Ecological site DX035X03A006
Basalt Hills and Mesas
16-35 inches

Last updated: 5/29/2025
Accessed: 06/15/2026

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.

Classification relationships

The following existing ESDs developed for WP2, MLRA 36, were evaluated in the development of this ESD. Both overstory and understory characteristics were assessed and compared as the data was collected and interpreted. The existing ESDs are: Savannah (R036XB127NM); Hills (R036XB124NM); Gravelly (R036XB114NM); Juniper woodland (F036XB002NM); and Pinyon/Juniper woodland (F036XB001NM). The Savannah ESD occurs at a lower elevation though it has both pinyon and juniper in the stands with occasional ponderosa pine at higher elevations. The juniper species is not clearly defined in that ESD, but it's assumed to be dominated by oneseed juniper. The canopy cover is less than described in this ESD. The Hills ESD is also of lower elevation and tends to favor junipers as dominant over pinyon, with grasslands intermixed; again not comparable to this ESD. The Juniper and Pinyon-Juniper woodland ESDs are from the Zuni reservations, both reflecting drier site conditions and favoring pinyon and oneseed juniper which do not correspond to the vegetative structure and composition described in this ESD. The historical climax plant community structure (composition and density) was derived from data interpretation and not from adaptation of existing ESDs. The NRCS plants database was consulted to determine the likelihood of a species occurring on the soil series evaluated for this ESD. The lower elevation limit of the Alegros soil series is associated with the "Gravelly" site (R036XB114NM), which supports a grassland plant community. The upper elevations of the Alegros soils found in the locations associated with this ESD support a woodland plant community; therefore the R036XB114NM ESD is not comparable to this ESD.

Ecological site concept

This site occurs on various volcanic landforms with slopes generally between 1 and 15 percent. Soils range from shallow to moderately deep. This site is differentiated from much of MLRA 35 by its volcanic parent material, and by its relatively cold and moist climate.

Table 1. Dominant plant species

Tree	(1) *Pinus edulis* (2) *Juniperus monosperma*
Shrub	(1) *Quercus grisea*
Herbaceous	Not specified

Legacy ID

F035XG006NM

Physiographic features

This ecological site occurs on basalt hills, mesa tops, and alluvial plateaus. The aspect is variable. Elevation ranges from 7400 to 8400 feet. The slope ranges from 1 to 15% in most areas, occasionally reaching 35%. Overall, the terrain appears to be rolling hills and gentle sloping terrain from mesas or hills.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mesa (3) Plateau
Elevation	2,260 – 2,560 m
Slope	0 – 20 %
Aspect	Aspect is not a significant factor

Climatic features

According to the Catron County Soil Survey, the Smilo-Adman complex occurs in a 16-20 inch average annual precipitation zone. The Alegros soil series occurs in a 15-18 inch average annual precipitation zone. Summer moisture is usually from convective showers with winter moisture falling as snow or rain.

Average annual temperature for the Smilo-Adman complex is 40 to 46 ºF. The Catron County Soil Survey indicates that frost-free days (>/=32.5 ºF) range from 80-120 days and freeze free days (>/= 30 ºF) range from 123 to 153 days for the Smilo-Adman complex.

The Pie Town, New Mexico, climate station is the most representative of this ecological site. The tabular climate summary for this ESD was generated by the Climate Summarizer (http://www.nm.nrcs.usda.gov/technical/handbooks/nrph/Climate_Summarizer.xls) using data from the following climate station:

296812 PIETOWN 19 NE, NM (Period of record = 1988 to 2006)

Table 3 Representative climatic features

Frost-free period (average)	170 days
Freeze-free period (average)	190 days
Precipitation total (average)	380 mm

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. North slopes may retain significant snowpack.

Soil features

The representative soil is the Smilo soil series, which is a fine, mixed, superactive, frigid Aridic Argiustoll. The Adman soil series is a clayey, mixed, superactive, frigid aridic Lithic Argiustoll that also supports this ecological site and occurs in association with the Smilo series.

