Ecological site F036XB133NM
Pinyon-Utah juniper/skunkbush sumac

Last updated: 12/23/2024
Accessed: 09/29/2026

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): 036X–Southwestern Plateaus, Mesas, and Foothills

F036XB133NM Pinyon-Juniper/Skunkbush Sumac is an ecological site that is found on mesas, hills, fan piedmonts, valley sides, plateaus, mountain slopes, structural benches, breaks and ridges in MLRA 36 (Southwestern Plateaus Mesas and Foothills). The southern portion MLRA 36 is illustrated yellow color on the map where this site occurs. The site concept was established in the Southwestern Plateaus. Mesas, and Foothills – Warm Semiarid Mesas and Plateaus LRU (Land Resource Area). This LRU has 10 to 16 inches of precipitation and has a mesic temperature regime. Lower part of MLRA 36 is dominated by summer precipitation for monsoons, unlike the upper part of MLRA 36 which is almost an equal split.

Classification relationships

NRCS & BLM: Major Land Resource Area 36, Southwestern Plateaus Mesas and Foothills (United States Department of Agriculture, Natural Resources Conservation Service, 2006). USFS: 313Bd Chaco Basin High Desert Shrubland and 313Be San Juan Basin North subsections 313B Navaho Canyonlands Section 313 Colorado Plateau Semi-Desert (Cleland, et al., 2007). 315Ha Central Rio Grande Intermontane, and 315Hb North Central Rio Grande Intermontane subsections 315H Central Rio Grande Intermontane Section 315 Southwest Plateau and Plains Dry Steppe and Shrub (Cleland, et al., 2007). 315Ad Chupadera High Plains Grassland subsections 315A Pecos Valley Section 315 Southwest Plateau and Plains Dry Steppe and Shrub (Cleland, et al., 2007). 331Jb San Luis Hills and 331Jd Southern San Luis Grasslands subsections 331J Northern Rio Grande Basin Section 331 Great Plains- Palouse Dry Steppe (Cleland, et al., 2007). M313Bd Manzano Mountains Woodland subsection Sacramento-Monzano Mountains Section M313 Arizona-New Mexico Mountains Semi-Desert - Open Woodland - Coniferous Forest - Alpine Meadow M331Fg Sangre de Cristo Mountains Woodland and M331Fh Sangre de Cristo Mountains Coniferous Forest subsection M331F Southern Parks and Rocky Mountain Range Section M331 Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow M331Gk Brazos Uplift and M331Gm Jemez and San Pedro Mountains Coniferous Forest subsections M331G South Central Highlands Section M331 Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow EPA: 21d Foothill Shrublands and 21f Sedimentary Mid-Elevation Forests 21 Southern Rockies 6.2 Western Cordillera 6 Northwestern Forested Mountains (Griffith, 2006). 20c Semiarid Benchlands and Canyonlands 20 Colorado Plateaus 10.1 Cold Deserts 10 North American Deserts (Griffith, 2006). 22m Albuquerque Basin, 22i San Juan/Chaco Tablelands and Mesas, 22h North Central New Mexico Valleys and Mesas, 22f Taos Plateau, and 22g Rio Grande Floodplain, 22 Arizona/New Mexico Plateau 10.1 Cold Deserts 10 North American Deserts (Griffith, 2006). USGS: Colorado Plateau Province (Navajo and Datil Section) Southern Rocky Mountains Basin and Range (Mexican Highland and Sacramento Section)

Ecological site concept

F036XB133NM Pinyon-Juniper/Skunkbush Sumac ecological site was drafted from the existing F036XB133NM range site MLRA 36XB (NRCS, 2003). This site occurs on mesas, hills, fan piedmonts, valley sides, plateaus, mountain slopes, structural benches, breaks and ridges. The soil surface is loamy textures. Common soil surface textures range from very gravelly sandy loam, very gravelly loam, loam, sandy loam, paragravelly-ashy loamy coarse sand, extremely cobbly coarse sandy loam, and gravelly sandy loam. The effective precipitation ranges from 10 to 16 inches.

