USDA Natural Resources Conservation Service

Ecological site R070CY115NM
Breaks

Last updated: 10/21/2024
Accessed: 11/21/2024

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.

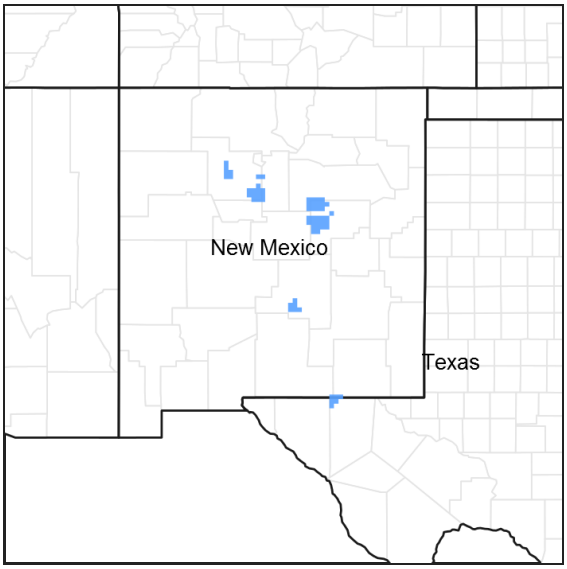


Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 042C–Central New Mexico Highlands

Major Land Resource Area (MLRA): 070C–Central New Mexico Highlands

Major Land Resource Area (MLRA) 70C - will become 42C - is a high elevation portion of central New Mexico that is the convergence of four major physiographic provinces: Basin and Range, Southern Rocky Mountains, Great Plains, and Colorado Plateau. As such, it contains parts or characteristics of each, though tectonically, as a region, it is the easternmost extent of the Basin and Range Province and, more specifically, a structural expression of the Rio Grande Rift. It consists mostly of rangeland with some forested areas associated with numerous disconnected mountain ranges such as the Guadalupe, Sacramento, and Manzano Mountains. Other major physiographic features include the Galisteo Basin or the enclosed Estancia Basin, the structural Chupadera and Glorieta Mesas, and the piedmonts of the Buchanan and Guadalupe Mesas.

Ecological site concept

The site occurs on very steep mountain escarpments with a rough, dissected topography. Slopes range from 40-95 percent.
The site consists of very shallow or shallow, well drained, and moderately permeable soils over slowly permeable limestone bedrock.

Associated sites

F042CY020TX	**Limestone Mountain (North Aspect) 20-26" PZ** Limestone Mountain (North Aspect) is on steep north facing slopes mostly above 2,286 m in elevation. Soils are mostly shallow to limestone bedrock and clayey. The reference plant community is a mixed conifer forest.
F042CY021TX	**Limestone Mountain (South Aspect) 20-26" PZ** The Limestone Mountain (South Aspect) occurs on mountain slopes and ridgetops, at elevations generally above 2,286 m. Aspects are predominantly south facing or neutral. Soils are mostly shallow to limestone bedrock, gravelly, and loamy. The reference plant community is a ponderosa pine savanna.
R070CY102NM	**Shallow Limestone** Shallow Limestone occurs on limestone hills with 10 to 50 percent slope gradient. Soils are shallow to limestone bedrock. HCPC is mixed prairie grassland with scattered forbs, shrubs, and trees.
R042CY745TX	**Limestone Canyon Bottomland** Limestone Canyon is a flood plain, stream terrace, arroyo, or basin floor with very gravelly or cobbly soils. HCPC is mainly riparian woodlands but vegetation is variable due to different soil conditions.
R042AD001NM	**Loamy, Dry Mixed Prairie** Can be adjacent to and in a higher position.
R070CY109NM	**Loamy** Loamy is a flood plain, stream terrace, arroyo, or basin floor with nongravelly or cobbly soils. HCPC is mixed prairie grassland with scattered shrubs, forbs, and trees.

