2–5	–
	vervain	VERBE	*Verbena*	2–5	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	2–5	–
11	**Annual forbs**			0–10	
	Forb, annual	2FA	*Forb, annual*	0–6	–
	bladderpod	LESQU	*Lesquerella*	0–2	–
	bristly nama	NAHI	*Nama hispidum*	0–2	–

Animal community

The Historic Climax Plant Community and the Chino Grama dominated community (2.1) are suited for a prescribed grazing system for the production of livestock, including cattle, sheep, and goats. Areas with lower relief are more suited for cattle grazing. Studies have also measured that cattle use declines significantly once surface rock cover approaches 30%. Steep mountain slopes are more accessible to sheep and goats. Continuous grazing causes a gradual decline in range health reducing livestock nutrition and habitat quality for wildlife. Livestock should be stocked at carrying capacity in proportion to the grazeable grass, forb, and browse. Vegetative growth is episodic mirroring the rainfall. For that reason, stocker type livestock operations may be more suitable than year-round stocking.

Many types of wildlife use the HCPC of this site. Invertebrates, reptiles, birds, and mammals either use the sit as their primary habitat or visit from adjacent sites. Common mammals include mule deer, jackrabbit, cottontail rabbit, javelina, coyote, ground squirrel, skunk, woodrats, many nocturnal mice, and occasionally mountain lions and desert bighorn sheep. 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.

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), current management, and climate determine 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).

With reference to the transitional pathway diagram, the Midgrass/Shrub State (1) is 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 as explained above. During high rainfall periods, water will percolate beyond the immediate surface root zone via fractures in the bedrock. As this water moves downward, it contributes to the recharge of groundwater.

In the HCPC, some runoff naturally occurs due to the low overall biomass production and common occurrence of high intensity summer rainfall. In addition to plant cover, surface rock fragments assist with minimizing runoff and reducing raindrop impact.

Improper grazing accelerated by periodic drought has caused loss or reduction of the midgrasses. Lack of sufficient herbaceous vegetative cover has impaired hydrologic function on this site. During the transition phase from Grass/Mixed Shrub State 1 to the Shrub State 2, infiltration decreases, runoff increases, and significant soil loss occurs due to loss of herbaceous plant cover and organic matter. Hydrologic conditions worsen with continued improper management. Rock surface fragments helps minimize some soil loss. Restoration to State 1 hydrology may not be possible or realistic.

Recreational uses

The Sandstone Hill and Mountain Site is limited for outdoor recreational uses. The loose and brittle sandstone makes a poor surface for hiking. Small stones, slope, and depth to bedrock make campsite preparation difficult. High summer temperatures also limit recreational uses.

Wood products

Ocotillo branches are used for fencing and landscaping. When harvesting, it is important not to remove an entire plant, but only a few stems to help preserve the integrity of the donor plant.

Other products

Not Available.

Other information

None.

Inventory data references

Information presented here has been derived from the revised Sandstone Hill and Mountain Range Site description, literature, field observations and personal contacts with range-trained personnel.

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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.

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Approved by	Mark Moseley, ESD Specialist, NRCS, Boerne, 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.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0-2 inche thick, light yellowish brown surface horizon with a weak medium granular structure. Data from Solis soil series description

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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.

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

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Warm-season perennial mid bunchgrass

    Sub-dominant: Warm-season perennial mid/short stoloniferous = Warm-season perennial short bunchgrasses = Mid/tall Shrubs

    Other: Subshrubs = Semi-succulent/succulent = Perennial forbs > Annual forbs

    Additional:

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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 drought conditions.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 200-500 lbs/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:** None.

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