Associated sites

F036XA005NM	**Riverine Riparian** Riverine Riparian - Site has a water table at 12-36” Landforms are V-shaped valleys, U-shaped valleys and Overflow Stream (channel).
R036XB006NM	**Loamy** Loamy - Slopes are 1-15%; Soils are moderately deep to deep; soil surface range from loam, gravelly loam, loamy fine sand, fine sandy loam, sandy loam, silt loam and clay loam. Subsoil is loamy and range from loam to clay loam. Landforms are mesas, plateaus, fan remnant, terraces, dipslopes on cuestas, and broad upland valley sides.
R036XB010NM	**Salty Bottomland** Salty Bottomland - This site is enhanced by runoff during periods of high runoff (intermittent). The water table depth is greater than 6 ft. Soils are deep to very deep soils that have surface textures of loams, silt loams to clays with loamy subsoil. Landforms are broad valley bottoms, floodplains, and in depressions.
R036XB011NM	**Sandy** Sandy - Slopes are 1-15%; soils are deep to very deep; Surface textures are loamy sand, gravelly loamy sand, loamy fine sand, fine sandy loam and sandy loam with sandy subsoil. Landforms are nearly level to gently sloping landscapes on dunes, fan remnant and alluvial fans.
R036XB015NM	**Shallow Savanna** Shallow Savannah - Slopes 1-55%; very shallow to shallow soils and non-skeletal; very cobbly loam, very cobbly sandy loam, loam, cobbly clay loam, and channery clay loam over a clayey subsoil. Bedrock can be sandstone, shale or basalt. Landforms narrow ridges, hills, breaks and mesas of bedrock controlled landscapes.
R036XB017NM	**Swale** Swale - This site is enhanced by runoff during periods of high runoff (intermittent). The water table depth is greater than 6 ft. Soils are deep to very deep soils that have surface textures of loams, silt loams to clays with loamy subsoil. Landforms are broad valley bottoms, floodplains, and in depressions.
R036XB111NM	**Sandy Slopes** Sandy Slopes - Slopes are 15-40% Soils are moderately deep to deep; Surface textures are loamy fine sand, loamy very fine sand, sandy loam and loamy sand with sandy subsoil. Landforms are hills, ridges, escarpments on cuestas, and escarpments on plateaus.
F036XA001NM	**Pinyon Upland** Pinyon Upland(south of Gallup 13-16) - Slope 1-35%; Soils are very shallow to shallow and non-skeletal; soil surface is loam, channery loam or clay loam. Landforms are broad mesas, cuestas, and hills interspersed with numerous deep canyons and dry washes.

F036XA136NM	**Pinyon-Utah juniper/Apache plume** Pinyon-Juniper-Apache Plume - Slopes are 1-35%; Soils are moderately deep to very deep and can be skeletal/non-skeletal. Soil surface textures are gravelly to extremely loam, loam, very gravelly clay loam, very gravelly to extremely gravelly coarse sandy loam, extremely cobbly fine sandy loam, extremely gravelly sandy clay loam, fine sandy loam, very gravelly fine sandy loam, sandy loam, gravelly sandy loam, and ashy loamy coarse sand with subsoil that are loamy. Landforms are escarpments, fan remnants, mesas, hills, cuestas, benches, fan piedmonts, valley sides, eroded fan remnants, and mountain slopes.
R036XB002NM	**Clayey** Clayey - Slopes are 0-15%; Soils are moderately deep to deep; soil surface loam, clay loam, silty clay loam, and silty clay over clayey subsoil with textures of clay loam, clay to silty clay loam or silty clay. Landforms are stream terraces, valley floors, fan remnants, alluvial fans, dipslopes on cuestas, mesas, hills, and valley floors.
R036XB132NM	**Gravelly Hills** Gravelly Hills - Slopes are (10-65%); Soils are very deep and skeletal and non-skeletal. Surface texture of gravelly to very gravelly fine sandy loam, very gravelly sandy loam, very cobbly loam, or gravelly loam with a sandy subsoil. Landforms are escarpments, fan piedmonts, mesas, hills, ridges and knolls.

