USDA Natural Resources Conservation Service

Ecological site R042AF286TX
Igneous Hill and Mountain, Mountain Savannah

Accessed: 05/04/2024

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

R042AF282TX	**Canyon, Mountain Savannah** This site is occurs downslope and in a water receiving position.

Similar sites

R042AE277TX	**Igneous Hill and Mountain, Mixed Prairie** The site occurs on igneous mountain slopes, but at lower elevations and climatic zone.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The site occurs on mostly steep and high elevation igneous hills and mountains. Slopes range from 5- 45 percent, but are mostly 20-40 percent. Rock outcrops are common. Aspect has a strong influence on vegetation composition and production. The site occurs in the “sky islands” of the Chisos and Davis Mountains of west Texas.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Hill
Elevation	1,829–2,286 m
Slope	5–45%
Aspect	N, S

Climatic features

The average annual precipitation usually ranges from 19-26 inches, but with extreme variations may range from 7 to 35 inches. Approximately 70-75 percent of the precipitation occurs as widely scattered thunderstorms of high intensity and short duration. However, daily totals are usually less than one inch. These storms occur from May through October with most occurring July through September. Annual snowfall is about ranges from 3-5 inches.

The optimum growing season is May through September. Because of high elevations, daytime temperatures above 100º F are uncommon. Average daily maximum temperature is in the mid 70s. Nighttime temperatures lower rapidly after sundown.

Frost free days average about 200 days from April through September. Evaporation is about 75 inches annually.

Table 3. Representative climatic features

Frost-free period (average)	213 days
Freeze-free period (average)	230 days
Precipitation total (average)	660 mm

Influencing water features

Soil features

The site consists of shallow to moderately deep, well drained, noncalcareous, gravelly to cobbly soils with a loamy surface texture. The soils formed in clayey materials weathered from Tertiary aged igneous bedrock and tuff. Depth to bedrock ranges from 12-40 inches. Percent of rocks by volume found within all soil horizons (0-40 inches) ranges from 35-80 percent. A characteristic of these soils is a clayey subsurface horizon (beginning at about 9 inches deep) that has a high water holding capacity. A one-inch thick layer of partially decomposed organic material can be found in some areas within the site. The representative soils and their associated map units are:

Big Bend National Park Soil Survey:
Liv-Mainstay-Rock outcrop complex, 20 to 45 percent slopes. (Liv and Mainstay component)
Puerta-Madrone complex, 20 to 45 percent slopes.

Brewster County Soil Survey:
Mainstay-Brewster complex, 10 to 30 percent slopes. (Mainstay component)

Jeff Davis County Soil Survey:
Liv-Mainstay-Rock outcrop association, steep. (Liv and Mainstay component)
Puerta-Madrone association, steep. (Puerta component)
Mainstay-Brewster association, hilly. (Mainstay component)

Presidio County Soil Survey:
Liv-Mainstay-Rock outcrop complex, 20 to 45 percent slopes. (Liv and Mainstay component)

Table 4. Representative soil features

Parent material	(1) Residuum–rhyolite
Surface texture	(1) Very gravelly silt loam (2) Very cobbly loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	30–102 cm
Surface fragment cover <=3"	10–30%
Surface fragment cover >3"	15–40%
Available water capacity (0-101.6cm)	5.08–10.16 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)	6.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	15–50%
Subsurface fragment volume >3" (Depth not specified)	7–20%

Ecological dynamics

The distribution of vegetation within the site is highly dependent on local environment. Elevation, soil moisture, aspect, slope, latitude, and topographic position are the major factors driving species composition and distribution. The Historic Climax Plant Community (HCPC) on north facing slopes is considered to be a pinyon-juniper-oak woodland (25-60% tree canopy cover) and an oak savannah (10-25% tree canopy cover) on south facing slopes. A combination of mid and tallgrasses, shrubs, and forbs comprise the understory on both aspects. Natural disturbances such as fire, insect kill, tree falling, and rock slides also contribute to vegetative diversity within the site.

The most influential natural disturbance that helps shape the plant community is fire. Historically, fires were frequent and low intensity, recurring at mean intervals of 4-9 years. Major fires ended in 1937 in both the Chisos and the Davis mountain ranges. Infrequent and smaller fires have occurred since then, mostly because of reduced fine fuel loads due to overutilization of plant resources by livestock and by direct fire suppression. Fires were important for maintaining open woodlands and savannahs within this site by suppressing woody plants. Changes in fire regime and livestock overutilization will change the vegetation structure on most slopes to tree dominated woodlands (south facing) or forests (north facing) with decreases in shade intolerant grasses. South facing slopes will have a tendency to have a higher increase in shrubs rather than trees because of the drier conditions.