The Alegros soil series is a clayey over sandy or sandy-skeletal, smectitic, mesic Typic Haplustalf that also supports this ecological site. It is associated with inclusions of the Coni soil series. The Coni series is a loamy, mixed, superactive, frigid Lithic Argiustoll found on ridges and hilltops.

The Smilo-Adman complex is located on basalt hills comprised of 55% Smilo stony loam and 25% Adman stony loam. Included are small amounts of Coni soils and a deep clayey soil in more gently sloping areas, totaling 20% of the soil complex. The Coni soil is intermixed

with the Smilo-Adman complex and difficult to differentiate from surface appearance. It tends to support similar vegetation, and for simplicity purposes, it is considered inclusive to the representative soils and is part of this ESD.

The Smilo soil series is moderately deep and well drained and derived from basalt parent material. Basalt is generally at a depth of 30 inches. The Adman soil series is shallow and well drained, also formed from basalt parent material. Basalt is at a depth of 19 inches. The Coni soil series is shallow, well drained, and formed in residuum derived from tuff, and a typical pedon is very gravelly sandy loam.

The Smilo-Adman complex is characterized by stony loam soils. The Alegros soil series is a deep, well drained cobbly loam to extremely cobbly loam formed in alluvium from basaltic or andesitic lava.

The Smilo-Adman complex contains substantial surface rock (stone and cobble), and in some cases it appears as weathered surface bedrock. These soils occur on variable aspects.

The Alegros soil series has a soil texture of cobbly loam to extremely cobbly loam. These soils are found on mesa tops and alluvial plateaus. Soil inclusions comprise 20% of the area and they are characterized as either: (1) lacking a calcium carbonate accumulation, (2) having a dark colored surface layer more than 7 inches thick, or (3) containing bedrock at a depth of 20-40 inches. These soils have a clayey horizon over sandy or gravelly loamy sand.

This ecological site is associated with the following map units (MUs) in the Catron County, Northern Part, Soil Survey.

MU 671, Smilo and Adman series;

MU 710, Alegros and Alegros variant series.

Table 4. Representative soil features

Surface texture	(1) Stony loam (2) Cobbly loam (3) Extremely cobbly loam
Drainage class	Well drained
Permeability class	Moderately slow to rapid
Soil depth	80 – 130 cm
Surface fragment cover <=3"	20 – 40 %
Surface fragment cover >3"	20 – 30 %
Available water capacity (0-101.6cm)	0.28 – 0.38 cm
Electrical conductivity (0-101.6cm)	Not specified

Soil reaction (1:1 water) (0-101.6cm)	5.6 – 7.3
Subsurface fragment volume <=3" (Depth not specified)	10 – 40 %
Subsurface fragment volume >3" (Depth not specified)	10 – 30 %

Ecological dynamics

The predominant vegetation is twoneedle pinyon (herein, referred to as pinyon) in both density and canopy cover. Alligator and oneseed junipers are codominant with pinyon on northerly and southerly aspects, respectively. Ponderosa pine and Rocky Mountain juniper vary in occurrence but generally are found on steeper slopes with northerly aspects. Gambel oak occurs in association with ponderosa pine in some locales, especially in areas near the Alegros Mountain slopes. Gray oak can also be found in association with alligator juniper and pinyon, regardless of aspect.

Three states are described in this ESD. This ESD is developed for the soil series addressed in the “Representative Soil Features” section of this document. Though the Alegros series has been addressed in another ESD, further information regarding its relationship to this ESD is described at the end of this document. These ecological sites support a woodland plant community situated on the edge of a transition between woodland and forest. This may be attributed to variations in elevation and climatic regimes. (See Figures 1 through 4).

These sites have a gentle slope that allows livestock grazing to occur. The principal driver among the states is grazing and its collateral effect on fire frequency and soil integrity. Drought/diseases, high precipitation events, and soil degradation also contribute to shifts in plant community structure. Only one state is known to exist at the present time, identified as State #2 in this ESD. The Historical Climax Plant Community (HCPC) and Potential Natural Community (PNC) stand structures are estimated based on interpretations of field data collected at multiple sample sites. Land treatments, in addition to livestock grazing intensity, aids in moving the plant communities among the different states as well. Overstory removal by fuelwood harvesting or incidental small-size crown fires creates a grassland-dominated plant community in each of the states.