Similar sites

F036XA001NM	**Pinyon Upland** Pinyon Upland(south of Gallup 13-16) - Slope 1-35%; Soils are very shallow to shallow and non-skeletal; soil surface is loam, channery loam or clay loam. Landforms are broad mesas, cuestas, and hills interspersed with numerous deep canyons and dry washes.
F036XA136NM	**Pinyon-Utah juniper/Apache plume** Pinyon-Juniper-Apache Plume - Slopes are 1-35%; Soils are moderately deep to very deep and can be skeletal/non-skeletal. Soil surface textures are gravelly to extremely loam, loam, very gravelly clay loam, very gravelly to extremely gravelly coarse sandy loam, extremely cobbly fine sandy loam, extremely gravelly sandy clay loam, fine sandy loam, very gravelly fine sandy loam, sandy loam, gravelly sandy loam, and ashy loamy coarse sand with subsoil that are loamy. Landforms are escarpments, fan remnants, mesas, hills, cuestas, benches, fan piedmonts, valley sides, eroded fan remnants, and mountain slopes.

Table 1. Dominant plant species

Tree	(1) *Pinus edulis*
Shrub	(1) *Rhus trilobata*
Herbaceous	(1) *Bouteloua gracilis*

Physiographic features

This site occurs on mesas, hills, fan piedmonts, valley sides, plateaus, mountain slopes, structural benches, breaks and ridges. Slopes typically range from 1-65%, and elevations are generally 5600-8000 ft.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mesa (3) Structural bench
Flooding frequency	None
Ponding frequency	None
Elevation	1,710 – 2,440 m
Slope	0 – 70 %
Aspect	Aspect is not a significant factor

Climatic features

This site has a semi-arid continental climate. There are distinct seasonal temperature variations. Mean annual precipitation varies from 10 to 16 inches. The overall climate is characterized by cold dry winters in which winter moisture is less than summer. Wide yearly and seasonal fluctuations are common for this climatic zone which can range from 5 to 25 inches. Of this, approximately 25-35% falls as snow, and 65-75% falls as rain between April 1 and November 1. The growing season is April through September. As much as half or more of the annual precipitation can be expected to come during the period of July through September. August is typically the wettest month of the year. The driest period is usually from November to April; and February is normally the driest month. During July, August, and September, 4 to 6 inches of precipitation influence the presence and production of warm-season plants. Fall and spring moisture is conducive to the growth of cool-season herbaceous plants and maximum shrub growth. Growth usually begins in March and ends with plant maturity and seed dissemination when the moisture deficiency and warmer temperatures occur in early June. There is also a period of growth in the fall. Summer precipitation is characterized by brief thunderstorms, normally occurring in the afternoon and evening. Winter moisture usually occurs as snow, which seldom lies on the ground for more than a few days. The average annual total snowfall is 29.1 inches. The snow depth usually ranges from 0 to 1 inches during the winter months. The highest snowfall record is 57.1 inches during the 1993-1994 winter. The frost- free period typically ranges from 110 to 145 days and the freeze free period is from 140 to 170 days. The last spring freeze is the middle of April to the first week of May. The first fall freeze is the middle of October to the first week of November. Mean daily annual air temperature is about 29ºF to 69ºF, averaging about 37ºF for the winter and 67ºF in the summer. The coldest winter temperature recorded was -20ºF on January 6, 1971 and the warmest winter temperature recorded was 70ºF on February 28, 1965. The coldest summer temperature recorded was 26ºF on June 1, 1980. The hottest day on record is 100ºF on July 9, 2003 and June 21, 1968. Data taken from Western Regional Climate Center (2017) for El Rito, New Mexico Climate Station.

Table 3 Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	150 days
Precipitation total (average)	330 mm

- (1) COCHITI DAM [USC00291982], Pena Blanca, NM
- (2) EL RITO [USC00292820], El Rito, NM
- (3) ABIQUIU DAM [USC00290041], Gallina, NM
- (4) LYBROOK [USC00295290], Dulce, NM

- (5) CUBA [USC00292241], Cuba, NM
- (6) NAVAJO DAM [USC00296061], Navajo Dam, NM
- (7) SANTA FE 2 [USC00298085], Santa Fe, NM

Influencing water features

This site is not influenced by water from a wetland or stream.

