USDA Natural Resources
Conservation Service

Ecological site R070CY105NM
Gypsum Upland

Last updated: 10/21/2024
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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) 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.

LRU notes

This site does not yet have an LRU designation.

Ecological site concept

This site occurs on soils formed from gypsum parent materials occurring on a variety of landforms. The overriding concept is that they tend to have a high gypsum content, so they can be shallow to deep with textures ranging from

fine sand loams to clays with a majority of textures in the loam to silt loam range. The soils are highly sensitive to disturbance and can quickly transition from a productive state to an irreversibly eroded state due to mismanagement coupled with extended drought periods.

Slopes 3-30% Vegetation includes black grama, bush muhly, alkali sacaton, galleta, tabosa, gyp grama, gyp dropseed, blue grama, hairy grama, sideoats grama, threadleaf groundsel, rayless goldenrod, bladderpod, fourwing saltbush, hairy coldenia, Mormon tea, sagebrush, juniper, winterfat, and walkingstick choilla.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex canescens* (2) *Tiquilia hispidissima*
Herbaceous	(1) *Bouteloua eriopoda* (2) *Muhlenbergia porteri*

Physiographic features

This site occurs on gently to moderately sloping upland sites such as basin floors, escarpments, fan remnants, hills, flood plain steps, stream terraces, and pediments. Slopes range from 3 to 30 percent with a few sites occurring on steep hillslopes with up to 50% slopes. Elevations range from 5,500 to 6,500 feet above sea level.

The properties of this site will exist within the ranges of the following soil series, but are not necessarily characterized by their full range.
Trofes soils are on low stream terraces of basin floors. They formed in eolian, lacustrine, and alluvial material derived from mixed sources. Slopes are 0 to 2 percent. Elevation ranges from 6,200 to 6,900 feet. Well drained; medium surface runoff; permeability moderately slow
Spyglass soils are on floodplain steps of basin floors . They formed in eolian, alluvium and lacustrine deposits derived from sandstone, shale, and gypsum. Slopes are 0 to 2 percent. Elevation ranges from 6,200 to 6,900 feet. Well drained; medium surface runoff; permeability is slow
Rayohill soils are on knolls, alluvial fans and pediments, which are underlain at moderate depths by gypsum or gypsiferous silt stone bedrock. Slope ranges from l to 6 percent. Well drained. Permeability is moderate. Runoff is very low.
Tanbark soils are on knolls and hills. Slopes range from 5 to 60 percent The soils formed in local alluvium derived from gypsum. Well drained; very high runoff; moderate permeability
The Netoma soils are on fan terraces and knolls. Slopes are 2 to 12 percent. The soils formed from alluvium derived from gypsum rock. Well drained. Permeability is moderate. Runoff is low on 2 to 5 percent slopes and medium on slopes greater than 5 percent

Table 2. Representative physiographic features

Landforms	(1) Valley (2) Valley side
Runoff class	Very low to high
Elevation	5,500–6,500 ft
Slope	3–30%
Aspect	Aspect is not a significant factor

Climatic features

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 is in early May and the first killing frost is in early October.

The majority of the precipitation falls when temperatures favor warm-season plant growth. However, about 40 percent of the precipitation is also available for cool-season plant growth. These two factors are both favorable to cool-season species and also increase the variety and production of the vegetative community. Strong winds from the west and southwest blow across the area from February to June and dry the soil during a critical period for 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.

The properties of this site will exist within the ranges of the following soil series, but are not necessarily characterized by their full range.
Trofes - The mean annual precipitation is 12 to 14 inches with about 45 percent falling as rain from high-intensity convective thunderstorms between July and September. The mean annual air temperature is 49 to 51 degrees F. The frost-free period is 140 to 160 days.
Spyglass - The mean annual precipitation is 12 to 14 inches with about 45 percent falling as rain from high-intensity convective thunderstorms between July and September. The mean annual air temperature is 49 to 51 degrees F. The frost-free period is 140 to 160 days.
Rayohill - The average annual precipitation ranges from l0 to l5 inches the average annual air temperature ranges from 52 to 57 degrees F. The average frost-free period ranges from l50 to l80 days.
Tanbark - The mean annual precipitation is about 10 to 14 inches. The mean annual temperature is about 50 to 56 degrees F. The frost-free period is about 120 to 190 days.
Netoma -The average annual temperature ranges from 49 to 58 degrees F., and the average annual precipitation ranges from 10 to 13 inches. The frost-free period ranges from 120 to 180 days. Elevation ranges from 5,500 to 6,500 feet.

