USDA Natural Resources
Conservation Service

Ecological site GX070A01X006
Slopes

Last updated: 10/01/2021
Accessed: 05/13/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 070A–High Plateaus of the Southwestern Great Plains

This site is only applicable to the Canadian Plateaus LRU of MLRA 70A (LRU 70A.1).

LRU notes

This site is only applicable to the Canadian Plateaus LRU of MLRA 70A (LRU 70A.1). Please refer to the following key:

Land Resource Unit (LRU) Key for MLRA 70A
– High Plateaus of the Southwestern Great Plains
1a. The site exists on a landform of volcanic origin, such as a basalt plateau, or is part of an escarpment system that rises directly to a volcanic structure. These escarpments are included if they have volcanic alluvium or colluvium (i.e. basalt, rhyolite, tuff, cinders) overlying non-volcanic residuum or bedrock (i.e. sandstone, shale). → VOLCANIC PLATEAUS LRU (VP)
User tip: Other alluvial or colluvial landform features extending below the escarpments are not included unless they have a predominance of volcanic fragments at the surface. Also, note that playas atop volcanic plateaus are included within the VP-LRU.
1b. All other sites. → 2
2a. The site exists in the annulus or floor of a playa. → CANADIAN PLATEAUS LRU (CP)
User tip: Small islands of playas occur within large areas of HP-LRU. These sites may be far from the nearest CP landform but will still key-out to the CP-LRU. The playa rim components, however, may key out to either LRU, so it is important to properly identify their soil properties.
2b All other sites. → 3
3a. The site is part of an escarpment landscape complex (defined below) or is within a canyon, valley, or small basin confined by such escarpments. At the upper boundary of the LRU, the soil surface meets at least 4 of the following 5 criteria:
I. Shallow or very shallow soils are present in at least 50% of the landform area;
II. Soils are underlain by sandstone bedrock of the Cretaceous Dakota Formation or older;
III. Presence or historical evidence of a conifer stand (≥ 2% canopy cover);
IV. The ground surface has a slope of at least 10%;
V. The landforms drain towards steep-walled escarpments or canyons below the Dakota sandstone (older Jurassic and Triassic Formations underlie this sandstone mesa cap).
→ MESOZOIC CANYONS AND BREAKS LRU (MCB)
User tip: The MCB sites also occur on any colluvial or alluvial bottomlands confined within escarpments or canyons. Some valleys transition from CP to MCB, or back to CP, and the turning point can be difficult to determine. Generally, the landforms are part of the MCB when confined between Dakota sandstone breaks or escarpments on both sides. Much of the acreage in the MCB is aproned by colluvial debris fans—composed of sandy materials with large sandstone fragments visible on the soil surface, including large stones or boulders. The soils in the bottoms of these confined valleys will also be in the MCB. When the valley opens, or there is only a single escarpment opening

to the plains, the landforms below the steeper, rockier escarpments will be members of the CP-LRU.
3b. Fewer than 4 of the above criteria are met. → 4
4a. The soil is on a plateau summit position (tread) and is within 50 cm to contact with either plateau bedrock (non-soil bedrock of cemented sandstone, limestone, or shale) or strath terrace cobbles2, but not a petrocalcic contact (caprock or caliche of cemented calcium carbonate). → CANADIAN PLATEAUS LRU (CP)
4b. No plateau bedrock or strath terrace cobbles within 50 cm. → 5
5a. Fragments (>2 mm) are visible within the soil profile and/or on the surface. If fragments cannot be found in the profile, it is acceptable to look nearby on ant mounds or around burrows. If site is in a drainageway, one can look for fragments on landforms immediately upslope.→ 6
5b. Fragments are entirely absent. → 7
6a. Fragments are mostly petronodes or High Plains gravels. → HIGH PLAINS LRU (HP)
6b. Fragments are mostly plateau bedrock fragments. → CANADIAN PLATEAUS LRU
7a. All horizons in the upper 100 cm of soil have textures of sandy clay loam or sandier.
→ CANADIAN PLATEAUS LRU (CP)
7b. At least one horizon in the upper 100 cm of soil has a texture that is less sandy than sandy clay loam. → HIGH PLAINS LRU (HP)

Classification relationships

NRCS and BLM: Slopes Canadian Plateaus LRU Major Land Resource Area 70A, High Plateaus of the Southwestern Great Plains Land Resource Region G, Western Great Plains Range and Irrigated Region (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS: Slopes Sandy Smooth High Plains Subsection Southern High Plains Section Great Plains-Palouse Dry Steppe Province (Cleland, et al., 2007).

EPA: Slopes <26l Upper Canadian Plateau<26 Southwestern Tablelands (Griffith, et al., 2006).

Ecological site concept

The Slopes ecological site occurs on plateau escarpments in the Canadian Plateaus LRU. This LRU occupies the western portion of MLRA 70A and extends from Las Vegas, NM at the southern end to beyond Raton, NM at its northern end. Elevation for the Canadian Plateaus LRU ranges from 5,000 to 7,500 feet.

