USDA Natural Resources
Conservation Service

Ecological site F039XB107NM
Shallow Hills 13-16 inches

Accessed: 05/03/2024

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.

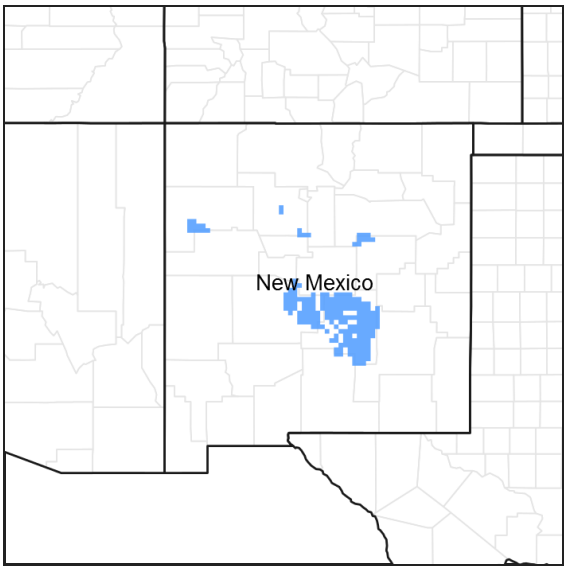

Figure 1. Mapped extent

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.

Classification relationships

The Limestone Hills ecological site (R070CY107NM) is grassland with very little tree cover (3-8%) that also occurs on the Deama, Tortugas, and Winona soil series.

The Limestone Hills ecological site (R070DY151NM) is grassland that also occurs on the Deama soil series.

The Breaks ecological site (R070CY115NM) is grassland or a grass/shrub mix with very little tree cover (8-12%) that occurs on the Deama and Stroupe soil series. It occurs on very broken terrain with much more exposed rock than this forest site.

The Hills ecological site (R070CY106NM) occurs on the Stroupe soil series. It is a mixed grass-shrub complex with scattered tree-type junipers and pinyons (6-15% tree cover).

Table 1. Dominant plant species

Tree	(1) *Juniperus monosperma* (2) *Pinus edulis*
Shrub	(1) *Cercocarpus montanus* (2) *Atriplex canescens*

Herbaceous	(1) *Bouteloua curtipendula* (2) *Hesperostipa neomexicana*

Physiographic features

The site occurs on hills, ridges, mesas, plateaus, knolls, uplands, cuestas, low mountains, and footslopes of higher mountains. Slope ranges from 0 to 75 percent. Elevation ranges from 4600 to 7500 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Ridge (2) Knoll (3) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,402–2,286 m
Slope	0–75%

Climatic features

This site has a semiarid continental climate characterized by distinct seasonal changes and large annual and diurnal temperature changes. Neither snowfall nor drought are uncommon. The average annual precipitation ranges from 13 to 18 inches. Approximately 76% of the precipitation falls from April to October. Most of the summer precipitation comes in the form of high intensity-short duration thunderstorms.

Both temperature and moisture favor warm-season perennial species. However, about 22% of the annual precipitation falls at a time favorable to cool-season plant growth. This allows cool-season plants to occupy an important component on this site. Colder, wetter sites will support a higher volume of cool-season species than the warmer, drier areas. On the north and east slopes, the cool-season component will be proportionately greater than on south and west slopes. Strong winds from February through April can dry the soil profile at a critical time for cool-season plant growth.

The tabular climate summary for this ecological site description (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 stations (results are unweighted averages):

294369 Jemez Springs, NM (Period of record = 1914 to 2006)

292093 Corona, NM (Period of record = 1914 to 1977)

292510 Dilia 1 SSE, NM (Period of record = 1947 to 2006)

293649 Gran Quivira Nat.Mon. NM (Period of record = 1938 to 2006)

291440 Capitan, NM (Period of record = 1914 to 2006)

Table 3. Representative climatic features

Frost-free period (average)	168 days
Freeze-free period (average)	192 days
Precipitation total (average)	457 mm

Influencing water features

This site is not influenced by water from streams or wetlands.

