USDA Natural Resources Conservation Service

Ecological site F070AY022NM
Pinus ponderosa-Juniperus scopulorum/Quercus gambelii

Last updated: 9/12/2023
Accessed: 05/20/2025

General information

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

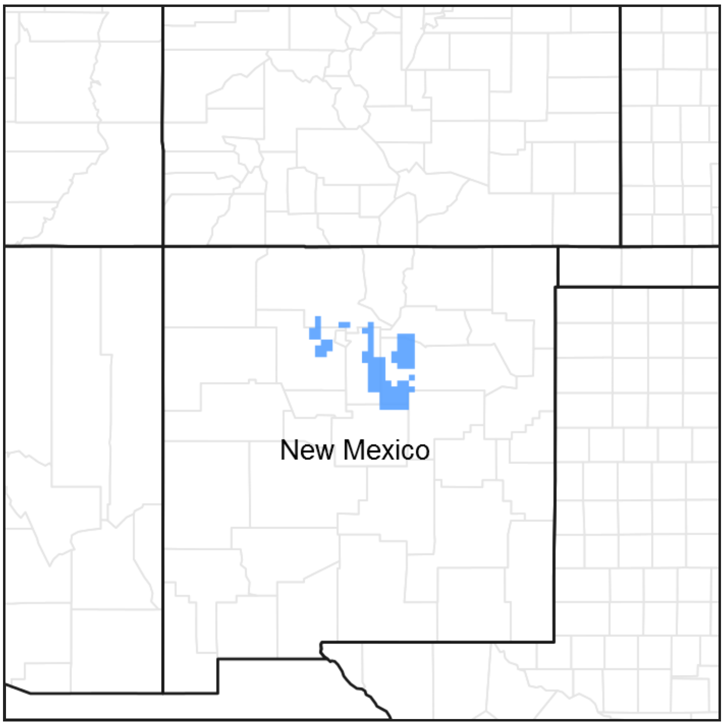

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Ecological site concept

This site occurs on landforms such as escarpments, structural benches, and the shoulders of plateau summits. Slopes range from 1 to 75 percent.
Soils are shallow to sandstone bedrock. Surface textures often have gravelly or very gravelly modifiers. This particular site occurs at higher elevations or cooler aspects than

F070AY020NM and F070AY021NM.

This site correlates to the Shallow Ecological Site Group (GX070A01XESG01).

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa* (2) *Juniperus scopulorum*
Shrub	(1) *Quercus gambelii* (2) *Cercocarpus montanus*
Herbaceous	(1) *Poa fendleriana* (2) *Muhlenbergia montana*

Physiographic features

This site occurs on various landforms and landform positions where soils are shallow to lithic contact (sandstone, limestone, basalt). Common examples are escarpments, structural benches, and the shoulders of plateau summits. Slopes range from 1 to 75 percent.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Escarpment (2) Plateau > Plateau (3) Plateau > Structural bench
Flooding frequency	None
Ponding frequency	None
Elevation	2,195–2,438 m
Slope	1–75%

Climatic features

Annual precipitation ranges from about 15 to 20 inches, being driest in the southeast and wettest at the highest elevations of the northwest. All areas follow the same seasonal patterns of rainfall with highest amounts in May through August and lowest amounts in November through February. A slight surge in late spring moisture is more pronounced at higher latitudes which appears to provide a modest advantage to cool-season grasses in northern parts of the MLRA. There are two overlapping precipitation patterns from west to east. As elevation increases westward, a corresponding precipitation increase is caused by orographic forcing. In contrast, there is a general gain in precipitation eastward with increasing proximity to moisture flow from the Gulf of Mexico.

Generally, the MLRA is within the mesic soil temperature regime and the aridic-ustic soil moisture regime, but contains smaller areas with typic-ustic/warm-frigid and aridic-ustic/thermic climate zones.

Table 3. Representative climatic features

Frost-free period (characteristic range)	97-122 days
Freeze-free period (characteristic range)	134-146 days
Precipitation total (characteristic range)	432-457 mm
Frost-free period (actual range)	87-135 days
Freeze-free period (actual range)	127-159 days
Precipitation total (actual range)	381-457 mm
Frost-free period (average)	112 days
Freeze-free period (average)	140 days
Precipitation total (average)	432 mm

Climate stations used

- (1) DES MOINES [USC00292453], Des Moines, NM
- (2) VALMORA [USC00299330], Valmora, NM
- (3) CAPULIN [USC00291450], Capulin, NM
- (4) GRENVILLE [USC00293706], Grenville, NM
- (5) KENTON [USC00344766], Kenton, OK
- (6) RATON MUNI CREWS AP [USW00023052], Raton, NM
- (7) MAXWELL 3 NW [USC00295490], Maxwell, NM
- (8) CIMARRON 4 SW [USC00291813], Cimarron, NM
- (9) LAS VEGAS MUNI AP [USW00023054], Las Vegas, NM
- (10) LAS VEGAS WWTP [USC00294862], Las Vegas, NM
- (11) VILLANUEVA [USC00299496], Ribera, NM

Influencing water features

This is an upland site, and does not include wetlands. However, it may shed water to landforms lower in the landscape.