Soil depth for the Slopes site ranges from 4 inches (10 centimeters [cm]) to over 60 inches (150 cm) to contact with shale or sandstone bedrock. Slope gradient is at least 10 percent. Because of this relatively steep gradient, aspect has a significant effect on microclimate.

Base soil texture at the surface is most often silty clay loam, clay loam, or silt loam; common texture modifiers are flaggy, channery, and very flaggy. Fragment content is generally higher in soils toward the top of the slope. The soils of this site are distinguished from other sites that occur on slopes of at least 10 percent.

Excluded from this concept are sites that meet all of the following criteria:
i. Soil surface has strong or violent effervescence (immediate frothy reaction to an acid such as white vinegar or dilute HCl.)
ii. At least 5 percent cover of calcareous rock fragments (limestone or limy sandstone/shale, or carbonate-coated fragments).
iii. Occur on an escarpment.
iv. Contain bedrock outcrop somewhere on escarpment (typically limestone).
Sites that meet the criteria above correlate to the Limy Escarpments ecological site.

Associated sites

GX070A01X014	**Lithic Limestone** This site occurs where soils are ≤ 20 inches (50 cm) to lithic contact with limestone bedrock, and often supports oneseed juniper savannahs.

GX070A01X008	**Ephemeral Drainageways** This site occurs on the channels and floodplains of ephemeral streams. Adjacent Slopes sites contribute water to this site via run-on and through-flow.
GX070A01X002	**Clayey Uplands** This site occurs in soils that have high clay in subsurface horizons. Typically, these soils are on more stable landforms that have resisted erosion, or else they have subsurface horizons derived from shale residuum. Slopes are < 10 percent.
GX070A01X004	**Shallow Loamy** This site occurs on the shoulders of strath terraces and on structural benches, where soils have ≥ 35 percent rounded fragments (old stream gravels and cobbles) in a layer at least 20 inches (50 cm) thick within the upper 40 inches (100 cm).
GX070A01X019	**Gravelly Terraces** This site occurs on the shoulders of strath terraces and on structural benches, where soils have ≥ 35 percent rounded fragments (old stream gravels and cobbles) in a layer at least 20 inches (50 cm) thick within the upper 40 inches (100 cm).
GX070A01X003	**Loamy Uplands** These soils are deeper than 50 cm to bedrock and are on landforms with slopes < 10 percent. They lack high clay in subsurface horizons.

Similar sites

R070AY019NM	**Shallow Savanna** The site is on hills, ridges, and plains. The soils formed in fine textured material weathered from shale, claystone or sandstone. Soils are well drained, very shallow and shallow over shale or limestone.
R070AY009NM	**Shale Hills** This site is on steep and very steep slopes along the mesa escarpments, scarp slopes, ridges and hillsides. The landscape is characteristically steep and very steep slopes, or low escarpments composed of interbedded shale and limestone with soil on moderately steep benches or fans. Soils are very shallow to shallow over shale or limestone.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Legacy ID

R070AA006NM

Physiographic features

The Canadian Plateaus LRU exists on a plateau unit of the Great Plains Province landscape. The landforms that occur on this landscape include both erosional and depositional surfaces of plateaus and consist of alluvial fans, ridges, benches, playas, breaks, terraces, and floodplains. The Canadian River Valley, primarily to the east, is the base level towards which the entire LRU is eroding and draining. As plateaus grade towards the Canadian River, the elevation drops from above 7,500 feet to below 5,000 feet over a distance of 30 to 40 miles. Because of this erosional gradient, the exposed strata are generally older as you move from west to east across this LRU. In the west, the younger rocks, such as the late Cretaceous shales and limestones, remain intact, a testament to their distance from the Canadian River Valley. To the east, the early Cretaceous Dakota sandstone provides a caprock that serves as the plateau rim.

The Slopes ecological site occurs on plateau escarpments in LRU 70A and is not extensive. Other ecological sites in the Canadian Plateaus LRU that occupy this landform position are the Limy Slopes, Shallow Loamy Slopes, and Loamy Slopes.

Associated sites that occur on landforms and landform positions adjacent to the Slopes ecological site are the Lithic

Limestone, Lithic Sandstone, Mountain Front Fans, Loamy Argillic, Playas, Saline Playas, Shallow Loamy, Sandy, Limy, Loamy, and Ephemeral Drainageway.

For more detail on how the Slopes ecological site contrasts with and relates to other sites in the Canadian Plateaus, see the Ecological Site Key and Associated Sites section.

Geology:
The geology of the Canadian Plateaus LRU consists primarily of Cretaceous rocks: shale, limestone and sandstone of the Dakota, Graneros, Greenhorn, Pierre, and Niobrara Formations. The Slopes site occurs on all of these formations where limestone is not the dominant parent material. Soils form in colluvium and slope alluvium over residuum, all derived from mixed sedimentary rocks.