Soil features

Characteristic soil series are Deama, Winona, Cuate, Tortugas, and Laporte.

The Deama series is a loamy-skeletal, carbonatic, mesic Lithic Calciustoll formed in limestone-derived alluvium. It is very shallow to shallow with moderate permeability and occurs in association with rock outcrops.

The Winona series is a loamy-skeletal, carbonatic, mesic, lithic Ustollic Calciorthid formed in limestone-derived alluvium. It is very shallow to shallow and well drained with moderate permeability.

The Cuate series is a loamy-skeletal, carbonatic, mesic Aridic Calciustoll formed from colluvium and alluvium derived primarily from limestone. It is moderately deep, well drained, and moderately permeable.

The Tortugas series is a loamy-skeletal, carbonatic, mesic Lithic Haplustoll derived from limestone. It occurs in association with rock outcrops on very steep to moderately sloping terrain. It is very shallow to shallow and well drained.

The Laporte series is a loamy, carbonatic, mesic Lithic Haplustoll formed from weathered limestone. It occurs in association with rock outcrops or in a complex with other soils— sometimes with the Deama series, as in Bernalillo and Valencia counties. It is shallow with moderate permeability.

This ecological site is supported by these soil series as mapped in the following map units (MUs) in the following soil surveys.

Guadalupe County
MU 58, Deama series;

Lincoln County Area
MU 11, Deama series;
MU 73, Deama, Stroupe series;
MUs 88, 89, 90, 91, 92, Tortugas series;

Sandoval County Area
MUs 58 & 358, Deama series;

Socorro County Area
MU 840, Deama series;
MU 845, Winona series;
MUs 828 & 830, Cuate series

Valencia County, Eastern Part
MU DL, Deama and Laporte series;

Table 4. Representative soil features

Surface texture	(1) Cobbly loam (2) Gravelly clay loam (3) Channery fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	15–102 cm
Surface fragment cover <=3"	5–60%
Surface fragment cover >3"	1–30%

Available water capacity (0-101.6cm)	0.13–0.33 cm
Electrical conductivity (0-101.6cm)	2–4 mmhos/cm
Subsurface fragment volume <=3" (Depth not specified)	15–50%
Subsurface fragment volume >3" (Depth not specified)	35–60%

Ecological dynamics

The plant communities occupy a diverse landscape and climatic regime and are influenced by aspect, climate, elevation, livestock grazing, and fire frequency and intensity. The site can be found on near level terrain, rolling hills and knolls, and steep and rocky limestone hills. Aspect has a significant effect on plant composition, species dominance, and fire behavior. Some of the plant communities identified in the state-and-transition model of this ESD are estimated from collected data. 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.

The typical climax community is a savannah of oneseed juniper with pinyon pine. Under a normal fire regime, tree spacing would be quite open with dominant mature trees. A dense and vigorous understory of cool- and warm-season plants would be maintained by frequent fires. A low fire-frequency would increase tree and shrub density with commensurate decreases in herbaceous density.

The site varies from a warmer, drier climatic regime to a colder, wetter regime. The warmer, drier type is dominated by oneseed juniper with a subdominant two-needle pinyon pine (hereafter referred to as pinyon) tree component. This type is generally found at lower elevations, on gentler terrain and occurring adjacent to grassland sites. The plant community would be characteristic of a juniper or juniper-pinyon savanna with a canopy cover ranging between 20% and 30%. An example of this is the rolling terrain at lower elevations within map units 828 and 840 in eastern Socorro County. South slopes consist of widely spaced trees, predominantly oneseed juniper. Recurrent fires would maintain the savanna appearance with canopy cover between 20% and 25%. Crown fires would not be prevalent except in isolated instances where sufficient ground fuels exist (such as pack rat nests) that can carry fire into the canopy with the help of strong winds.