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

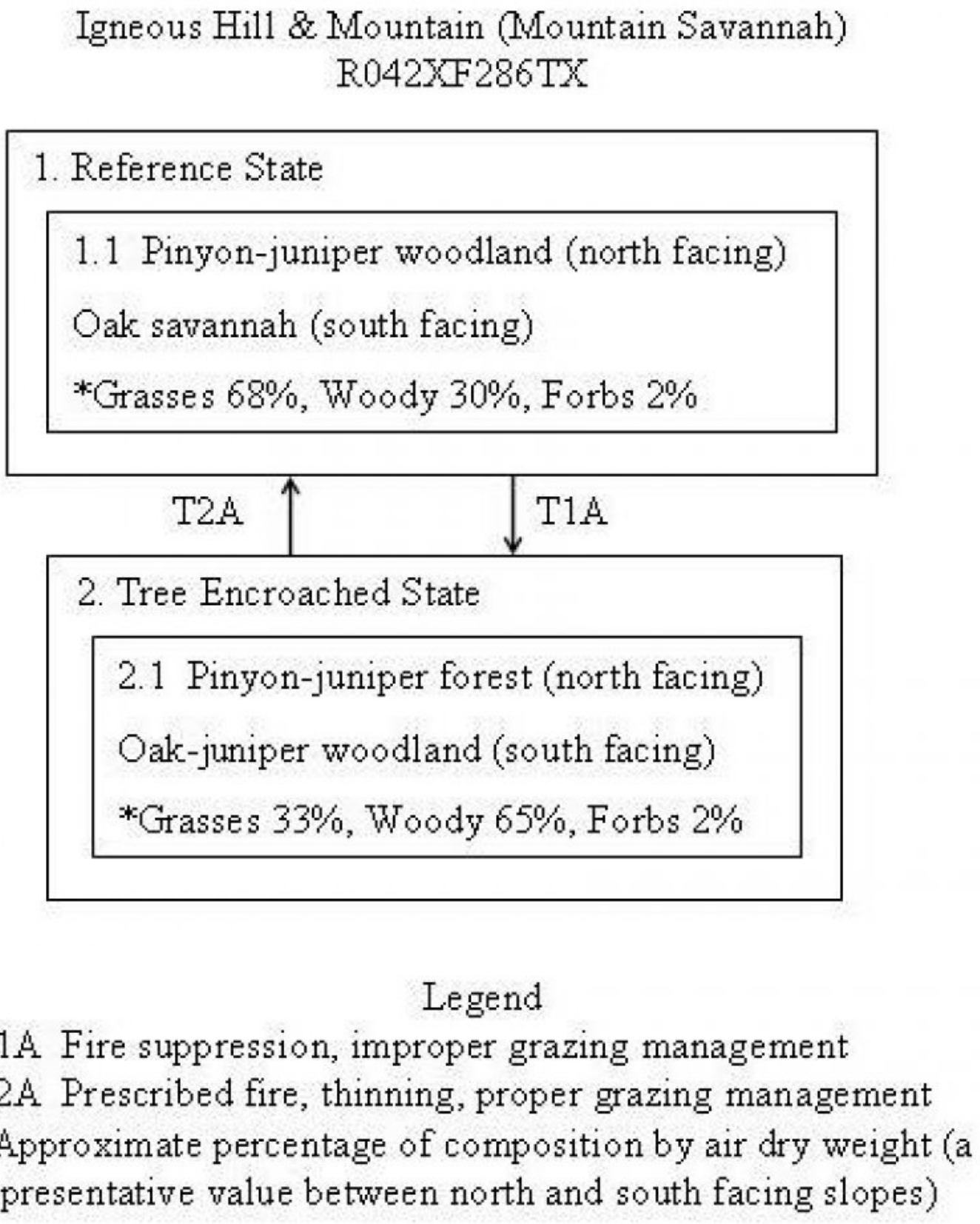

Figure 4. Igneous Hill & Mtn - Mountain Savannah - State & T

State 1
Reference State

Community 1.1
Pinyon-Juniper Woodland (North Slopes) or Oak Savannah (South Slopes)