Figure 1. The Slopes site occurs on escarpments such as the one in the background here. Note the absence of rock outcrop—which is a defining feature of the Limy Escarpments ecological site.

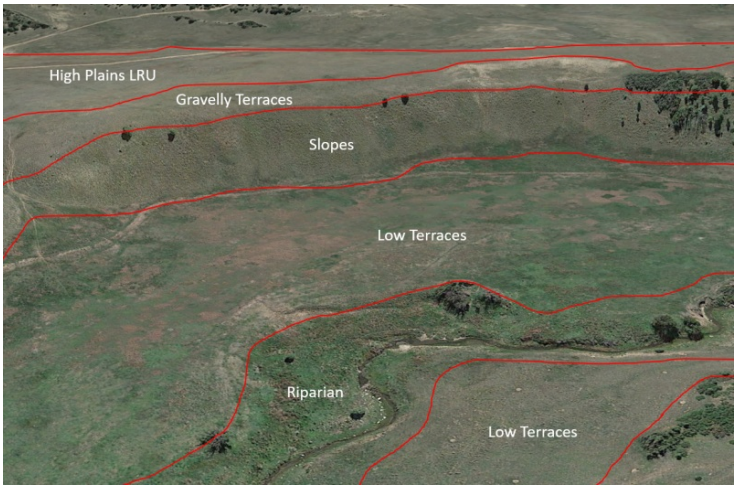


Figure 2. A landscape diagram showing the Slopes site in relation to commonly-associated sites.

Table 2. Representative physiographic features

Landforms	(1) Escarpment (2) Plateau
Flooding frequency	None
Ponding frequency	None
Elevation	1,524–2,286 m
Slope	10–100%
Water table depth	203–251 cm
Aspect	Aspect is not a significant factor

Climatic features

The Canadian Plateaus are currently described as having an aridic-ustic and mesic soil climate regime. The estimated average annual soil temperature ranges from 49 to 58 F, supported by soil temperature measurements taken from May 2014 to July 2015. Rainfall occurs mostly during the summer months and ranges from 15 to 18 inches annually. An annual average range of 130 to 170 cumulative frost free days is common, with 150 days or fewer occurring above 7,000 feet.

Table 3. Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	170 days
Precipitation total (average)	406 mm

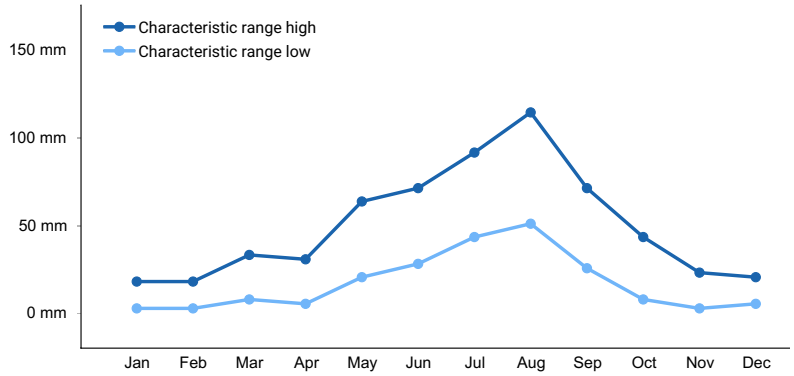


Figure 3. Monthly precipitation range

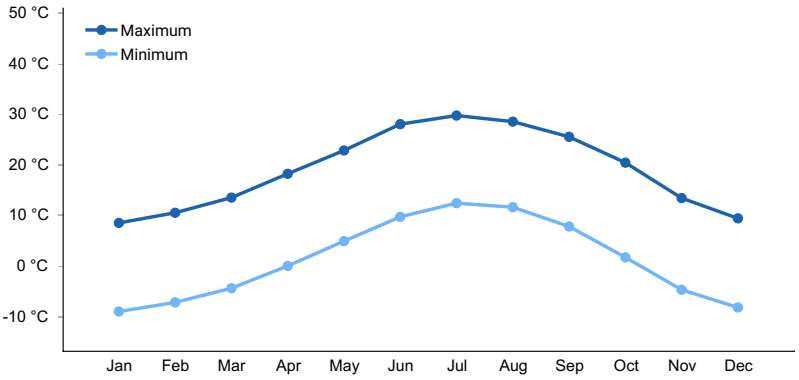


Figure 4. Monthly average minimum and maximum temperature

Climate stations used

- (1) MAXWELL 3 NW [USC00295490], Maxwell, NM
- (2) SPRINGER [USC00298501], Springer, NM
- (3) LAS VEGAS WWTP [USC00294862], Las Vegas, NM
- (4) ROY [USC00297638], Roy, NM
- (5) LAS VEGAS MUNI AP [USW00023054], Las Vegas, NM
- (6) CIMARRON 4 SW [USC00291813], Cimarron, NM
- (7) DES MOINES [USC00292453], Des Moines, NM
- (8) VALMORA [USC00299330], Valmora, NM

Influencing water features

Soil Hydrology

The Slopes ecological site is not associated with a wetland or riparian system; it is an upland ecological site. Because this site occurs on plateau escarpments, it readily sheds water (via run-off and through-flow) to sites lower

in the catena. The Clayey Uplands and Ephemeral Drainageways are the sites that most commonly receive additional moisture from this site. Small, isolated areas of seeping water occasionally discharge from the bottoms (footslope positions) of these slopes.