At lower elevations, precipitation can be infrequent, making pinyon readily susceptible to drought-induced mortality. On north aspects at lower elevations, the plant community may have a high frequency of standing dead or down pinyon carcasses, leaving an almost pure oneseed juniper stand. This site would be prone to natural fires if the herbaceous understory is dense enough to carry a fire. Livestock grazing can sufficiently reduce fine fuels (grass, forbs, and small shrubs), reducing the natural fire frequency or eliminating fire altogether in some localities.

The colder, wetter locations would occupy higher elevations with aspect strongly influencing the plant community. On north aspects, this site would be dominated by pinyon with subdominant oneseed juniper and scattered alligator juniper. South slopes would be dominated by oneseed juniper with scattered pinyon and alligator juniper. Occasional occurrences of Rocky Mountain juniper and ponderosa pine are found on north slopes. These species are not prominent in the plant community except in the transition between pinyon-juniper woodland and ponderosa pine forest.

In fire-prone landscapes, alligator juniper may outcompete oneseed juniper at the upper extent of the pinyon-juniper zone. In addition, wavyleaf oak may also become the dominant shrub species since it resprouts after fire. Tree density would be substantially less on south aspects resulting in more understory fires which maintains the open tree spacing.

On steeper slopes and at the higher elevations, livestock grazing may be limited to toeslopes, ridgetops, saddles, and less steep slopes making the fire frequency quite variable. The steep slopes have substantial rock outcrops and other surface coarse fragments (stone and cobble) that impede fire spread and momentum. Burning patterns may

be irregular, resulting in a mix of surface and crown fire effects on the same slope. Crown fires would decrease oneseed juniper density and favor alligator juniper dominance. Reductions in pinyon may also occur, with an open stand persisting for several decades. Wavyleaf oak, along with hairy mountain mahogany and skunkbush sumac would dominate the understory along with cool-season species. Reestablishment of pinyon will be slow, perhaps requiring a century for pinyon to dominate.

Natural fire would have been part of the historical climax plant community (HCPC) development. Based on the frequency of burned stumps in the warmer, drier zone, the fire return interval may have been short. The fire return interval may have been less than 25 years and as low as 10 years, maintaining a savannah. Livestock grazing can reduce fine fuels significantly making natural fire occurrences less frequent and it may also impeded the use of prescribed fire. In the HCPC within the wetter, colder zone, the fire return interval could have been many decades, with the fuel buildup likely producing a catastrophic fire. Occasional small, low-intensity fires may have consumed understory fuels in localized areas with little effect on stand structure and species composition.

On the warmer, drier areas, the HCPC canopy cover is about 20% on south slopes and 30% on north slopes. In the potential natural community (PNC), canopy cover would range between 25% and 45%. In the colder, wetter zone, the canopy cover for HCPC would range between 20% and 50%, with the PNC having a canopy cover ranging between 35% and 75%. The state-and-transition model depicts an average of these variations for the entire moisture regime.

Tree spacing in the HCPC ranges from 18 to 22 feet in the colder, wetter areas with warmer, drier areas ranging from 18 to 38 feet. In the PNC, a well-managed site including prescribed fire may have a tree spacing ranging from 30 to 45 feet. Where heavy grazing removes fine fuels and fire frequency is substantially reduced, the tree spacing will drop below 18 feet, producing a very dense stand of trees.

Photographs herein may depict plant communities of similar structure and function to those described but with minor differences in species composition and density.

Description of State and Transition Model
State 1:
Plant Community 1 (PC1) is the historical climax plant community (HCPC), self-sustaining through periodic natural fires with minimal susceptibility to insect and disease.