Similar sites

R042AE278TX	**Limestone Hill and Mountain, Mixed Prairie** More productive and site supports oak, juniper, and pinyon trees.
R042AC249TX	**Limestone Hill and Mountain, Desert Grassland** Less productive and lacks abundance of mesic grass species.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The site occurs on very steep mountain escarpments with a rough, dissected topography. Aspect is mostly south, east, and west (90-270°). Elevation ranges from 4600-8700 feet. Slopes range from 40-95 percent and have a very high runoff potential. Exposed bedrock is common throughout the site. Species composition varies with elevation, aspect, and soil differences.

Table 2. Representative physiographic features

Landforms	(1) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	4,600–8,600 ft
Slope	40–95%
Aspect	E, S, W

Climatic features

The climate of the area is "semi-arid continental."

The average annual precipitation ranges from 13 to 16 inches. Variations of 5 inches, more or less, are not uncommon. Seventy-five percent of the precipitation falls from April to October. Most of the summer precipitation comes in the form of high intensity-short duration thunderstorms.

Temperatures are characterized by distinct seasonal changes and large annual and diurnal temperature changes. The average annual temperature is about 50 degrees F with extremes of -29 degrees F in the winter and 103 degrees F in the summer.

The average frost-free season is 130 to 160 days. The last killing frost falling in early May and the first killing frost in early October.

Both temperature and precipitation favor warm-season perennial species. However, about 40 percent of the annual precipitation falls at a time favorable to cool-season plant growth. The soils of this site can store water from winter and early spring moisture for use by cool-season species. This allows the cool-season species to occupy an important component of this site. Strong wind from the west and southwest that blow from February to June can rapidly dry the soil profile during a critical period for cool-season plant growth.

Climate data was obtained from http://www.wrcc.sage.dri.edu/summary/climsmnm.html web site using 50% probability for freeze-free and frost-free seasons using 28.5 degrees F and 32.5 degrees F respectively.

Table 3. Representative climatic features

Frost-free period (average)	173 days
Freeze-free period (average)	187 days
Precipitation total (average)	16 in

Influencing water features

This is an upland site, and is not associated with water features or wetlands. During heavy rain events, this site may receive run-on moisture from landforms above and contribute runoff to landforms below.

Soil features

The site consists of very shallow or shallow, well drained, and moderately permeable soils over slowly permeable limestone bedrock. Soils formed in both colluvium and residuum on mountain flanks and escarpments. Generally, the soils formed from colluvium are deeper and are more productive than those formed over residuum. All horizons have a high percentage of gravels and cobbles, averaging over 35 percent by volume. Typically, the surface layer is dark grayish brown and very gravelly clay loam about 7 inches thick. The underlying material from 7 to 17 inches is indurate limestone bedrock. The soil component and associated map unit correlated to this site is:

Guadalupe Mountains National Park Soil Survey Project:
Lostpeak-Rock outcrop complex, 40 to 95 percent slopes.

New Mexico:
TBD

Table 4. Representative soil features

Parent material	(1) Residuum–limestone (2) Colluvium–limestone
Surface texture	(1) Very gravelly clay loam (2) Stony loam (3) Stony silt loam
Family particle size	(1) Loamy

Drainage class	Well drained
Permeability class	Very slow to moderately slow
Soil depth	4–15 in
Surface fragment cover <=3"	10–35%
Surface fragment cover >3"	10–25%
Available water capacity (0-40in)	0–2 in
Calcium carbonate equivalent (0-40in)	40–80%
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)	30–40%
Subsurface fragment volume >3" (Depth not specified)	4–15%