Pinyon-Juniper Woodland – North Facing Slopes

Figure 5. 1.1 Pinyon-Juniper Woodland (North Slopes) or Oak

The pinyon-juniper woodland and the oak savannah are the reference plant communities for the north and south facing slopes, respectively. East and west facing slopes are considered to be a part of the south facing plant community. North facing slopes tend to be cooler and wetter, while south facing slopes are warmer and drier. The two reference plant communities are independent of each other and are not a product of succession. Management strategies will differ mostly because of varying forage quantity and wildlife habitat structure. Fire management will also differ because of different potential fuel accumulation and woody plant density. Depending on soils, slope, elevation, and other environmental factors, other plant communities can exist within the site (such a finestem needlegrass dominated montane meadow), but the two reference communities are the most predominant. In addition, the Chisos and Davis Mountains differ considerably in size and distance from each other with vast areas of Chihuahuan Desert plant communities in between. The concept of island effects or island biogeography is expressed within the two mountain ranges. On corresponding north aspects with similar elevation and soil parent material (approximately 6,900 feet elevation) a ponderosa-southwestern white pine/silverleaf oak/pinyon ricegrass forest (*Pinus ponderosa* var. scopulorum-*Pinus strobiformis*/*Quercus hypoleucoides*/*Piptochaetium fimbriatum*) will occur in the Davis Mountains (forestland ecological site). While in the Chisos, the plant community is a pinyon-juniper woodland/forest. Also, species such as drooping juniper (*Juniperus flaccida*) and Arizona pine (*Pinus arizonica* var. stormiae) are unique to the Chisos when compared to the Davis Mountains. The oak savannah reference community will have a higher ratio of grass-woody plant canopy cover than the pinyon-juniper woodland. Gray, Emory, and Graves oak are the dominant trees. Alligator juniper and Mexican pinyon pine occur to a much lesser extent. At the highest elevations of the site, Mexican pinyon pine can dominate is some areas, but the physiognomy would still be an open savannah. Shrubs are more common on the south facing slopes. The north facing pinyon-juniper woodland overstory is dominated by Mexican Pinyon pine and Alligator juniper, while oaks subdominate. Areas that receive extra water such as V-notch fluves on both south and north facing slopes will have a higher diversity of vegetation that require the additional soil moisture such as deer muhly (*Muhlenbergia rigens*), Gambel's oak (*Quercus gambelii*), and ponderosa pine (*Pinus ponderosa* var. scopulorum). Retrogression resulting from livestock overgrazing will result in a reduction of palatable grasses and ultimately litter accumulation. Shrubs and a few trees will increase on south facing slopes while mainly trees will increase on north facing slopes. 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 to increase. The plant communities will eventually transition to a woodland on the south facing slopes and a forest on north facing slopes (community 2.1).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1296	1601	1905
Tree	381	471	560
Shrub/Vine	191	235	280
Forb	38	47	56
Total	**1906**	**2354**	**2801**

Figure 7. Plant community growth curve (percent production by month). TX0021, Pinyon-Juniper Woodland Community. Pinyon-Juniper Woodland and Oak Savannah with scattered shrubs, warm-season grasses and few cool-season grasses..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	3	5	11	11	20	25	15	2	2

State 2
Tree Encroached State

Community 2.1
Pinyon-Juniper Forest (North Slopes) and Oak Woodland (South Slopes)

Figure 8. 2.1 Pinyon-Juniper Forest (North Slopes) and Oak W

These plant communities are the result of livestock overgrazing and direct fire suppression. Overgrazing reduces the amount of fine fuels needed for natural fires to occur. This provides a competitive advantage to woody plants. Climate limitations will most likely prevent the oak woodland on south facing slopes to transition to a closed forest. Increases in shrubs such as catclaw mimosa are observed. On cooler and wetter north facing slopes, a closed

canopy pinyon-juniper forest dominates. There is reduction of shade intolerant grasses and increases in shade tolerant grasses such as pinyon ricegrass and finestem needlegrass. Proper grazing management (adequate rest to allow recovery of some grasses) followed by prescribed fire and/or thinning will help transition the community back to composition similar to the reference. On some closed canopy north facing slopes, prescribed burns may be difficult to accomplish because tree density thresholds may have been surpassed. On south facing slopes prescribed fire can more easily be accomplished because of the more open canopy and greater amounts of fine fuels.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	818	1009	1202
Grass/Grasslike	629	777	925
Shrub/Vine	420	521	597
Forb	38	47	56
Total	**1905**	**2354**	**2780**

Figure 10. Plant community growth curve (percent production by month). TX0021, Pinyon-Juniper Woodland Community. Pinyon-Juniper Woodland and Oak Savannah with scattered shrubs, warm-season grasses and few cool-season grasses..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	3	5	11	11	20	25	15	2	2

Transition T1A
State 1 to 2

Fire suppression and improper grazing management leads to Tree Encroached State.