In the reference state, fire, drought, moisture, and disease interact individually or collectively to change the character of the woodlands, shifting from one plant community to another within the state. Livestock grazing is not considered a part of the Historical Climax Plant Community but other natural processes such as fire, drought, disease, high precipitation events, and wildlife impacts are. Fuelwooding is considered as an impact in the HCPC state as a socially driven activity for heating fuel or religious purposes.

Fires were likely creeping understory events with an occasional wind-driven crowning fire resulting in a thinning or pruning effect on various age class trees. It’s likely that oneseed and alligator junipers are in constant competition for dominance depending on the severity and frequency of fire events. The lack of recurring fire favors survival of regenerating oneseed juniper, since that species is less fire-tolerant than alligator juniper. The age structure for alligator juniper in the Deteriorated Plant Community is represented by very old large-diameter trees. Alligator juniper in the young age class (> 3 inches and 6 inches diameter at root collar) is minimal in the deteriorated state, further suggesting the influence of fire on species dominance.

Trees are grouped into the following age classes: old trees = 13+ inches diameter at root collar (drc); mid-age trees = 6 to 12.99 inches drc; young trees = 3 to 5.99 inches drc; seedling and saplings = 3 inches drc.

Description of the State-and-Transition Model:
State 2, Plant Community 5 is the only recorded plant community in this model, due to extensive alterations of the vegetative components upon the soils addressed in this ESD. The other plant communities in this model are estimated. For the estimated plant communities, composition and production of plant species and other related numerical values are reconstructed from either similar plant communities or historical accounts and based on ecological principles, historical records, or anecdotal evidence. Photographs herein may depict plant communities of similar structure and function to those described but with minor differences in species composition.

State and transition model

Figure 3. MLRA 39

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**warm-season increasers**			112-157	
	blue grama	BOGR2	*Bouteloua gracilis*	112-140	–
	common wolfstail	LYPH	*Lycurus phleoides*	3-7	–
	pine dropseed	BLTR	*Blepharoneuron tricholepis*	2-4	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0-2	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0-2	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0-1	–
2	**warm-season decreasers**			67-84	
	spike muhly	MUWR	*Muhlenbergia wrightii*	28-34	–
	mountain muhly	MUMO	*Muhlenbergia montana*	17-22	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	11	–
	little bluestem	SCSC	*Schizachyrium scoparium*	8-11	–
	big bluestem	ANGE	*Andropogon gerardii*	3-6	–
3	**cool-season increasers**			22-34	
	sedge	CAREX	*Carex*	11-17	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	11-17	–
4	**cool-season decreasers**			101-123	
	prairie Junegrass	KOMA	*Koeleria macrantha*	34-45	–
	muttongrass	POFE	*Poa fendleriana*	17-22	–
	western wheatgrass	PASM	*Pascopyrum smithii*	17	–
5	**late cool-season decreasers**			90-118	
	sideoats grama	BOCU	*Bouteloua curtipendula*	84-112	–
	green sprangletop	LEDU	*Leptochloa dubia*	6	–
Forb					
6	**warm-season forbs**			1-6	
	James' buckwheat	ERJA	*Eriogonum jamesii*	1-3	–
	globemallow	SPHAE	*Sphaeralcea*	0-1	–
	Carruth's sagewort	ARCA14	*Artemisia carruthii*	0-1	–
Shrub/Vine					
7	**broom snakeweed (half-shrub increaser)**			0-3	
	sideoats grama	BOCU	*Bouteloua curtipendula*	84-112	–
	green sprangletop	LEDU	*Leptochloa dubia*	6	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-3	–
8	**prairie sagewort (half-shrub increaser)**			0-1	
	prairie sagewort	ARFR4	*Artemisia frigida*	0-1	–
9	**cool-season shrubs**			28-39	
	hairy mountain mahogany	CEMOP	*Cercocarpus montanus var. paucidentatus*	17	–
	gray oak	QUGR3	*Quercus grisea*	6-11	–
	skunkbush sumac	RHTR	*Rhus trilobata*	6-11	–
10	**succulent shrubs**			0-1	
	little bluestem	SCSC	*Schizachyrium scoparium*	8-11	–
	big bluestem	ANGE	*Andropogon gerardii*	3-6	–

	pricklypear	OPUNT	*Opuntia*	0-1	–
	yucca	YUCCA	*Yucca*	0-1	–
11	**shrub increasers**			1-3	
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	1-2	–
	currant	RIBES	*Ribes*	0-1	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	0	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0	–
	desert-thorn	LYCIU	*Lycium*	0	–