Soil features

The unifying feature of the soils on this site is that they are generally shallow to lithic bedrock (sandstone, limestone, or basalt). Common surface textures are cobbly sandy loam and stony fine sandy loam. Salinity and sodicity are both low.

Table 4. Representative soil features

Surface texture	(1) Cobbly sandy loam (2) Stony fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid to moderately slow
Soil depth	15–102 cm
Available water capacity (0-101.6cm)	5.08–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.3

Ecological dynamics

Within this site, the dominant species of short grasses are inherently drought- and grazing-tolerant (Lauenroth et al., 1994). Across the western parts of the U.S., blue grama is one of the most extensively distributed grasses and occurs in a wide variety of different ecological sites ranging from grasslands to shrubland and woodland sites. This grass evolved with grazing by large herbivores and, when grazed continuously, tends to form a short sod. When allowed to grow under lower grazing pressures, the plants develop the upright physiognomy of a bunchgrass. If blue grama is eliminated from an area by extended drought (3-4 years) or disturbance such as plowing, regeneration is slow because of very slow tillering rates (Samuel, 1985), low and variable seed production, minimal seed storage in the soil (Coffin and Lauenroth, 1989) and limited seedling germination and establishment due to particular temperature and extended soil moisture requirements for successful seedling establishment (Hyder et al., 1971) (Briske and Wilson, 1978). Buffalograss, which is more abundant at warmer, lower elevations of this site, is often found occupying swale or depression positions across the landscape. Buffalograss is less drought-tolerant than blue grama but re-establishes more quickly following disturbance due to higher seed abundance and viability and more effective above-ground tillering.

Large-scale processes such as climate, fire, and grazing influence this site. During years with favorable growing seasons, the effects of grazing may be mitigated. During years of low precipitation, grazing can magnify degradation of the site (Milchunas et al., 1988). Fire is a natural disturbance regime that suppresses succulents and shrubs while stimulating grasses and forbs, however, in contrast to mid and tall grass prairie sites, fire is less important (Wright, 1982). This is because the drier conditions produce less vegetation/fuel load, lowering the relative fire frequency. However, historically, fires that did occur were often very expansive, especially after a series of years where above average precipitation built enough litter/fine fuels. Currently, fire suppression and more extensive grazing in the region have decreased the fire frequency, and it is unlikely that these processes could occur at a natural scale (USNVC, 2017)-G144. According to (Gebow, 2001), fire effects in the same location will vary, especially with fire timing, where seasonality can either hinder or benefit plants depending on their growing stage. Precipitation events occurring before and after fire will also influence the 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, galleta, and purple threeawn; shrubs such as broom snakeweed and prairie sagewort; and tree species such as Rocky Mountain juniper and ponderosa pine.

State and transition model

Figure 8. Generalized STM for shallow sites in 70A. Note that this particular site will have a tree community dominated by Rocky Mountain Juniper and ponderosa pine.

State 1
Reference State

This state is relatively late-seral in terms of grazing dynamics. Highly palatable species such as little bluestem and western wheatgrass are well-represented.

State 2
Degraded

This state is relatively early-seral in terms of grazing dynamics. Highly palatable species such as little bluestem and western wheatgrass are either absent or poorly represented. Early-seral grasses such as galleta and threeawn are often abundant.

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

Other references

Briske, D.D. and Wilson, A.M.. (1978) Moisture and Temperature Requirements for Adventitious Root Development in Blue Grama Seedlings. Journal of Range Management 31 (3): 174-178.

Coffin, D.P. and Lauenroth, W.K. (1989), Spatial and Temporal Variation in the Seed Bank of a Semiarid Grassland. American Journal of Botany, 76: 53-58. doi:10.1002/j.1537-2197.1989.tb11284.x

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

Hyder, D.N., Everson, A.C., and Bement, R.E. (1985) Seedling Morphology and Seeding Failures with Blue Grama. Journal of Range Management 24 (4): 287-292.

Lauenroth, W.K., Sala, O.E., Coffin, D.P. and Kirchner, T.B. (1994), The Importance of Soil Water in the Recruitment of Bouteloua Gracilis in the Shortgrass Steppe. Ecological Applications, 4: 741-749. doi:10.2307/1942004

Milchunas, D.G., Sala, O.E., and Laurnroth, W.K. (1988) A Generalized Model of the Effects of Grazing by Large Herbivores on Grassland Community Structure. The American Naturalist 132 (1): 87-106.

Samuel, M.J. (1985) Growth Parameter Differences Between Populations of Blue Grama. Journal of Range Management 38 (8): 339-342.

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

Contributors

Christine Bishop, former range ecologist with NRCS

Approval

Kendra Moseley, 9/12/2023

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	05/20/2025
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:**