HCPC is generally comprised of an old-age class of pinyon and oneseed juniper trees dominating the plant community. In the wetter moisture regime, alligator juniper may be present but not in significant quantity, possibly with incidental occurrences of Rocky mountain juniper and ponderosa pine. Pinyon and oneseed juniper may coexist in about equal stand density.

In the wetter moisture regime, pinyon may exert dominance, comprising up to 70% of the tree composition. At the drier end of the moisture regime, oneseed juniper comprises between 70 and 95% of the tree composition.

Pinyon will be more common on north aspects and infrequently encountered on south aspects. Recurrent understory burns will reduce the mid-age class trees, leaving remnants as recruitment trees. Young-age class trees will be minimal occurrences in the plant community. Pinyon growth and reproduction decrease with decreasing elevation and moisture. Pinyon will likely be much smaller than on more productive sites, seldom exceeding 12 to 14 inches in diameter at the root collar.

On the colder, wetter areas, especially on north slopes at higher elevations, the sites would appear heavily wooded. At the lower elevations, warmer and drier areas, the plant community would appear more savanna-like, and alligator juniper, Rocky Mountain juniper, and ponderosa pine would not be encountered.

At the lower elevations, frequent fires maintain an open stand. At the wetter moisture regime on steeper slopes, fire frequency would be lower due to abundant, large, surface coarse fragments. The fire return interval may span many decades or more than a century. Lower elevation fires would tend to be understory burns, whereas upper elevation fires would tend to be catastrophic and consume portions of the overstory.

The herbaceous component is comprised of a mixture of warm- and cool-season species, with slight differences in species composition between the drier, lower elevations and the wetter, upper elevations. Shrubs species and

densities would also differ by moisture regime.

The HCPC is comprised of 70 to 80% old trees, 15-25% or less mid-age trees, and 0-10% young trees (seedlings and saplings). Tree density ranges from 60 to 130 trees per acre. (Note: The HCPC projections are derived from reconstructed stand structure analysis using existing data and an average description of the drier and wetter moisture regimes.)

Plant Community 2 (PC2) results from overstory tree mortality caused by a crown fire. (Note: The result is from a shift in plant species dominance, not stand replacement.) Overstory fires would be rare, and usually small, at the drier, lower elevations. At the wetter, higher elevations, crown fires are more likely to occur in short up-slope runs reducing tree density and accelerating shrub and grass growth. PC2 will revert to PC1 through succession.

State 2:
State 2 occurs where livestock grazing at light to moderate levels reduces fine fuels (herbaceous plants), thereby reducing fire frequency and increasing the shrub and tree components. With grazing eliminated and land treatments applied (thinning, burning, seeding herbaceous species) State #2 can revert to State #1 (HCPC) and a natural fire regime.

Plant Community 3 (PC3) is the potential natural community (PNC) dominated by pinyon with oneseed juniper as codominant on gentler (less than 30%) slopes. Shrub density decreases due to overstory competition in the absence of fire. Oneseed juniper and pinyon density and canopy cover is greater than in PC1, comprised mostly of mid-age and young-age class trees. Intensity of natural or prescribed fire will be greater because of the high tree density, and therefore, have more of an impact on stand density and composition. A high stand density will add competition for space and nutrients among pinyon trees which will exacerbate drought stress. Drought and disease can cause widespread pinyon mortality, which will move PC3 to PC4. Canopy removal (fuelwooding, thinning) or herbicide treatments can move PC3 to PC5.

On very steep slopes in the wetter moisture regime, the plant community is dominated by pinyon with oneseed juniper as subdominant. Alligator juniper can also be found in the stands with occasional Rocky Mountain juniper and ponderosa pine.

In the drier zone, oneseed juniper would dominate with pinyon as subdominant. Livestock grazing reduces fine fuels (herbaceous plants), thereby reducing fire frequency and allowing young-age class oneseed junipers to increase in density. Thinning and prescribed burning would be required to mimic natural fire regime. Canopy cover would be substantially greater than in the HCPC. This plant community could maintain itself in a state of equilibrium until a catastrophic fire results from long-term woody fuel accumulation (drought, disease, insect) and severe fire weather conditions (high temperature, low humidity, strong winds). A high-intensity fire would shift the plant community to PC5.