Soil features

Every ecological site and associated soil component has static soil properties that help define the physical, chemical, and biological characteristics that make the site unique. The following soil profile information is a description of those unique soil properties for the Slopes ecological site.

The Slopes ecological site currently correlates to major components of several map units in the Canadian Plateaus LRU of 70A. These components are correlated either to the Mion or to the Litle soil series. These soils form in colluvium and/or slope alluvium over residuum, all derived from mixed sedimentary rock. The main distinction between these series is depth to bedrock, which is typically either weakly or moderately cemented.

These soils are well drained, and have a slow to moderately slow saturated conductivity, with medium to rapid runoff. The soil moisture regime is ustic bordering on aridic. The mean annual soil temperature is 49 to 58 degrees F; this range falls in the mesic temperature regime.

The soils have various surface textures, including clay loam, clay loam, and silt loam; common texture modifiers are flaggy, channery, and very flaggy. Common subsurface horizon textures are clay loam, clay, and silty clay, as well as flaggy modifiers of these base textures. A high concentration of surface fragments is common on both components. This property appears to select for sideoats grama, which is an important component of all plant community phases.

The Mion soils generally occur on the upper half of the escarpment, and the Litle soils generally occur on the bottom half. However, variations in stratigraphy often create exceptions to this trend. Below are central concepts of these two soils.

TYPICAL PEDON: Mion silt loam, Colfax County, New Mexico; about 9 miles west of Maxwell; 350 feet south and 1,580 feet west of NE corner of section 28, T. 26 N., R. 21 E.

A-0 to 4 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, plastic; many fine roots; few fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary. (2 to 5 inches thick)

AC-4 to 14 inches; pale brown (10YR 6/3) silty clay, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, firm, slightly sticky and plastic; many fine roots; common fine and medium tubular pores; strongly effervescent; moderately alkaline; abrupt smooth boundary. (4 to 15 inches thick)

Cr-14 to 22 inches; light brownish gray (2.5Y 6/2) shale, dark grayish brown (2.5Y 4/2) moist; many fine roots between plates in upper inch; thin lime deposits between plates in upper few inches.

Parent Material Kind: shale, sandstone, and limestone
Parent Material Origin: colluvium and/or slope alluvium over residuum.
Surface Texture Group: clay, silty clay, flaggy clay, and flaggy silty clay
Subsurface Texture Group: very channery loam, extremely channery loam, and parachannery clay loam.
Surface Fragments

Figure 5. A typical Mion soil profile for the Slopes site. Note the gray shale fragments towards the bottom of the excavation, where developed soil grades into soft shale bedrock.

Figure 6. A typical soil profile for the Litle component in the Slopes ecological site. Parent material is mostly derived from shale. Soft shale bedrock occurs at 27 inches (68 cm) in depth.

Table 4. Representative soil features

Parent material	(1) Colluvium–sandstone and shale (2) Alluvium–limestone
Surface texture	(1) Flaggy clay (2) Silty clay (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderately slow
Depth to restrictive layer	10–152 cm
Soil depth	10–152 cm
Surface fragment cover <=3"	50–70%
Surface fragment cover >3"	5–20%
Available water capacity (0-152.4cm)	1.27–12.7 cm
Calcium carbonate equivalent (0-152.4cm)	1–25%
Electrical conductivity (0-152.4cm)	0–2 mmhos/cm

Sodium adsorption ratio (0-152.4cm)	0–1
Soil reaction (1:1 water) (0-152.4cm)	7.4–8.4
Subsurface fragment volume <=3" (152.4cm)	15–50%
Subsurface fragment volume >3" (152.4cm)	0–30%

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	40–90%
Surface fragment cover >3"	0–40%
Available water capacity (0-152.4cm)	0.51–20.32 cm
Calcium carbonate equivalent (0-152.4cm)	Not specified
Electrical conductivity (0-152.4cm)	Not specified
Sodium adsorption ratio (0-152.4cm)	Not specified
Soil reaction (1:1 water) (0-152.4cm)	Not specified
Subsurface fragment volume <=3" (152.4cm)	Not specified
Subsurface fragment volume >3" (152.4cm)	Not specified

Ecological dynamics

Plant tables have not been developed for this site. Until such time as they can be updated, use the plant tables in the referenced literature that correlates to this concept (refer to legacy information correlated to this site included below). With respect to the imperfect alignment of such correlations, be aware of these shortcomings in their applicability to conservation planning.