Soil features

Soils are moderately deep to very deep in depth (4 to 20 inches). The surface soils textures range from very gravelly sandy loam, very gravelly loam, loam, sandy loam, paragravelly-ashy loamy coarse sand, extremely cobbly coarse sandy loam, and gravelly sandy loam.

This ecological site has been used in the following Soil Surveys: NM678, NM687, NM650, NM670, NM672, NM656, and NM606

Typical soils assigned to this ecological site are:
Clayey – Hackroy
Loamy-Skeletal - Rosced, Santa Fe
Fine-Silty - Elpedro
Fine-Loamy – Dermala
Loamy - Vessilla
Ashy - Piojillo
Fragmental - Chimayo

Table 4. Representative soil features

Surface texture	(1) Very gravelly sandy loam (2) Very gravelly loam (3) Sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	10 – 50 cm
Surface fragment cover <=3"	10 – 40 %
Surface fragment cover >3"	0 – 20 %
Available water capacity (0-101.6cm)	16.76 – 21.34 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified

Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Subsurface fragment volume <=3" (Depth not specified)	10 – 30 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

Ecological dynamics

MLRA 36 occurs on the higher elevation portion of the Colorado Plateau. The Colorado Plateau is a physiographic province which exists throughout eastern Utah, western Colorado, western New Mexico and northern Arizona. It is characterized by uplifted plateaus, canyons and eroded features. The Colorado Plateau lies south of the Uintah Mountains, north of the Mogollon transition area, west of the Rocky Mountains, and east of the central Utah highlands. The higher elevation portion of the Colorado Plateau which is represented by MLRA 36 is characterize by broken topography, and lack of perennial water sources. This area has a long history of past prehistoric human use for years. MLRA 36 shows archaeological evidence indicating that pinyon-juniper woodlands where modified by prehistoric humans and not pristine and thus where altered at the time of European settlement (Cartledge & Propper, 1993). This area also included natural influences of herbivory, fire, and climate. This area rarely served as habitat for large herds of native herbivores or large frequent historic fires due to the broken topography. This site is extremely variable and plant community composition will vary with the water fluctuations on this site.

The lower part MLRA 36 developed under climatic conditions that include hot, dry summers with summer rains showers and little to no snow with the mild winter temperatures. This area has climatic fluctuations and prolonged droughts are common occurrences. Between an above average year and a drought year. Forbs are the most dynamic component of this community and can vary up to 4 fold (Passey et.al. 1982). The precipitation and climate of MLRA 36 are conducive to producing Pinyon/juniper, and sagebrush complexes with high productive sites in the bottoms of the canyons. Predominant species on the Colorado Plateau are Wyoming big sagebrush (Artemisia tridentata var. wyomingensis), mountain big sagebrush (A. tridentata var. vaseyana), and black sagebrush (A. nova), basin big sagebrush (A. tridentata var. tridentata), Utah juniper (Juniperus utahensis), one-seed juniper (Juniperus monosperma), and two-needle pinyon (Pinus edulis). One-seed juniper has the capability to discontinue active growth when moisture is limited but can resume growth when moisture availability improves. This growth pattern may represent an important adaptation allowing them to survive on very arid sites. It is possible that small trees may be killed by drought; mature one-seed junipers are resilient to drought, especially in comparison to two-needle pinyon (Johnsen, 1962).