Ecological dynamics

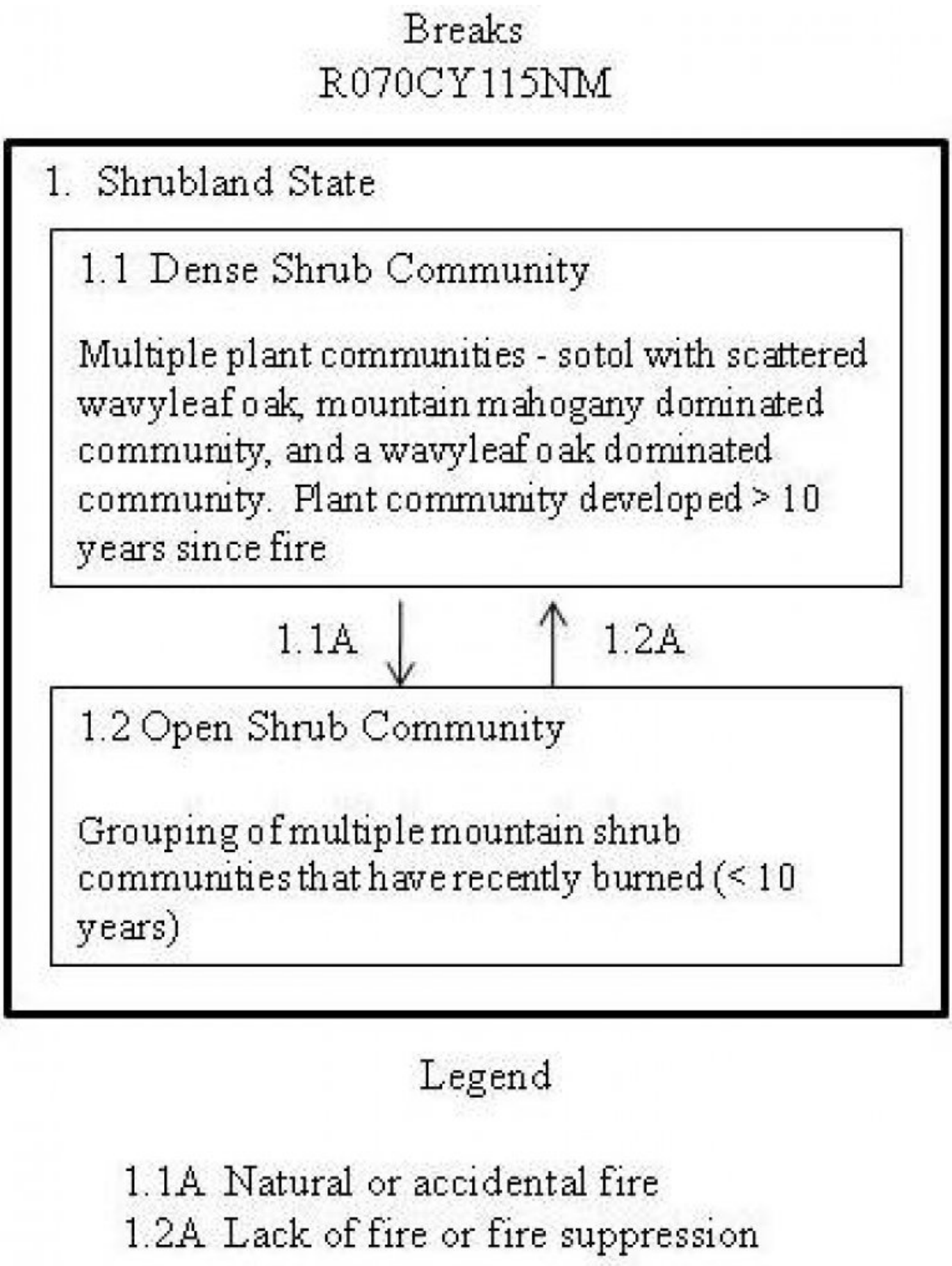
The Breaks ecological site is characterized by several mountain shrub community potentials due to variability in elevation, soil depth and texture, aspect, and topography. Plant communities include a sotol with scattered wavyleaf oak, mountain mahogany dominated community, and a wavyleaf oak dominated community.

All communities tend to occur within one very stable state. The most influential driver affecting plant community dynamics is fire. Vegetation on this site, also referred to as chaparral, experiences stand-replacing fires measured in decades (Wright 1990; Paysen et al. 2000). The buildup of litter and dry conditions following a fire will take at least 10-15 years the area is ready to burn again (Wright 1990). Since chaparral tends to replace chaparral after fire, species composition can change depending on post-fire seed bank composition, individual species morphology, and severity of the fire (NPS 2005). Generally, the dynamic is from a more closed or dense shrubland to an open shrubland phase and vice versa within a stable state.