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 soils on this site are shallow, well drained soils that formed in materials sourced from gypsum bedrock. This includes alluvium, eoilian deposits and lacustrine deposits.

The Trofes series consists of very deep, well drained soils that formed in eolian and lacustrine deposits derived from mixed sources. Trofes soils are on low stream terraces of basin floors. Slopes are 0 to 2 percent. Mean annual precipitation is about 13 inches and mean annual temperature is about 50 degrees F.
The Spyglass series consists of very deep, well drained soils that formed in eolian and lacustrine material derived from sandstone, shale, and gypsum. Spyglass soils are on floodplain steps of basin floors . Slopes are 0 to 2 percent. Mean annual precipitation is about 13 inches and mean annual temperature is about 50 degrees F.
The Rayohill series consists of moderately deep, well drained, moderately permeable soils that formed in alluvium derived from gypsum rock. Rayohill soils are on knolls, alluvial fans and pediments. Slopes range from l to 6 percent. Mean annual precipitation is about l2 inches and mean annual temperature is about 55 degrees F.

The Tanbark series consists of soils that are very shallow and shallow to gypsum. They are well drained, moderately permeable soils that formed in local alluvium derived from gypsum on knolls, hills, and mesas. Slopes range from 1 to 80 percent. Mean annual precipitation is about 11 inches, and mean annual temperature is about 53 degrees F.
The Netoma series consists of deep, well drained, moderately permeable soil formed in alluvium derived from gypsum rock on knolls and fan terraces. Slope ranges from 2 to 12 percent. Mean annual precipitation is about 11 inches, and mean annual temperature is about 53 degrees F.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	4–24 in
Available water capacity (0-40in)	0–3 in
Electrical conductivity (0-40in)	0–8 mmhos/cm
Soil reaction (1:1 water) (0-40in)	7.4–9

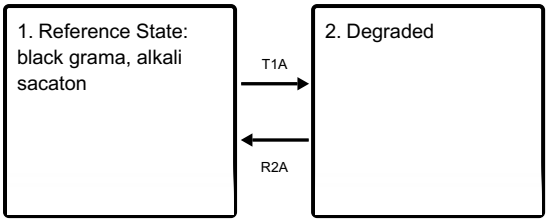
Ecological dynamics

Gypsum in the soil affects plant composition and growth. Nutrient and water dynamics are affected by the percentage of gypsum in the soil. As one approaches eroded areas with exposed gypsum, a shift in plant composition toward more gypsiferous plants, such as gyp dropseed, is evident.
Livestock grazing is the dominant agricultural use on this site.
The grazed plant community exists due to past management and disturbance, primarily fire suppression coupled with grazing management that decreases grass competition. After many years of slow retrogression a trigger event such as a severe drought could cause this site to cross a threshold where ecological processes and soil properties keep it in a degraded state.
With fire suppression, shrubs gain a competitive advantage due to deeper root systems, which take advantage of moisture stored deep in the soil profile. Conversely, grasses struggle with the slow decline of soil organic matter and the resulting decrease in plant available water. Also, due to the decrease in soil organic matter, aggregate stability diminishes causing a decrease in infiltration and an increase in runoff.
Livestock contribute to the distribution of seed and can lessen plant vigor and soil organic matter through continuous grazing and over-stocking. As grass vigor decreases, shrubs gain a competitive advantage. Over time, without a change in management, it is possible for this plant community to degrade further.
This site is suited for grazing by all kinds and classes of livestock at all seasons of the year. Due to shallow, highly erosive soil on this site, grazing must be carefully managed to prevent irreparable loss of productivity. This site lends itself to grazing management which varies the season of use and provides deferment for the desirable forage species during their growing season. Mismanagement of grazing leads to a decrease in desirable forage plants such as black grama and an increase in undesirable forage plants such as threeawn, ring muhly, burrograss, groundsel, bladderpod, and other undesirable forbs.

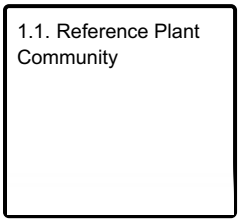
Vegetation includes black grama, bush muhly, alkali sacaton, galleta, tabosa, gyp grama, gyp dropseed, blue grama, hairy grama, sideoats grama, threadleaf groundsel, rayless goldenrod, bladderpod, fourwing saltbush, hairy coldenia, Mormon tea, sagebrush, juniper, winterfat, and walkingstick cholla.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State: black grama, alkali sacaton

black grama, alkali sacaton, galleta, tobosa, winterfat

Resilience management. Due to shallow, highly erosive soil on this site, grazing must be carefully managed to prevent irreparable loss of productivity. This site lends itself to grazing management which varies the season of use and provides deferment for the desirable forage species during their growing season.