Restoration pathway R2A
State 2 to 1

With Prescribed Fire, Brush Thinning, and Proper Grazing Management, the Tree Encroached State can revert back to the Reference State.

Conservation practices

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 tallgrasses**			286–420	
	bullgrass	MUEM	*Muhlenbergia emersleyi*	286–420	–
2	**Warm-season tallgrasses**			381–560	
	Texas bluestem	SCCI2	*Schizachyrium cirratum*	191–336	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	191–336	–
3	**Warm-season midgrasses**			381–560	

	cane bluestem	BOBA3	*Bothriochloa barbinodis*	168–336	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	168–336	–
	blue grama	BOGR2	*Bouteloua gracilis*	56–168	–
4	**Cool-season midgrasses**			95–140	
	finestem needlegrass	NATE3	*Nassella tenuissima*	56–84	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	28–50	–
	squirreltail	ELEL5	*Elymus elymoides*	11–28	–
5	**Warm-season mid/shortgrasses**			95–140	
	hairy grama	BOHI2	*Bouteloua hirsuta*	11–28	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	17–28	–
	bristly wolfstail	LYSE3	*Lycurus setosus*	11–28	–
	woolyspike balsamscale	ELBA	*Elionurus barbiculmis*	11–22	–
	sprucetop grama	BOCH	*Bouteloua chondrosioides*	9–17	–
	black grama	BOER4	*Bouteloua eriopoda*	9–17	–
	fall witchgrass	DICO6	*Digitaria cognata*	8–13	–
6	**Warm-season midgrasses**			57–84	
	green sprangletop	LEDU	*Leptochloa dubia*	22–45	–
	purple muhly	MURI3	*Muhlenbergia rigida*	22–39	–
	pine muhly	MUDU	*Muhlenbergia dubia*	11–22	–
7	**Warm-season midgrasses**			37–53	
	threeawn	ARIST	*Aristida*	19–34	–
	spidergrass	ARTE3	*Aristida ternipes*	19–34	–
8	**Warm-season tallgrasses**			38–56	
	Indiangrass	SONU2	*Sorghastrum nutans*	18–34	–
	tall beardgrass	BOAL3	*Bothriochloa alta*	9–18	–
	eastern gamagrass	TRDA3	*Tripsacum dactyloides*	6–11	–
	big bluestem	ANGE	*Andropogon gerardii*	6–11	–
9	**Grasslikes**			1–3	
	flatsedge	CYPER	*Cyperus*	1–3	–
Shrub/Vine					
10	**Shrubs**			114–168	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	39–56	–
	fragrant sumac	RHAR4	*Rhus aromatica*	17–28	–
	evergreen sumac	RHVI3	*Rhus virens*	17–28	–
	golden currant	RIAU	*Ribes aureum*	11–17	–
	cliff fendlerbush	FERU	*Fendlera rupicola*	11–17	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	11–17	–
	brickellbush	BRICK	*Brickellia*	11–17	–
11	**Subshrubs**			57–84	
	heartleaf goldeneye	VICO	*Viguiera cordifolia*	11–17	–
	firecrackerbush	BOTE2	*Bouvardia ternifolia*	7–13	–
	Guadalupe rabbitbrush	CHSP3	*Chrysothamnus spathulatus*	7–13	–
	black prairie clover	DAEP3	*Dalea frutescens*	7–13	