The Slopes ecological site is dominated by short grasses, but also contains a mix of shrubs, forbs, and succulents. Trees are occasionally present. As is typical of plant communities in this region, pronounced annual variations in precipitation translate to considerable short-term fluctuations in annual production within a given plant community phase.

There are numerous variables which affect the range of characteristics for this ecological site. Variables such as elevation, latitude, and orographic effects create a climatic gradient which influence the distribution of C3 and C4 plants. Soil properties such as surface texture, depth to clay layer, parent material, and accumulated salts affect species diversity and composition. Natural disturbances such as drought and wildfire affect species density and cover.

The climate gradient across the CP LRU shows a greater distribution of C3 plants such as western wheatgrass and bottlebrush squirreltail where temperatures are cooler, and moisture is more abundant. Where surface texture trends toward clay loam, western wheatgrass, galleta, and vine mesquite grass increase. In areas of sandier surface textures, sideoats grama and sand dropseed are more likely to occur.

Fire is a disturbance regime that reduces succulents and shrubs while stimulating grasses and forbs. Not all fires are equal. According to Gebow (2001), fire effects in the same location will vary, especially with fire timing, both

seasonally and within the scheme of year-to-year moisture variation. Precipitation during seasons before and after fire has a major effect on recovery of plants. Fire promotes rhizomatous plant species, such as western wheatgrass, that can take advantage of below-ground rhizomes from which tillering is rapidly initiated.
Grazing pressure will tend to favor grasses such as blue grama and purple threeawn as well as shrubs such as broom snakeweed and Plains yucca.
Plant communities are quite similar on both soil components. In general, shrub cover is somewhat higher and grass cover is somewhat lower on the Mion component. Plant community phase descriptions herein apply to the entire escarpment.
Correlation to Current Ecological Sites:
The Mion components that fit the Slopes concept are currently divided among two ESDs: Shallow Savannah (R070AY019NM) and Shale Hills (R070AY009NM). While these two ESDs are very difficult to distinguish, the ecological dynamics narrative for the Shallow Savannah site (R070AY019NM) is more detailed: "The structure of the potential natural plant community is predominantly grasses with scattered overstory of one seed juniper. Grass species are dominated by warm-season mid-grasses. Woody species make up 30 percent of the vegetation. Juniper, mountain mahogany and oak are the major woody species. Forbs make up 10 percent of the vegetation."

Legacy Correlations:

From Shallow Savannah (R070AY019NM) Tables
Annual production by plant type
Plant Type-------Low(Lb/Acre)-------RV(Lb/Acre)-------High(Lb/Acre)
Grass/Grasslike-----320----------400----------650
Tree----------150----------200----------300
Forb----------50----------70----------100
Total----------520----------670----------1050

Community 1.1 plant community composition
Common Name----------Symbol----------Scientific Name-------Annual Production (Lb/Acre)
GRASS/GRASSLIKE
1 blue grama----------BOGR2-----*Bouteloua gracilis*----------50–150
2 sideoats grama----------BOCU------*Bouteloua curtipendula*----------75–200
3 little bluestem----------SCSCS------*Schizachyrium scoparium* var. scoparium--50–150
4 wolfstail----------LYCUR------Lycurus----------15–50
5 western wheatgrass----------PASM-------*Pascopyrum smithii*----------25–100
7 slimspike threeawn----------ARLO16-----*Aristida longespica*----------15–50
8 needle and thread----------HECOC8-------*Hesperostipa comata* ssp. comata-------25–100
11 New Mexico feathergrass----HENE5-------*Hesperostipa neomexicana*----------25–100
TREE
9 oneseed juniper----------JUMO-------*Juniperus monosperma*----------25–100
10 twoneedle pinyon----------PIED-------*Pinus edulis*----------15–50
SHRUB/VINE
12 alderleaf mountain mahogany-CEMO2----*Cercocarpus montanus*----------15–50
13 field sagewort ----------ARCA12------*Artemisia campestris*----------15–50
14 Apache plume----------FAPA-------*Fallugia paradoxa*----------15–50
15 fourwing saltbush----------ATCAC-------*Atriplex canescens* var. canescens---------15–50
16 Gambel oak----------QUGA-------*Quercus gambelii*----------15–50
FORB
17 buckwheat----------ERIOG-------Eriogonum----------15–50

From Shale Hills (R070AY009NM) Tables
ANNUAL PRODUCTION BY PLANT TYPE
Plant Type--------Low(Lb/Acre)--------RV(Lb/Acre)--------High(Lb/Acre)
Grass/Grasslike----------360----------510----------660
Shrub/Vine----------170----------240----------310
Forb----------50----------70----------90
Total----------580----------820----------1060