Community 1.1
Reference Plant Community

The aspect of this phase is a grassland-shrub with a scattering of oneseed juniper. Forbs are scattered and make up an important part of the potential plant community. Other grasses that could appear on this phase include burrograss, ring muhly, threeawn, New Mexico feathergrass, needleandthread, curlyleaf muhly, vine-mesquite, bush muhly, triden, sand dropseed, and mesa dropseed. Other shrubs include, rubber rabbitbrush, wolfberry, opuntia, yucca, and pinyon. Other forbs include spectaclepod, annual sunflowers, verbena, wildbuckwhrat, and wooly Indian-wheat.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	210	368	525
Forb	30	53	75
Total	**240**	**421**	**600**

Table 6. Ground cover

Tree foliar cover	0-3%
Shrub/vine/liana foliar cover	3-10%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	35%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%

Bedrock	0%
Water	0%
Bare ground	40%

Figure 5. Plant community growth curve (percent production by month). NM4305, R070CY105NM Gyp Upland HCPC. R070CY105NM Gyp Upland HCPC Grassland-shrub with scattered oneseed juniper with forbs. .

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

State 2
Degraded

Mismanagement of grazing leads to a decrease in desirable forage plants such as black grama and an increase in undesirable forage plants such as threeawn, ring muhly, burrograss, groundsel, bladderpod, and other undesirable forbs.

Transition T1A
State 1 to 2

Season-long grazing providing little rest and recovery for preferred grazed plants during critical growing periods, coupled with high utilization.

Restoration pathway R2A
State 2 to 1

Restoration pathway resulting from the implementation of prescribed grazing.

Conservation practices

Grazing Management Plan - Applied

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				79–131	
	black grama	BOER4	*Bouteloua eriopoda*	79–131	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	79–131	–
2				26–79	
	alkali sacaton	SPAI	*Sporobolus airoides*	26–79	–
3				26–53	
	James' galleta	PLJA	*Pleuraphis jamesii*	26–53	–
	tobosagrass	PLMU3	*Pleuraphis mutica*	26–53	–
4				53–105	
	gypsum grama	BOBR	*Bouteloua breviseta*	53–105	–
	gyp dropseed	SPNE	*Sporobolus nealleyi*	53–105	–
5				26–53	
	blue grama	BOGR2	*Bouteloua gracilis*	26–53	–

	hairy grama	BOHI2	*Bouteloua hirsuta*	26–53	–
6				26–53	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	26–53	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	26–53	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	26–53	–
7				5–26	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	5–26	–
Forb					
8				5–26	
	threadleaf ragwort	SEFLF	*Senecio flaccidus var. flaccidus*	5–26	–
9				5–16	
	southern goldenbush	ISPL	*Isocoma pluriflora*	5–16	–
	southern goldenbush	ISPL	*Isocoma pluriflora*	50–16	–
10				5–16	
	bladderpod	LESQU	*Lesquerella*	5–16	–
11				5–16	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	5–16	–
12				5–16	
	fetid marigold	DYPA	*Dyssodia papposa*	5–16	–
13				5–16	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	5–16	–
Shrub/Vine					
14				26–53	
	fourwing saltbush	ATCA2	*Atriplex canescens*	26–53	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	26–53	–
15				26–37	
	hairy crinklemat	TIHI	*Tiquilia hispidissima*	26–37	–
16				26–37	
	mormon tea	EPVI	*Ephedra viridis*	26–37	–
17				5–26	
	Bigelow sage	ARBI3	*Artemisia bigelovii*	5–26	–
18				16–26	
	oneseed juniper	JUMO	*Juniperus monosperma*	16–26	–
19				26–53	
	winterfat	KRLA2	*Krascheninnikovia lanata*	26–53	–
20				26–53	
21				5–16	
	Shrub, deciduous	2SD	*Shrub, deciduous*	5–16	–

Type locality

Location 1: Chaves County, NM
Location 2: De Baca County, NM

Location 3: Guadalupe County, NM
Location 4: Lincoln County, NM
Location 5: Torrance County, NM

Other references

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. This site has been mapped and correlated with soils in the following soil surveys: Chaves, De Baca, Guadalupe, Lincoln, Sna Miguel, Santa Fe, Torrance.

Characteristic Soils Are:
Tanbark

Contributors

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Approval

Kendra Moseley, 10/21/2024

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):**

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:**