Table 6. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**warm-season increasers**			168-207	
	blue grama	BOGR2	*Bouteloua gracilis*	140-168	–
	common wolfstail	LYPH	*Lycurus phleoides*	17-22	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	3-7	–
	pine dropseed	BLTR	*Blepharoneuron tricholepis*	6	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	1-2	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	1-2	–
2	**warm-season decreasers**			90-129	
	spike muhly	MUWR	*Muhlenbergia wrightii*	45-56	–
	mountain muhly	MUMO	*Muhlenbergia montana*	17-22	–
	little bluestem	SCSC	*Schizachyrium scoparium*	11-17	–
	big bluestem	ANGE	*Andropogon gerardii*	11-17	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	6-17	–
3	**cool-season increasers**			34-45	
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	28-34	–
	sedge	CAREX	*Carex*	6-11	–
4	**cool-season decreasers**			34-45	
	prairie Junegrass	KOMA	*Koeleria macrantha*	11-17	–
	muttongrass	POFE	*Poa fendleriana*	6	–
	western wheatgrass	PASM	*Pascopyrum smithii*	6	–
5	**late cool-season decreasers**			174-230	
	sideoats grama	BOCU	*Bouteloua curtipendula*	168-224	–
	green sprangletop	LEDU	*Leptochloa dubia*	6	–
Forb					
6	**warm-season forbs**			11-17	
	James' buckwheat	ERJA	*Eriogonum jamesii*	6-8	–
	globemallow	SPHAE	*Sphaeralcea*	3-4	–
	Carruth's sagewort	ARCA14	*Artemisia carruthii*	2-4	–
Shrub/Vine					
7	**broom snakeweed (half-shrub increaser)**			0-6	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-6	–
8	**prairie sagewort (half-shrub increaser)**			2-6	
	prairie sagewort	ARFR4	*Artemisia frigida*	2-6	–
9	**cool-season shrubs**			28-56	

	hairy mountain mahogany	CEMOP	*Cercocarpus montanus var. paucidentatus*	11-28	–
	skunkbush sumac	RHTR	*Rhus trilobata*	11-17	–
	gray oak	QUGR3	*Quercus grisea*	6-11	–
10	**succulent shrubs**			2-4	
	pricklypear	OPUNT	*Opuntia*	1-2	–
	yucca	YUCCA	*Yucca*	1-2	–
11	**shrub increasers**			7-12	
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	3-6	–
	currant	RIBES	*Ribes*	1-2	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	1-2	–
	desert-thorn	LYCIU	*Lycium*	1	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	0-1	–

Table 7. Community 5.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**warm-season increasers**			92-112	
	blue grama	BOGR2	*Bouteloua gracilis*	90-101	–
	common wolfstail	LYPH	*Lycurus phleoides*	1-3	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	1-3	–
	pine dropseed	BLTR	*Blepharoneuron tricholepis*	0-2	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0-1	–
	ring muhly	MUTO2	*Muhlenbergia torreyi*	0-1	–
2	**warm-season decreasers**			1-10	
	spike muhly	MUWR	*Muhlenbergia wrightii*	1-3	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0-3	–
	big bluestem	ANGE	*Andropogon gerardii*	0-1	–
	bullgrass	MUEM	*Muhlenbergia emersleyi*	0-1	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0-1	–
3	**cool-season increasers**			2-17	
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	1-11	–
	sedge	CAREX	*Carex*	1-6	–
4	**cool-season decreasers**			1-6	
	prairie Junegrass	KOMA	*Koeleria macrantha*	1-2	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0-1	–
	muttongrass	POFE	*Poa fendleriana*	0-1	–
5	**late cool-season decreasers**			6-12	
	sideoats grama	BOCU	*Bouteloua curtipendula*	6-11	–
	green sprangletop	LEDU	*Leptochloa dubia*	0-1	–
Forb					
6	**warm-season forbs**			2-17	
	James' buckwheat	ERJA	*Eriogonum jamesii*	1-8	–
	globemallow	SPHAE	*Sphaeralcea*	1-4	–
	Carruth's sagewort	ARCA14	*Artemisia carruthii*	0-4	–
Shrub/Vine					
7	**broom snakeweed (half-shrub increaser)**			1-6	