Community 1.1 plant community composition

Common Name----------Symbol-------Scientific Name----------Annual Production (Lb/Acre)
GRASS/GRASSLIKE
1 blue grama----------BOGR2--------*Bouteloua gracilis*----------128–170
2 sideoats grama----------BOCU--------*Bouteloua curtipendula*--------85–128
3 little bluestem----------SCSC--------*Schizachyrium scoparium*--------85–128
4 James' galleta----------PLJA--------*Pleuraphis jamesii*----------43–85
5 western wheatgrass----------PASM--------*Pascopyrum smithii*----------43–85
6 threeawn----------ARIST--------Aristida----------26–43
7 needle and thread----------HECO26-----*Hesperostipa comata*----------26–43
8 New Mexico feathergrass--------HENE5------*Hesperostipa neomexicana*-----26–43
9 *Graminoid (grass or grass-like)*--2GRAM------ *Graminoid (grass or grass-like)*-26–43
FORB
10 buckwheat----------ERIOG------Eriogonum----------26–43
11 *Forb, annual*----------2FA--------- *Forb, annual*----------26–43
12 *Forb, perennial*----------2FP-------- *Forb, perennial*----------26–43
Tree
13 juniper----------JUNIP-------Juniperus----------43–85
14 twoneedle pinyon----------PIED--------*Pinus edulis*----------43–85
Shrub/Vine
15 hairy mountain mahogany---CEMOP---*Cercocarpus montanus* var. paucidentatus-26–43
16 prairie sagewort----------ARFR4------*Artemisia frigida*----------26–43
17 fourwing saltbush----------ATCA2------*Atriplex canescens*----------26–43
18 Apache plume----------FAPA-------*Fallugia paradoxa*----------26–43
19 oak----------QUERC-------Quercus----------43–85
20 broom snakeweed----------GUSA2-------*Gutierrezia sarothrae*----------26–43
21 *Shrub, deciduous*----------2SD---------- *Shrub, deciduous*----------43–85

From the San Miguel County (NM630) soil survey :
"The potential plant community on the Mion soil is mainly sideoats grama, little bluestem, blue grama, and needleandthread. (…) As the range deteriorates, the proportion of these forage plants decreases and the proportion of ring muhly, blue grama, pricklypear, and oneseed juniper increases. Grazing management should be designed to increase the productivity and reproduction of sideoats grama, western wheatgrass, and little bluestem."
The structure of the potential natural plant community is predominantly grasses with scattered overstory of oneseed juniper. Grass species are dominated by warm season mid-grasses. Woody species make up 30 percent of the vegetation. Juniper, mountain mahogany, and oak are the major woody species. Forbs make up 10 percent of the vegetation.
Other grasses may occur in trace amounts include vine mesquite, prairie Junegrass, and big bluestem.
Other woody plants may occur in trace amounts include: winterfat, skunkbush, and Bigelow sage.
Other woody plants* may occur in trace amounts include: Asters and Indian paintbrush.
*This refers to forbs rather than woody plants.

State and transition model

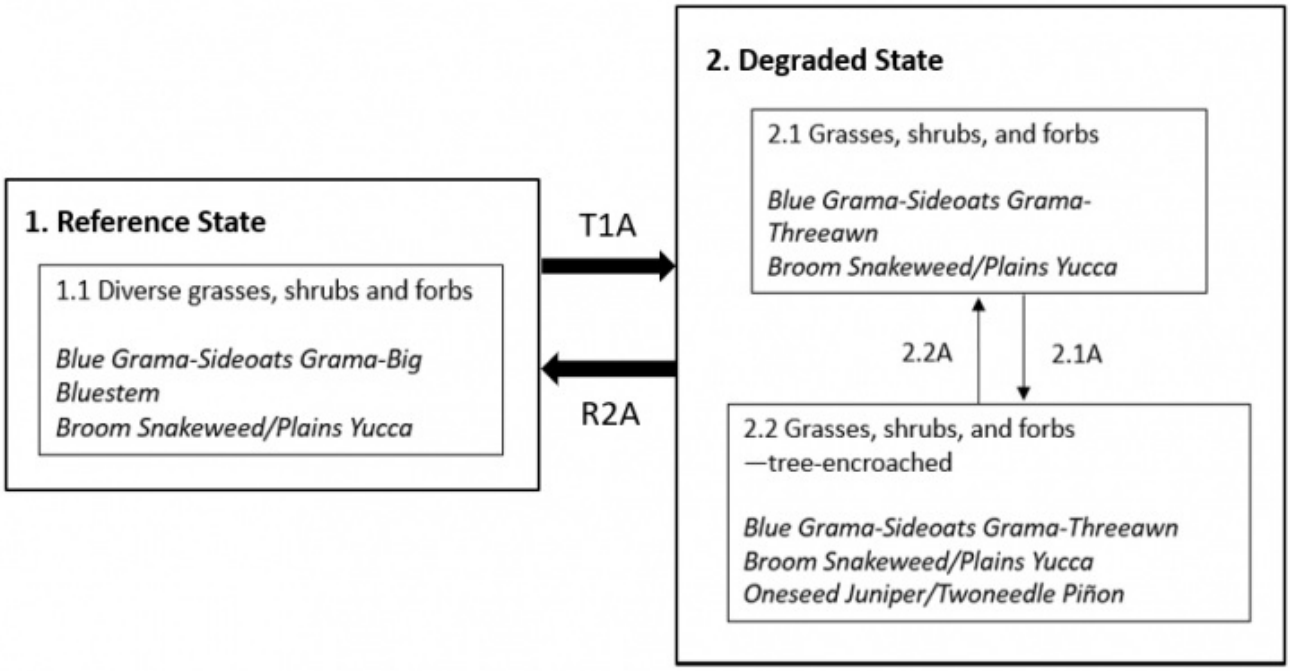


Figure 7. State and transition model diagram for the Slopes site.