Depending on the steepness of the slope, cattle grazing would have a different effect on tree recruitment and fuel accumulation than sheep or goat grazing (browsing). Ridgetops and adjoining upper sideslopes along with toeslopes would be used more by cattle with the mid-slopes less impacted and prone to severe fires.

Moderate sheep or goat browsing on the hillsides would reduce the shrub component and may contribute to increases in grass production; however, heavy browsing on the hillsides may increase sheet erosion and improve conditions for oneseed juniper expansion on the slopes. With drought stress and insect infestations, pinyon mortality would be substantial and would move PC3 to PC4. This plant community would revert to PC3 through succession. Pinyon mortality would create a substantial fuel source and the site would be susceptible to a high-intensity fire, which would result in a shift from PC4 to PC5.

On gentler slopes, livestock grazing would decrease herbaceous plants and allow trees and shrubs to increase. The natural fire frequency may be reduced enough to require prescribed fire to mimic natural fire events, or mechanical and herbicidal treatments could be used to reduce tree densities. This would shift PC3 to PC4.

Plant Community 4 (PC4) is dominated by oneseed juniper with shrub and herbaceous components increasing in density. Grazing can reduce herbage and shrub production, extending the natural fire interval by reducing fine fuels which are also required for prescribed fire. Reduced fire frequency promotes pinyon establishment. As pinyon matures, PC4 reverts to PC3. Prescribed fire or thinning can move PC4 to PC5.

On gentler slopes, wavyleaf oak would increase with a commensurate decrease in herbaceous plants due to shading by shrubs and livestock grazing. Tree canopy reduction by prescribed fire, combined with thinning or herbicidal treatment of the shrubs, may increase grass production, thereby increasing fine fuels and the likelihood of naturally occurring ground fire.

Mechanical treatments can also be used to reduce tree density, and combined with prescribed fire, it will reduce the canopy enough to allow shrubs to dominate for a period of time, moving PC4 to PC5.

PC4 may not occur on steep slopes where fire frequency is extended to several decades or even over a century. A fire on steep slopes would likely be catastrophic and lead to PC5 rather than PC4.

Plant Community 5 (PC5) varies by elevation. At lower elevations (warmer, drier) it may be grassland that can be sustained with some level of natural or prescribed recurrent fires. Four-wing saltbush, winterfat, Mormon tea, and skunkbush sumac would be more common in lightly to moderately grazed areas. Bunchgrasses such as sideoats grama, New Mexico feathergrass, curlyleaf muhly, and galleta would be present with minor amounts of prairie junegrass and littleseed ricegrass. Surface fires would maintain an open stand, with oneseed juniper establishing before pinyon.

At the upper elevations, (colder, wetter) the plant community would be dominated by shrubs such as wavyleaf oak, skunkbush sumac, winterfat, and hairy mountain mahogany. Herbaceous plants would increase for a period of time and recurrent fires would not likely occur. Sideoats grama, New Mexico muhly, prairie junegrass, plains lovegrass, mutton bluegrass, and little bluestem would be present. The site would take a substantial amount of time to become populated with trees, especially on steeper slopes. The shrub-dominated plant community could persist for a long time on steep, rocky hillsides such as in MU830 (Soil Survey of Socorro County Area) or MU91 (Soil Survey of Lincoln County Area). With reduced fire frequency, PC5 eventually reverts to PC3 as trees become established.