Other disturbances such as prolonged droughts will negatively affect annual productivity. Grazing and/or browsing by domestic sheep and goats probably does not influence the site enough to cause significant phase changes because of the long and near vertical escarpments with abundant rocks outcrops protecting vegetation and the long distance to water. Historically, desert bighorn sheep and mule deer were probably the major grazers/browsers. Mule deer still occur on the site and bighorn sheep are being reintroduced in nearby areas.

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



State 1
Shrubland State

Dense Shrub Community is variable due to the variations in plants environments multiple mountain shrubland

communities are grouped into this general plant community phase. In general, the Dense Shrub Communities (1.1) phase is the potential of the site in absence of natural fires for a period of at least 10 years. Vegetation has recovered from fires, fuels have built up, and the phase is ready to burn naturally again. Annual production ranges from 1425 to 2800 pounds per acre. The Open Shrub Community is a grouping of multiple mountain shrub communities that have recently burned (< 10 years). Species composition, relative percentages of grasses and shrubs will differ due to variations in local environments (soils, topography, elevation, and aspect). In general, these communities will have a lower canopy cover of shrubs when comparing similar environments that have not burned. Individual plant morphology, local seed bank, and the severity of the fire will dictate species composition in the years following a fire.

Community 1.1
Dense Shrub Community

Figure 4. 1.1 Dense Shrub Community - Landscape View

Figure 5. 1.1 Dense Shrub Community - Sotol Dominant

Figure 6. 1.1 Dense Shrub Community - Wavyleaf Oak Dominant

Figure 7. 1.1 Dense Shrub Community - Mountain Mahogany

Due to the numerous variations in plants environments multiple mountain shrubland communities are grouped into this general plant community phase. In general, the Dense Shrub Communities (1.1) phase is the potential of the site in absence of natural fires for a period of at least 10 years. Vegetation has recovered from fires, fuels have built up, and the phase is ready to burn naturally again. Canopy cover of shrubs ranges from 35-90 percent depending on local environments. Canopy cover of grasses ranges from 30-80 percent. Total ground cover, which includes foliar and basal cover, rock fragments, and litter is high ranging from 85- 99 percent. Annual production ranges from 1425 to 2800 pounds per acre. Colluvial soils tend to be deeper than residual soils and usually support abundant grasses such as New Mexico muhly, bull muhly, sideoats grama, and little bluestem relative to shrubs. Common shrubs scattered among the grasses include sacahuista, sotol, banana yucca, and wavyleaf oak. Soils that are very shallow (<10”), usually formed from residuum, support a higher percentage of shrubs relative to grasses. The species composition of shrubs, however, will differ based on soil-moisture relationships resulting from differences in elevation, aspect, or topographic position. Sotol, mariola, skeletonleaf goldeneye, lechuguilla, and pricklypear are more abundant at lower elevations. Mountain mahogany will dominate very shallow and usually loamier soils on south facing slopes at very high elevations. Many of the shrubs found at lower elevations are rare in this community. Desert ceanothus can be found throughout all elevations. A wavyleaf oak dominated shrubland is also found on several aspects at high elevations or on mesic areas at lower elevations. Finer textured soils with better water holding capacity tend to be associated with this community (Bunting 1978 and USDA- NRCS). This community phase is very resilient and stable. Droughts or wet years will cause fluctuations in annual productivity. Fire is the only driver identified to cause temporary changes in shrub canopy cover and/or possible species composition changes depending on the severity of the fire, individual plant morphology and seed bank.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	800	1150	1500
Grass/Grasslike	600	800	1200
Forb	25	50	100
Tree	0	0	0
Total	**1425**	**2000**	**2800**

Table 6. Ground cover

Tree foliar cover	8-12%
Shrub/vine/liana foliar cover	3-8%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%

Litter	5-10%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	15-40%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	2-10%	5-10%	1-3%
>0.5 <= 1	–	3-10%	5-20%	1-2%
>1 <= 2	–	5-25%	15-30%	–
>2 <= 4.5	–	20-45%	5-20%	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 9. Plant community growth curve (percent production by month). NM4315, R070CY115NM Breaks HCPC. R070CY115NM Breaks HCPC Mixed warm/cool=season, short, mid and tall grassland with a major shrubs component and minor forb component. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	7	10	15	25	25	8	5	0	0