The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Fire is an important aspect of grassland dominated ecological sites. According to the Fire Effects System literature review of one seed juniper puts fire intervals are historically 5-100 years on desert grassland sites and 10 to 50 years on woodland sites with juniper and pinyon (Johnson, 2002). Modeling done with LANDFIRE successional modeling for southwestern pinyon-juniper communities which includes Pinyon-juniper shrubland and pinyon-juniper woodland on the Colorado Plateau that the Fire return interval is 10 to 203 years (USFS, 2012). Pinyon-Juniper woodland fires were of mixed types being both surface and crown fires. Periodic fire is believed to have played an important role in maintaining juniper savannas (Johnsen, 1962, Paysen, et. al., 2000) Mueggler (1976) stated that a fire-free period of 85 to 90 years was necessary for development of a mature juniper woodland. Recent decades of fire suppression have probably contributed to encroachment of juniper into grasslands (Lanner and Van Devender, 1998). Fires varied in intensity and frequency depending on the site’s productivity. Fires were typically patchy, and formed mosaics on productive sites (Johnson, 2002, Gottgried, 1999, and Paysen, et.al, 2000). The time necessary for post-fire recovery of one-seed juniper has not been well documented. Data suggests that factors such as soil type and pre-burn community plant composition may influence the length of time required for recovery. Once established, one-seed juniper can bear seed as early as 10 years of age on some sites (Schott and Pieper, 1987). Shrub vegetation is able to reestablish from seed dispersal from the adjacent non burned sagebrush stands; however the process is relatively slow. Fire also decreases the extent of juniper/pinyon pine invasions, which allows the historic plant community to maintain integrity. When the plant community is burned shrubs decrease, while perennial and annual grasses increase. The perennial shrubs associated with this site are able to recover at a faster rate than the invading trees.

When the site is degraded by the presence of invasive annuals, the fire return interval is shortened due to increased fuels. The shortened fire return interval is often sufficient to suppress the native plant community. Cheatgrass invaded one seed juniper stand has a fire return interval of 10 years (Johnson, 2002).

Variability in climate, soils, aspect and complex biological processes will cause the plant communities to differ. These factors contributing to annual production variability include wildlife use, drought, and insects. Factors contributing to special variability include soil texture, depth, rock fragments, slope, aspect, and micro-topography. The species lists are representative and not a complete list of all occurring or potentially occurring species on this site. The species lists are not intended to cover the full range of conditions, species and responses of the site. The State & Transition model depicted for this site is based on available research, field observations and interpretations by experts and could change as knowledge increases. As more data is collected, some of these plant communities may be revised or removed, and new ones may be added. The following diagram does not necessarily depict all the transitions and states that this site may exhibit, but it does show some of the most common plant communities.

State and transition model

Figure 5. STM

Figure 6. Legend

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1				50-252	
	sideoats grama	BOCU	*Bouteloua curtipendula*	50-252	–
	blue grama	BOGR2	*Bouteloua gracilis*	50-252	–
2				50-202	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	50-202	–
3				50-101	
	western wheatgrass	PASM	*Pascopyrum smithii*	22-101	–
	James' galleta	PLJA	*Pleuraphis jamesii*	22-101	–
4				22-101	
	Grass, annual	2GA	*Grass, annual*	0-22	–
	Grass, perennial	2GP	*Grass, perennial*	0-22	–
	black grama	BOER4	*Bouteloua eriopoda*	0-22	–
	sedge	CAREX	*Carex*	0-22	–
	squirreltail	ELEL5	*Elymus elymoides*	0-22	–
	needle and thread	HECO26	*Hesperostipa comata*	0-22	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	0-22	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-22	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0-22	–
	muttongrass	POFE	*Poa fendleriana*	0-22	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0-22	–
Forb					
5				6-56	
	Forb, annual	2FA	*Forb, annual*	6-22	–
	Forb, perennial	2FP	*Forb, perennial*	6-22	–
Shrub/Vine					
6				50-202	
	skunkbush sumac	RHTR	*Rhus trilobata*	50-202	–
7				50-151	

	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-50	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0-50	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0-50	–
	Apache plume	FAPA	*Fallugia paradoxa*	0-50	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-50	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-50	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	0-50	–
	Gambel oak	QUGA	*Quercus gambelii*	0-50	–
Tree					
8				50-280	
	twoneedle pinyon	PIED	*Pinus edulis*	50-280	–
9				50-151	
	oneseed juniper	JUMO	*Juniperus monosperma*	50-151	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Other references

Arnold, J. F. 1964. Zonation of understory vegetation around a juniper tree. Journal of Range Management. 17: 41-42.