	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1-6	–
8	**prairie sagewort (half-shrub increaser)**			0-2	
	prairie sagewort	ARFR4	*Artemisia frigida*	0-2	–
9	**cool-season shrubs**			1-6	
	gray oak	QUGR3	*Quercus grisea*	1-2	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0-2	–
	hairy mountain mahogany	CEMOP	*Cercocarpus montanus var. paucidentatus*	0-1	–
10	**succulent shrubs**			0-2	
	pricklypear	OPUNT	*Opuntia*	0-1	–
	yucca	YUCCA	*Yucca*	0-1	–
11	**shrub increasers**			1-9	
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	1-4	–
	currant	RIBES	*Ribes*	0-1	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	0-1	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0-1	–
	desert-thorn	LYCIU	*Lycium*	0-1	–

Animal community

This ecological site is grazed by livestock. Slopes are gentle enough to allow livestock unlimited access over most of the terrain. There are no naturally occurring water sources (springs or streams) in any of the soils. Livestock use depends on the development of man-made watering facilities (wells or stock tanks) and herding techniques to distribute livestock. Livestock have been in various parts of this area for over a century. The effect of grazing on the land and vegetation is evident. The intensity of grazing and livestock management along with the fire regime will determine how much the plant community changes (overstory and understory) and which state may exists on these sites. Wildlife such as deer, elk, turkey, and javelina utilize these areas for forage, escape cover, and thermal cover. The cool-season species are most utilized by wildlife during fall, winter, and early spring. Competition for forage between livestock and wildlife can occur, especially for cool-season grasses and shrubs.

Hydrological functions

The course fragments (gravel, cobble, and stone) comprise a substantial part of the ground cover that protects and binds the soil. The soil contains fine sandy or gravelly loam which is subjected to sheet erosion; although not as severe as could possibly occur considering the beneficial effects of the rock content. In State #2, ground cover is minimal; consequently much of the moisture is lost in run-off. If the plant community had a greater diversity of herbaceous plants, much of the moisture could be retained or run-off reduced to allow greater infiltration and support a greater amount of plant diversity. In State #2, soil loss and water run-off is more prevalent than in States 1 and 3, and it likely results in soil deposition on adjoining sites.

Recreational uses

This ecological site is conducive to recreation such as camping and firewood gathering. The woodland/savannah plant communities also provide thermal and nesting cover for wildlife and may provide hunting opportunities at certain times of the year. Most soils are not on steep terrain but can be isolated by steep terrain or distance from an established road. Very little vehicle use occurs on these units; most access is by foot or on horseback. Scenic values are not that high, and changing the vegetative patterns across the landscape would not change the scenic rating significantly except that it may induce more wildlife activity and thusly, wildlife viewing. This site seldom occurs near a road, limiting the potential for pinyon nut gathering.

Wood products

States #1, #2, and #3 produce different levels of wood fiber volume. HCPC produces less fiber than the other two states. State #2 produces the most fiber. The limited access to this site does not make it conducive to personal or commercial fuelwood collection. Stand density reductions would likely require other forms of brush disposal, such as chipping, lop and scatter/burn (if sufficient ground fuels are present), or piling and burning. The fuelwood production is estimated to be about 1.3 cords of wood per acre per year on a sustainable basis, assuming a 150-year rotation cycle, and harvesting only the old age-class trees in the stand. If a greater amount of juniper fuelwood is desired, the rotation cycle would need to be extended out to 300-500 years. Wood posts and stays could also be derived from the woodland/savannah stands but the volume and quality may vary significantly, as height, density, and age class of trees vary by plant community. Few of the oneseed junipers are straight enough for posts, but are generally good enough for stays. In addition, not all alligator juniper trees are straight. Many trees are twisted and curved and inadequate for posts. The very old alligator juniper trees would

have to be split to create posts since the first 8 to 12 feet exhibit a very large diameter trunk, too large for a single post.