State and transition model

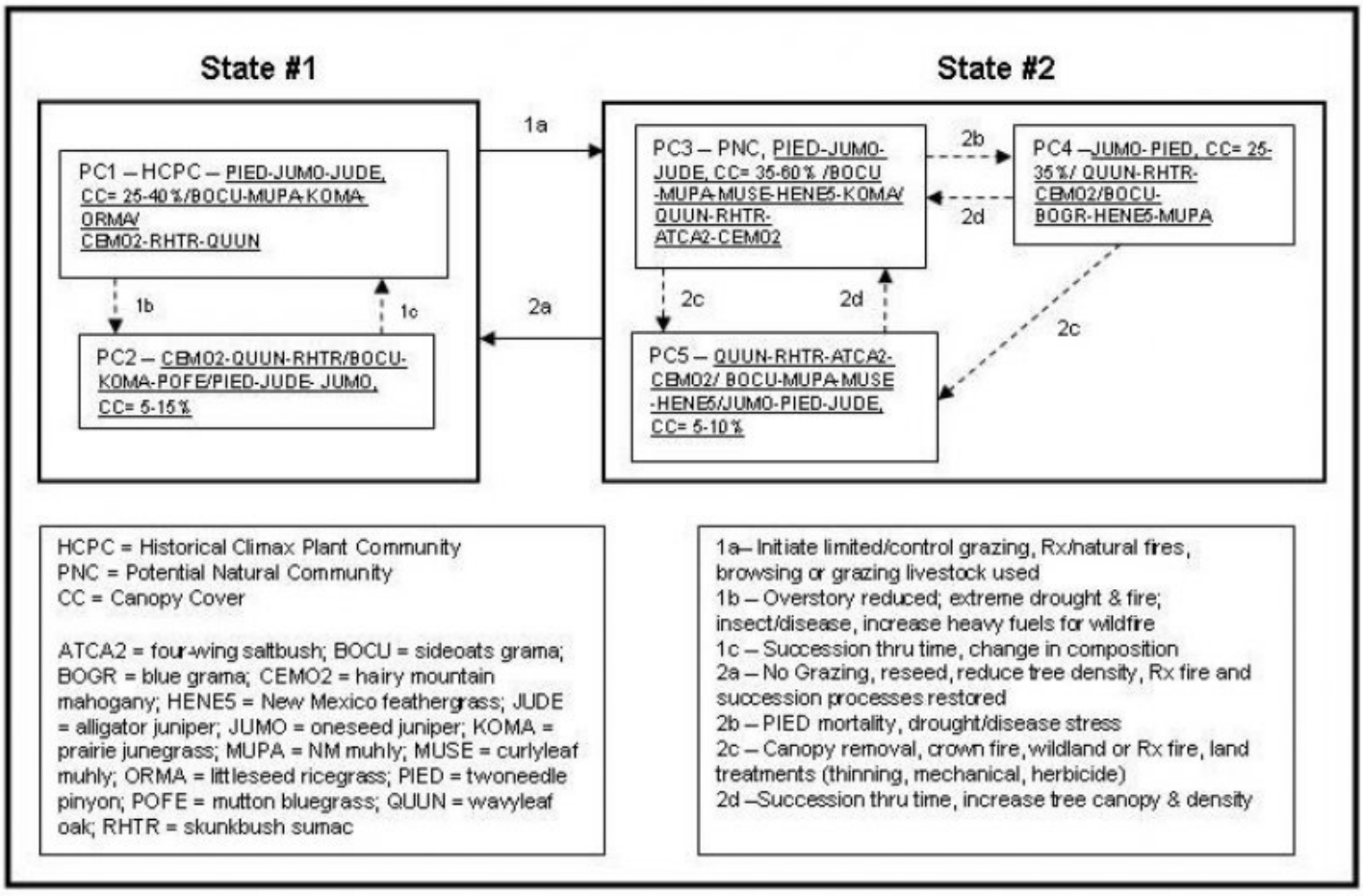

Figure 4. State-and-Transition Model

State 1
Historic Climax Plant Community (State 1, Plant Community 1)

Community 1.1
Historic Climax Plant Community (State 1, Plant Community 1)