State 1
Reference State

Community 1.1
1.1 Diverse grasses, shrubs and forbs (diagnostic plant community)

Figure 8. Community 1.1 in Mora County, August 2017. Camera angle is directly upslope, and the deeper Litle component is the dominant soil in the foreground.

This community is dominated by grasses, but also contains a number of shrubs and forbs. Foliar cover is approximately 70 percent, and bare ground is typically less than 5 percent—due largely to a preponderance of surface fragments. Total canopy cover of grasses ranges from 35 to 60 percent. Shrub cover ranges from 5 to 25 percent. Annual production averages around 900 pounds per acre, but varies considerably in response to annual weather patterns. This community occurs where season-long grazing has not been practiced in a number of years. Blue grama and sideoats grama are the dominant grasses. Palatable tallgrass species such as big bluestem and yellow Indiangrass are present, and often well-represented. The shrub community is usually dominated by broom

snakeweed; but plains yucca, Bigelow sagebrush, and plains pricklypear are also common.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- blue grama (*Bouteloua gracilis*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

State 2
Degraded State

Community 2.1
Grasses, shrubs, and forbs

Figure 9. Community 2.1 in Colfax County, September 2018. Surface fragments here are mostly calcareous sandstone.

Figure 10. Community 2.1 in Mora County, September 2017. This is an example of a strath terrace escarpment, where a veneer of river cobbles overlies shale-derived soils.

This community is dominated by grasses, but also contains a number of shrubs and forbs. Foliar cover ranges from 45 to 60 percent, and bare ground is as high as 10 percent—governed largely by the percentage of surface fragments. Total canopy cover of grasses ranges from 35 to 60 percent. Shrub cover ranges from 5 to 30 percent. Annual production averages around 650 pounds per acre, but varies considerably in response to annual weather patterns. While grass cover does not differ between phases 1.1 and 2.1, grass vigor/production is markedly lower in the latter. This community occurs where the plant community has been affected by season-long grazing. Blue grama and sideoats grama are typically the dominant grasses. Purple threeawn, galleta, and little bluestem are often major players. The shrub community is usually dominated by broom snakeweed; but plains yucca, Bigelow sagebrush, and plains pricklypear are also common.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- blue grama (*Bouteloua gracilis*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Community 2.2
Grasses, shrubs, and forbs—tree-encroached

Figure 11. Community 2.2 in Mora County, October 2017. Camera angle is up-slope

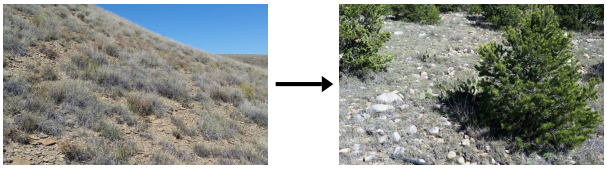
Figure 12. Community 2.2 in Mora County, October 2017. This is an east-facing escarpment of a strath terrace; note the veneer of river cobbles on the soil surface.

This community is dominated by grasses, but also contains a number of trees, shrubs, and forbs. Foliar cover ranges from 40 to 60 percent, and bare ground is generally around 7 percent. Total canopy cover of grasses ranges from 15 to 45 percent. Shrub cover ranges from 2 to 20 percent. Tree cover ranges from 5 to 35 percent. Annual production averages around 500 pounds per acre, but varies considerably in response to annual weather patterns. This community occurs where the plant community has been affected by season-long grazing and the absence of fire. Blue grama and sideoats grama are typically the dominant grasses. Galleta may also be dominant. The shrub community is usually dominated by broom snakeweed or Gambel oak; but plains yucca, Bigelow sagebrush, and plains pricklypear are also common. Oneseed juniper and twoneedle piñon comprise the overstory, and vary in their relative dominance.

Dominant plant species

- oneseed juniper (*Juniperus monosperma*), tree
- twoneedle pinyon (*Pinus edulis*), tree
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- Gambel oak (*Quercus gambelii*), shrub
- blue grama (*Bouteloua gracilis*), grass
- sideoats grama (*Bouteloua curtipendula*), grass
- James' galleta (*Pleuraphis jamesii*), grass

Pathway 2.1A
Community 2.1 to 2.2



Grasses, shrubs, and forbs

Grasses, shrubs, and forbs—tree-encroached

This pathway represents the encroachment of tree species. The most likely mechanism is season-long grazing providing little rest and recovery for preferred grazed plants during critical growing periods, coupled with high utilization. Lack of fire is also a mechanism here. Established trees suppress the growth of grasses and shrubs alike through direct competition and allelopathy.