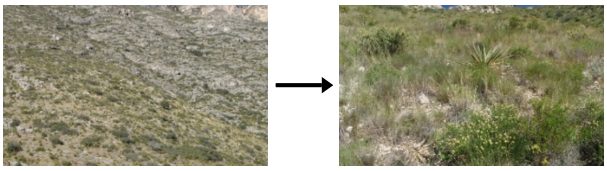
Community 1.2
Open Shrub Community

Figure 10. 1.2 Open Shrub Community

The Open Shrub Community Phase 1.2 is a grouping of multiple mountain shrub communities that have recently burned (< 10 years). Species composition, relative percentages of grasses and shrubs will differ due to variations in local environments (soils, topography, elevation, and aspect). In general, these communities will have a lower canopy cover of shrubs when comparing similar environments that have not burned. Individual plant morphology, local seed bank, and the severity of the fire will dictate species composition in the years following a fire. In a fire study within the Guadalupe Mountains, skeletonleaf goldeneye was more frequent on burned than on unburned

sites (Ahlstrand, 1978). Also, sotol, lechuguilla, and sacahuista suffered losses in excess of 50% on burned sites (Ahlstrand, 1978). The ability of sotol and other plants to survive fire is dependent upon individual plant morphology and the frequency and severity of fire. Mature sotol can contribute to fire travel since they can burn for hours and can spread fire by falling and rolling downhill (USFS). Desert ceanothus plants are usually killed by fire (Keeley et al. 1978; Zammit, 1992), but they are fire dependent because ceanothus seeds need heat stimulation from fire to germinate (Zammit, 1992). Wavyleaf oak, on the other hand, sprouts prolifically following top-kill by fire and has the potential to return to its pre-fire phase in one year with favorable rainfall and minimal herbivory. Other communities with mixed shrubs will have varying responses following a fire.

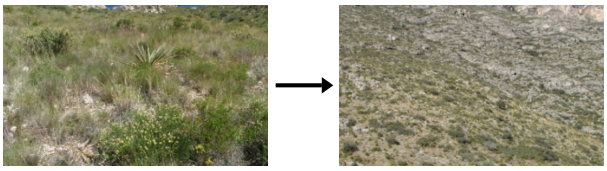
Pathway 1.1A
Community 1.1 to 1.2



Dense Shrub Community **Open Shrub Community**

Fire, either lightning induced or accidental, is the most influential driver causing a community phase change from phase 1.1 Dense Shrub Community to phase 1.2 Open Shrub Community. The severity of the fire influences post fire community composition.

Pathway 1.2A
Community 1.2 to 1.1



Open Shrub Community **Dense Shrub Community**

Lack of fire or fire suppression will help allow natural succession to occur return the more open shrub community (1.2) back to its potential of a denser shrub community (1.1). The rate of recovery will depend on the extent to which the site has been disturbed.

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	**Midgrasses**			120–240	
	sideoats grama	BOCU	*Bouteloua curtipendula*	60–200	–
	little bluestem	SCSC	*Schizachyrium scoparium*	60–200	–
2	**Short/Midgrasses**			90–180	
	blue grama	BOGR2	*Bouteloua gracilis*	50–175	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	20–60	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	30–60	–
	common wolfstail	LYPH	*Lycurus phleoides*	20–60	–
3	**Shortgrasses**			180–360	
	New Mexico muhly	MUPA2	*Muhlenbergia pauciflora*	75–250	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	50–150	–
	curlyleaf muhly	MUSE	*Muhlenbergia setifolia*	30–60	–