	black prairie clover	DAFR2	*Dalea frutescens*	7–13	–
	awnless bushsunflower	SICA7	*Simsia calva*	7–13	–
12	**Fibrous/Succulents**			19–28	
	Texas sacahuista	NOTE	*Nolina texana*	7–13	–
	pricklypear	OPUNT	*Opuntia*	9–13	–
	Havard's century plant	AGHA	*Agave havardiana*	3–9	–
Tree					
13	**Trees**			381–560	
	Mexican pinyon	PICE	*Pinus cembroides*	84–140	–
	alligator juniper	JUDE2	*Juniperus deppeana*	73–112	–
	gray oak	QUGR3	*Quercus grisea*	62–84	–
	Emory oak	QUEM	*Quercus emoryi*	11–22	–
	Chisos red oak	QUGR2	*Quercus gravesii*	11–22	–
	drooping juniper	JUFL	*Juniperus flaccida*	0–11	–
	Texas madrone	ARXA80	*Arbutus xalapensis*	6–11	–
Forb					
14	**Forbs**			38–56	
	Forb, dicot, perennial	2FDP	*Forb, dicot, perennial*	22–34	–
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Texas snoutbean	RHSET	*Rhynchosia senna var. texana*	6–9	–
	pale cologania	COPA4	*Cologania pallida*	6–9	–
	croton	CROTO	*Croton*	6–9	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	6–9	–
	Indian paintbrush	CASTI2	*Castilleja*	0–3	–
	dayflower	COMME	*Commelina*	0–3	–
	nodding onion	ALCE2	*Allium cernuum*	1–3	–
	woodsorrel	OXALI	*Oxalis*	1–3	–

Animal community

The site can be somewhat limiting for livestock grazing because of the preponderance of steep, rocky terrain, predators, and distance to water. However, sheep and goats are the domestic grazers that can most efficiently utilize the site. Cattle are generally limited to slope gradients less than 15 percent.

Improper grazing management causes a gradual decline in range health, reducing livestock nutrition and habitat quality for wildlife. Livestock should be stocked in proportion to the amount of 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).

The site supports a high diversity of wildlife species. Mammals that that use this site for at least a portion of their overall habitat needs include mule deer, white-tailed deer, mountain lions, javelinas, black bears, bobcats, coyotes, black-tailed jackrabbits, cottontails, raccoons, ringtails, gray foxes, bats, and rock squirrels. Birds that use this site as either year-round habitat, stopover site, nesting ground, and/or wintering ground include Montezuma quail, dove, raptors, hummingbirds, and numerous song birds.

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 hydrologic functions of the site vary with soil texture and depth, rock and litter cover, slope shape, vegetation structure, and yearly precipitation fluctuations. Deep and fine textured soils generally retain more soil moisture for plant growth than shallow and/or coarse textured soils. High amounts of tree cover within a particular area can result in high interception rates and ultimately high evapotranspiration. Rock and litter cover helps reduce the velocity of overland flow and protects the soil surface from raindrop impact. 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 concentrate 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.

During the wet season, an important subsurface hydrologic process within the site that can influence species composition at varied locations. As rainwater infiltrates the soil it can reach a restrictive layer such as a clayey argillic horizon or igneous bedrock of very low permeability and then flows laterally down slope (interflow). Interflow can later discharge in areas where the soil above the restricting layer is shallow, where the downhill slope decreases such as the toe-slope of a hill, or in topographically converging areas. The occurrences of plant species with higher water requirements or of larger size can help identify the discharge areas.

These discharge areas, also known as variable source areas, will expand or contract in relation to the wet and dry seasons because it is dependent on the aerial extent of saturation within a watershed and is independent of rainfall intensity. The variable source area concept is common in humid climates with dense vegetation, steep, straight hillslopes, deep soils, and narrow valley bottoms.

Continued overutilization, can potentially influence infiltration rates and overland flow by reducing the amount of perennial, deep rooted mid and tallgrasses. There is can also be some effect from soil compaction but no formal research has quantified this for the site. Increases in overland flow can lead to soil erosion and decreased infiltration. In the Tree Encroached State (2), increases in junipers and potentially other trees can decrease amount of water available to other plants by rainfall interception and evapotranspiration.

Recreational uses

The site is used for hiking, camping, 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, soils data and ecological interpretations gained by field observation.

Other references

Bataineh, M.M., B.P. Oswald, A.L. Bataineh, K.W. Farrish, and D.W. Coble. 2007. Plant communities associated with *Pinus ponderosa* forests in the sky islands of the Davis Mountains, TX.

Begon M., J.L. Harper, and C.R. Towsnend. 1996. Ecology. 3rd edition Blackwell Science, Ltd., Cambridge, MA.