Pathway 2.2A
Community 2.2 to 2.1

Grasses, shrubs, and forbs—tree-encroached

Grasses, shrubs, and forbs

This pathway represents the removal of tree species. Fire, mechanical treatments, and herbicide applications are the most likely mechanisms.

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. This results in the extirpation of big bluestem and/or yellow Indiangrass. Concurrently, early-seral species such as purple threeawn and galleta increase in abundance.

Restoration pathway R2A
State 2 to 1

Re-establishment of tallgrass species such as big bluestem and yellow Indiangrass, and a diminishment of early-seral grasses. Prescribed or deferred grazing practices would most likely be an essential component of this process. Seeding and fire may also be necessary.

Context dependence. This pathway will most likely proceed from Community 2.1, since trees are expected to suppress the growth of grasses.

Additional community tables

Animal community

Habitat for Wildlife:
From the Hills (R070AY019NM) site: “This site provides habitats which support a resident animal community that is characterized by mule deer, coyote, bobcat, eastern cottontail, rock squirrel, southern plains woodrat, pinyon mouse, great horned owl, ferruginous hawk, plain titmouse, brown towhee, scrub jay, western diamondback rattlesnake, and red spotted toad.”

Hydrological functions

Soil Hydrology
The Slopes ecological site is not associated with a wetland or riparian system; it is an upland ecological site. Because this site occurs on plateau escarpments, it readily sheds water (via run-off and through-flow) to sites lower in the catena. The Clayey Uplands and Ephemeral Drainageways are the sites that most commonly receive additional moisture from this site. Small, isolated areas of seeping water occasionally discharge from the bottoms (footslope positions) of these slopes.

Wood products

This site can support oneseed juniper woodlands--some of which contain pinyon pine.

Other products

Tables from Shallow Savannah Ecological Site - R070AY019NM

Other information

Grazing: This site is adapted to spring, summer, and fall grazing. Distribution of domestic livestock is a problem on this site. All ages and classes prefer to graze flatter slopes, leaving the steeper slopes ungrazed. It is better suited to younger age livestock. Goats will be best suited to use the large amount of woody species on the site. Approximately 70 percent of the total annual yield is by species that produce forage or browse. The large variety of grasses and forbs and shrubs provide a balanced feed and excellent nutrition for all grazing and browsing animals. Continuous grazing in the growing season will cause the more desirable forage plants such as sideoats grama, little bluestem, western wheatgrass, mountain mahogany, New Mexico feathergrass, and winterfat to decrease. Species most likely to increase are blue grama, galleta, threeawn, oneseed juniper, sleepygrass, and oakbrush. As the condition further deteriorates it is accompanied by a sharp increase in oneseed juniper and oak brush. The ground cover is greatly reduced causing excessive erosion which exposes the weathered shale. A system of deferred grazing which varies the time of grazing and rest in a pasture during successive years is needed to maintain or improve the plant community. Rest during April, May, and June allows western wheatgrass to grow and reproduce. Rest during the late winter and early spring is beneficial to shrubs such as mountain mahogany.

Other references

Cleland, D.T.; Freeouf, J.A.; Keys, J.E., Jr.; Nowacki, G.J.; Carpenter, C; McNab, W.H. 2007. Ecological Subregions: Sections and Subsections of the Conterminous United States.[1:3,500,000], Sloan, A.M., cartog. Gen. Tech. Report WO-76. Washington, DC: U.S. Department of Agriculture, Forest Service.

Gebow, B. S., 2001. Search, Compile, and Analyze Fire Literature and Research Associated with Chihuahuan Desert Uplands, Tucson: The University of Arizona.

Griffith, G.E.; Omernik, J.M.; McGraw, M.M.; Jacobi, G.Z.; Canavan, C.M.; Schrader, T.S.; Mercer, D.; Hill, R.; and Moran, B.C., 2006. Ecoregions of New Mexico (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,400,000).

Kuchler, A.W. 1964. Potential Natural Vegetation of the Conterminous United States. American Geographical Society, Special Publication.

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

United States Department of Agriculture, Natural Resources Conservation Service. 1977. Soil survey of San Miguel County, New Mexico.
https://www.nrcs.usda.gov/wps/portal/nrcs/soilsurvey/soils/survey/state/

United States Department of Agriculture, Natural Resources Conservation Service. 1981. Soil survey of Mora County, New Mexico.

https://www.nrcs.usda.gov/wps/portal/nrcs/soilsurvey/soils/survey/state/

USNVC, 2017. United States National Vegetation Classification Database, V2.01. [Online]
Available at: http://usnvc.org/explore-classification/

Contributors

Logan Peterson, soil scientist, NRCS
Aaron Miller, soil scientist, NRCS

Approval

Curtis Talbot, 10/01/2021

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	05/13/2025
Approved by	Curtis Talbot
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:**