	slimflower muhly	MUTE	*Muhlenbergia tenuiflora*	30–60	–
	pine muhly	MUDU	*Muhlenbergia dubia*	30–60	–
4	**Shortgrasses**			30–60	
	black grama	BOER4	*Bouteloua eriopoda*	40–90	–
	slim tridens	TRMU	*Tridens muticus*	10–30	–
	threeawn	ARIST	*Aristida*	10–30	–
5	**Cool-season bunchgrasses**			60–120	
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	45–100	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	5–30	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	5–30	–
	needle and thread	HECO26	*Hesperostipa comata*	5–30	–
Shrub/Vine					
6	**Dominant Shrubs**			435–840	
	pungent oak	QUPU	*Quercus pungens*	400–800	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	200–700	–
	desert ceanothus	CEGR	*Ceanothus greggii*	100–400	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	40–120	–
7	**Subdominant Shrubs**			220–420	
	resinbush	VIST	*Viguiera stenoloba*	50–125	–
	fragrant sumac	RHAR4	*Rhus aromatica*	25–100	–
	eggleaf silktassel	GAOV	*Garrya ovata*	25–100	–
	algerita	MATR3	*Mahonia trifoliolata*	25–100	–
	Rio Grande saddlebush	MOSC	*Mortonia scabrella*	25–100	–
	mariola	PAIN2	*Parthenium incanum*	25–100	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	40–80	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	40–80	–
	Big Bend barometerbush	LEMI4	*Leucophyllum minus*	10–75	–
	rough jointfir	EPAS	*Ephedra aspera*	10–75	–
	javelina bush	COER5	*Condalia ericoides*	10–75	–
	featherplume	DAFO	*Dalea formosa*	5–50	–
	damianita	CHME3	*Chrysactinia mexicana*	5–50	–
	Guadalupe rabbitbrush	CHSP3	*Chrysothamnus spathulatus*	5–50	–
	Arizona honeysuckle	LOAR	*Lonicera arizonica*	5–50	–
	mock orange	PHILA	*Philadelphus*	5–50	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	5–50	–
8	**Fibrous/Succulents**			220–420	
	green sotol	DALE2	*Dasylirion leiophyllum*	100–300	–
	Texas sacahuista	NOTE	*Nolina texana*	50–125	–
	Havard's century plant	AGHA	*Agave havardiana*	50–125	–
	banana yucca	YUBA	*Yucca baccata*	50–125	–
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	25–100	–
	pricklypear	OPUNT	*Opuntia*	25–100	–

	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	24–40	–
Forb					
9	**Perennial Forbs**			25–100	
	Forb, perennial	2FP	*Forb, perennial*	10–25	–
	bundleflower	DESMA	*Desmanthus*	3–10	–
	buckwheat	ERIOG	*Eriogonum*	3–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	3–10	–
	needleleaf bluet	HOACP2	*Houstonia acerosa var. polypremoides*	3–10	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	3–10	–
	menodora	MENOD	*Menodora*	3–10	–
	beardtongue	PENST	*Penstemon*	3–10	–
	polygala	POLYG	*Polygala*	3–10	–
	longstalk greenthread	THLO	*Thelesperma longipes*	3–10	–
	noseburn	TRAGI	*Tragia*	3–10	–
10	**Annual Forbs**			0–10	
	Forb, annual	2FA	*Forb, annual*	0–10	–
	woolly plantain	PLPA2	*Plantago patagonica*	0–3	–

Inventory data references

Information presented here has been developed from NRCS clipping, composition, plant cover, soils data and ecological interpretations gained by field observation.

Several counties in New Mexico were inventoried: Chaves, DeBaca, Guadalupe, Lincoln, San Miguel, Santa Fe, and Torrance.

Other references

References:
1. 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.
2. Ludwig, J.A. and Muldavin, E. 2000. Vegetation change and surface erosion in desert grasslands of Otero Mesa, southern New Mexico: 1982 to 1995. American Midland Naturalist 144:273-285.
3. McNamee, G. 2008. Otero Mesa: preserving America’s wildest grassland. University of New Mexico Press, Albuquerque, NM.
4. USDA, Natural Resources Conservation Service, “Plants Database,” http://plants.usda.gov/ (accessed August 2009).

Data collection for this site was done in conjunction with the progressive soil surveys within the Pecos-Canadian Plains and Valleys 70 Major Land Resource Area of New Mexico.

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Approval

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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	11/21/2024
Approved by	Kendra Moseley
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):**

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

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

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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):**

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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:

    Sub-dominant:

    Other:

    Additional:

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

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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):**

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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:**

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17. **Perennial plant reproductive capability:**