Blackburn, W.H., R.W. Knight, and M.K. Wood. 1981. Impacts of grazing on watersheds: A state of knowledge. Paper presented at the National Academy of Sciences/National Research Council, Committee on Developing Strategies for Rangeland Management, Workshop on: Impacts of Grazing Intensity and Specialized Grazing systems on Use and Value of Rangelands. El Paso, TX, March 16-17, 1981.

Brandes, D. and B.P. Wilcox. 2000. Evapotranspiration and soil moisture dynamics on a semiarid ponderosa pine hillslope. Journal of the American Water Resources Association 36(5) 965-974.

Briske, D.D., J.D. Derner, J.R. Brown, S.D. Fuhlendorf, W.R. Teague, K.M. Havstad, R.L. Gillen, A.J. Ash, and W.D. Willms. 2008. Rotational grazing on rangelands: Reconciliation of perception and experimental evidence. Rangeland Ecology and Management 61: 3-17.

Hart, C.R., T. Garland, A.C. Barr, B.B. Carpenter, and J.C. Reagor. 2003. Toxic plants of Texas. Texas Cooperative Extension publication, Texas A&M Press, College Station.

Harveson, L.A., T.H. Allen, F. Hernandez, D.A. Holdermann, J.M. Mueller, and M.S. Whitley. 2007. Montezuma quail ecology and life history. In Texas Quails: Ecology and Management, edited by L.A. Brennan. Texas A&M University Press, College Station, TX.

Hernandez, F., L.A. Harveson, F. Hernandez, and C.E. Brewer. 2006. Habitat characteristics of Montezuma quail foraging areas in west Texas. Wildlife Society Bulletin 34(3): 856-860.

Owens, M.K., R. Lyons, and C. Kneuper. 2001. Evaporation and interception water loss from juniper communities on the Edwards Aquifer Recharge Area. Final Report, Texas Agricultural Experiment Station and Texas Agricultural Extension Service, Uvalde Research and Extension Center, Uvalde, TX.

Poulos, H.M. 2007. Top down and bottom up influences on fire regimes, diversity, vegetation patterns in the Chihuahuan Desert borderlands. PhD dissertation, Yale University, New Haven, CT.

Powell, M.A. 2000. Grasses of the Trans-Pecos and Adjacent Areas. Iron Mountain Press, Marathon, TX.

Powell, M.A. 1998. Trees and shrubs of the Trans-Pecos and adjacent areas. University of Texas Press, Austin.

Ramirez, L.M. 2003. Classification of the plant communities of Davis Mountains State Park, Jeff Davis County, Texas. Thesis, Sul Ross State University, Alpine, TX.

Stopher, D.R. 1998. Ecological analysis of the plant community structure of laguna meadow, Big Bend National Park, Texas. Thesis, Sul Ross State University, Alpine, TX.

The Nature Conservancy. 2002. Conservation assessment for the Davis Mountains: Cooperative conservation through private partnerships. Planning document, West Texas Field Office, Alpine, TX.

USDA, National Water and Climate Center, “Climate Reports,” http://www.wcc.nrcs.usda.gov/climate/ (accessed January 2007).

USDA, Natural Resources Conservation Service, “Plants Database,” http://plants.usda.gov/ (accessed October 2008).

Walter, M.T., M.F. Walter, E.S. Brooks, T.S. Steenhuis, J. Boll, and K. Weiler. 2000. Hydrologically sensitive areas: Variable source area hydrology implications for water quality risk assessment. Journal of Soil and Water Conservation 3:277-284.

Warnock, B.H. 1977. Wildflowers of the Davis Mountains and Marathon Basin Texas. Sul Ross State University, Alpine, TX.

Reviewers
Jim Clausen, Soil Scientist, NRCS, Marfa, TX
Rusty Dowell, Resource Soil Scientist, NRCS, San Angelo, TX
Froylan Hernandez, Assistant Area Manager, Elephant Mountain WMA, TPWD, Alpine, TX
Lynn Loomis, Soil Scientist, NRCS, Marfa, TX
Laurie Meadows, Soil Conservation Technician, NRCS, Marfa, TX
Mark Moseley, Rangeland Management Specialist, NRCS, San Antonio, TX
Colin Shackelford, Davis Mtns. Director of Stewardship, The Nature Conservancy, Alpine, TX

Contributors

Michael Margo, RMS, NRCS, Marfa, Texas
Unknown

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:**