Other products

None.

Other information

Historical and current grazing practices have significantly altered the plant composition of this ecological site. Restoration efforts will entail a long-term recovery process to restore the native plant structures of States #1 or #3. Reseeding will be an integral part of the recovery process.

Inventory data references

USDA Natural Resources Conservation Service soil survey and a Pinyon/Juniper technical reference, dated September 1997 were used in the location, identification, inventory, and data summary for this ESD. The references are listed in the literature citation of this document. Standard NRCS forms were used to collect data and a field form was created to document frequency, species, and age structure of fire-scarred trees within and adjacent to the study plots for interpretation of the plant community fire history. Data Source - BLM NMSO Number of records - 21 Sampling Period - Fall 2005, Winter/Spring 2006 Sampling Location - Catron County, NM.

Other references

Fire and restoration of pinon-juniper woodlands in the western United States: a review, William L. Baker, Douglas J. Shinneman, Forest Ecology and Management 189 (2004) 1-21.

Historical Weather data for Quemado, NM and Pie Town, NM, Western Regional Climate Center, Reno, Nevada.

Howell, J., Jr., 1940, Pinyon and juniper – A preliminary study of volume, growth, and yield, USDA Soil Conservation Service, Region 8, Bulletin 71, Albuquerque, NM.

Juniper Growth Table, Physical Characteristics and Utilization of Major Woodland Tree Species, Table 26, Barger and Folliot, 1972.

New Mexico Vegetation, Chapter 6 - Woodland and Savannah Vegetation, William A. Dick-Peddie with contributions by W.H Moir and Richard Spellenberg, University of NM Press, 1993.

Regional Bulletin #71, Culmination of Mean Annual Increment, USDA 1940.

Swetnam, T. W., and P. M. Brown. 1992. Oldest known conifers in the southwestern United States: temporal and spatial patterns of maximum age. Pages 24–38 in M. R. Kaufmann, W. H. Moir, and R. L. Basset, technical editors. Old-growth forest in the Southwest and Rocky Mountain regions: the status of our knowledge. Proceedings of a workshop. General technical report RM-213. Rocky Mountain Forest and Range Experiment Station, U.S. Forest Service, Fort Collins, Colorado.

USDA Forest Service, General Technical Report XX, Disturbance and Climate Change in United States/Mexico Borderland Plant Communities – A State-of-the-Knowledge Review; Guy R. McPherson and Jake F. Weltzin, April 2000.

USDA Forest Service, General Technical Report #42, Volume 2; Wildland Fire in Ecosystems –Effects of fire on Flora, December 2000.

USDA Forest Service, Plant website database, Botanical and Ecological Characteristics of Juniperus deppeana, August 2006

USDA Forest Service, Plant website database, Botanical and Ecological Characteristics of Juniperus monosperma, August 2006

USDA Forest Service, Terrestrial Ecosystem Survey, Gila NF

USDA Forest Service, Vegetative Structural Stages, Southwestern Region, RMSTAND data, March 2000 (updated January 3, 2003)

USDA-NRCS, Inventorying, Classifying, and Correlating Juniper and Pinyon Communities, to Soils in the Western United States, September 1997, Grazing Lands and Technology Institute, Ft. Worth , Texas.

USDA-NRCS, Soil Survey for Catron County, NM, North Part, W. Ralph Johnson, May 1985.

USDA Natural Resources Conservation Service, Plants database, Plant Profiles, August 2006

USDI-BLM, Fire Regime Condition Class (FRGG) Interagency Handbook reference Condition, April 6, 2005, draft document, Doug Havlina.

Contributors

Michael Carpinelli
Noe Gonzalez

Approval

Kendra Moseley, 5/29/2025

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	06/15/2026
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:**