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	265	448	633
Shrub/Vine	39	62	90
Forb	1	1	2
Total	**305**	**511**	**725**

State 2
Grassland (State 1, Plant Community 2)

Community 2.1
Grassland (State 1, Plant Community 2)

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	455	628	796
Shrub/Vine	101	146	191
Forb	6	8	11
Total	**562**	**782**	**998**

State 3
State 2, Plant Community 3 (photo only)

Community 3.1
State 2, Plant Community 3 (photo only)

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**warm-season increasers**			52–67	
	blue grama	BOGR2	*Bouteloua gracilis*	22	–
	curlyleaf muhly	MUSE	*Muhlenbergia setifolia*	17	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	6–11	–
	New Mexico muhly	MUPA2	*Muhlenbergia pauciflora*	6–11	–
	poverty threeawn	ARDI5	*Aristida divaricata*	1–6	–
2	**warm-season decreasers**			45–235	
	plains lovegrass	ERIN	*Eragrostis intermedia*	17–78	–
	little bluestem	SCSC	*Schizachyrium scoparium*	6–56	–
	common wolfstail	LYPH	*Lycurus phleoides*	11–45	–
	black grama	BOER4	*Bouteloua eriopoda*	6–34	–
	James' galleta	PLJA	*Pleuraphis jamesii*	6–22	–
3	**sideoats grama**			95–140	
	sideoats grama	BOCU	*Bouteloua curtipendula*	95–140	–
4	**cool-season decreasers**			28–50	
	prairie Junegrass	KOMA	*Koeleria macrantha*	11–28	–
5	**cool-season increasers**			39–129	
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	17–78	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	6–34	–
	squirreltail	ELEL5	*Elymus elymoides*	17	–
6	**sedge**			6–11	
	sedge	CAREX	*Carex*	6–11	–
7	**James' buckwheat**			1–2	
	James' buckwheat	ERJA	*Eriogonum jamesii*	1–2	–
Shrub/Vine					
8	**cool-season decreasers**			17–34	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	6–17	–
	skunkbush sumac	RHTR	*Rhus trilobata*	11–17	–
9	**warm-season decreasers**			17–39	
	winterfat	KRLA2	*Krascheninnikovia lanata*	11–28	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	6–11	–
10	**warm-season increaser**			6–11	
11	**succulent increasers**			0–6	
	pricklypear	OPUNT	*Opuntia*	0–6	–
	yucca	YUCCA	*Yucca*	0–6	–

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**warm-season increasers**			101–151	
	New Mexico muhly	MUPA2	*Muhlenbergia pauciflora*	22–39	–
	curlyleaf muhly	MUSE	*Muhlenbergia setifolia*	28–39	–
	blue grama	BOGR2	*Bouteloua gracilis*	28–34	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	17–28	–
	poverty threeawn	ARDI5	*Aristida divaricata*	6–11	–
2	**warm-season decreasers**			163–286	
	plains lovegrass	ERIN	*Eragrostis intermedia*	39–101	–
	James' galleta	PLJA	*Pleuraphis jamesii*	45–67	–
	black grama	BOER4	*Bouteloua eriopoda*	28–50	–
	little bluestem	SCSC	*Schizachyrium scoparium*	34–45	–
	common wolfstail	LYPH	*Lycurus phleoides*	17–22	–
3	**sideoats grama**			112–168	
	sideoats grama	BOCU	*Bouteloua curtipendula*	112–168	–
4	**cool-season decreasers**			17–34	
	prairie Junegrass	KOMA	*Koeleria macrantha*	11–22	–
5	**cool-season increasers**			62–151	
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	34–95	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	22–45	–
	squirreltail	ELEL5	*Elymus elymoides*	6–11	–
6	**sedge**			1–6	
	sedge	CAREX	*Carex*	1–6	–
7	**James' buckwheat**			6–11	
	James' buckwheat	ERJA	*Eriogonum jamesii*	6–11	–
Shrub/Vine					
8	**cool-season decreasers**			39–62	
	skunkbush sumac	RHTR	*Rhus trilobata*	22–34	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	17–28	–
9	**warm-season decreasers**			45–78	
	winterfat	KRLA2	*Krascheninnikovia lanata*	28–50	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	17–28	–
10	**warm-season increaser**			17–39	
11	**succulent increasers**			0–11	
	pricklypear	OPUNT	*Opuntia*	0–6	–
	yucca	YUCCA	*Yucca*	0–6	–