Cartledge, T. R., and J. G. Propper. 1993. Pinon-Juniper Ecosystems through Time: Information and Insights from the Past. In Gen. Tech. RM-236 - Managing Pinon-Juniper Ecosystems for Sustainability and Social Needs.

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.

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).

Gottfried, G. J. 1999. Pinyon-juniper woodlands in the southwestern United States. In: Folliott, Peter F.; Ortega-Rubio, Alfredo, eds. Ecology and management of forests, woodlands, and shrublands in the dryland regions of the United States and Mexico: perspectives for the 21st century. Co-edition No. 1. Tucson, AZ: The University of Arizona; La Paz, Mexico: Centro de Investigaciones Biologicas del Noroeste, SC; Flagstaff, AZ: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 53-67.

Johnsen, T. N., Jr. 1962. One-seeded juniper invasion of northern Arizona grasslands. Ecological Monographs. 32(3): 187-207.

Johnson, Kathleen A. 2002. Juniperus monosperma. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2017, December 20].

Lanner, R.M. and T. R. Van Devender. 1998. The recent history of pinyon pines in the American Southwest. In: Richardson, David M., ed. Ecology and biogeography of Pinus. Cambridge, United Kingdom: The Press Syndicate of the University of Cambridge: 171-182.

Mueggler, W. F. 1976. Ecological role of fire in western woodland and range ecosystems. In: Use of prescribed burning in western woodland and range ecosystems: Proceedings of the symposium; 1976 March 18-19; Logan, UT. Logan, UT: Utah State University, Utah Agricultural Experiment Station: 1-9.

Natural Resources Conservation Service (NRCS). 2003. Ecological Site Description for F036XB133NM PJ/Skunkbush Sumac/Shallow

Sandy: USDA, Albuquerque. New Mexico.

Passey, H. B., W. K. Hugie, E. W. Williams, and D. E. Ball. 1982. Relationships between soil, plant community, and climate on rangelands of the Intermountain west. USDA, Soil Conservation Service, Tech. Bull. No. 1669.

Paysen, Timothy E.; A. R. James, Brown, J. K.; [and others]. 2000. Fire in western shrubland, woodland, and grassland ecosystems. In: Brown, James K.; Smith, Jane Kapler, eds. Wildland fire in ecosystems: Effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-volume 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 121-159.

Schott, M. R.; Pieper, R. D. 1987. Succession in tree pits following cabling in pinyon-juniper communities. The Southwestern Naturalist. 32(3): 399-402.

U.S. Department of Agriculture, Forest Service, Missoula Fire Sciences Laboratory (USFS). 2012. Information from LANDFIRE on fire regimes of southwestern pinyon-juniper communities. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: https://www.fs.fed.us/database/feis/fire_regimes/SW_pinyon_juniper/all.html [2017, December 28].

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.

Western Regional Climate Center. Retrieved from http://www.wrcc.dri.edu/summary/Climsmco.html on December 27, 2017.

Contributors

John Tunberg
Michael Carpinelli
Wendy McCoy
Suzanne Mayne Kinney

Approval

Kirt Walstad, 12/23/2024

Acknowledgments

Project Staff: Suzanne Mayne-Kinney, Ecological Site Specialist, NRCS MLRA, Grand Junction Colorado SSO Chuck Peacock, MLRA Soil Survey Leader, NRCS MLRA Grand Junction Colorado SSO Alan Stuebe, MLRA Soil Survey Leader, NRCS MLRA Alamosa Colorado SSO Program Support: Brenda Simpson, NRCS NM State Rangeland Management Specialist, Albuquerque, NM Scott Woodhall, NRCS MLRA Ecological Site Specialist-QA Phoenix, AZ Eva Muller, Regional Director, Rocky Mountain Regional Soil Survey Office, Bozeman, MT Rick Strait, NM State Soil Scientist, Albuquerque, NM Steve Kadas, CO State Resource Conservationist, Albuquerque, NM --Site Development and Testing Plan--: Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data. Additional information and data is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 36 must be further investigated. Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

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	09/29/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

---

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

---

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

---

14. **Average percent litter cover (%) and depth (in):**

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

---

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

---

17. **Perennial plant reproductive capability:**