Table 9. Community 3.1 plant community composition

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

Animal community

These areas have been grazed historically by livestock since the late 1800s. Slopes, with rock outcrops, vary enough that traversing the landscape may be difficult, but not impossible, for livestock. Both sheep and cattle with

some pack and saddle stock have utilized the lands for over a century with varying intensity. The steepest terrain has had little grazing impact, except in areas that may have been used for horse pastures or sheep and goat range. Most of the areas have no natural water sources. Accessible areas close to man-made water sources have experienced heavy grazing impact during late 19th century and much of the 20th century.

With very few natural water sources existing on these lands, grazing impacts will vary from excessive use to light or no use. Elk and deer forage on some of the map units addressed in this ESD. Oryx, an introduced exotic species, is found within map unit 840 (Deama soil series), located north of White Sands Missile Range. Oryx are year-round residents, and they can have a significant effect on vegetation and fire frequency. Livestock use (historical and current) also altered the understory plant composition, in turn affecting the fire regime for these lands. Natural fires are less common in State 2, although prescribed fire can be more frequent if land management focuses on producing sufficient accumulated fuels to ignite and carry a fire.

Stocking capacity in State 2 is moderate, with forage production influenced by management (reducing tree density and canopy cover), proper stocking, season of use, and prescribed grazing.

Competition for forage between livestock and wildlife occurs on these sites, especially for the cool-season grasses and desirable shrubs. Desirable shrub species are severely hedged on gentler terrain and more vigorous on steeper slopes.

Hydrological functions

Coarse fragments (gravel, cobble, stone) and rock outcrops comprise a significant part of the ground cover, protecting and binding the soil and modifying surface runoff. Rocks impede the force of surface runoff and channel water flow that will influence vegetation and soil integrity. The surface flow improves establishment of vegetation in rock crevices and contributes to downslope sedimentation allowing plants to establish on slightly deeper soils within the same slope.

Though the soil texture ranges from channery to flaggy with gravel and cobble, it is intermixed with a loamy soil containing calcium carbonate fragments. Where grazing reduces vegetation and litter and increases runoff, this soil is subject to sheet and gully erosion. Runoff is more rapid on these slopes contributing to soil movement and water channeling.

Recreational uses

This site provides outdoor recreation opportunity, from hunting and sightseeing to camping and horseback riding. Some wood gathering occurs. The wooded areas also provide thermal and nesting cover for wildlife. Scenic values are low to moderate, with some locations providing vista opportunities.

Wood products

This site produces wood fiber (firewood, fenceposts) in varying amounts. Old oneseed junipers can be found in clumps or in widely scattered stands containing large diameter trunks and limbs. In some plant communities, the older trees would be widely scattered with interspaces filled with younger trees. Pinyon-dominated plant communities are more productive than juniper-dominated plant communities.

Average production is about 4 cords of wood per acre or about 560 cubic feet (70% usable wood fiber from 800 cubic feet). The culmination of mean annual increment (CMAI) is 1.4 to 13.3 cubic feet per acre per year. At HCPC, the rotation cycle would likely be long (300+ years) to ensure sustainable wood fiber production.

Other products

Rock quarries can be found on this site, mostly as a source of roadbed surface rock. Rehabilitation of these sites is difficult where the topsoil has been removed.

Inventory data references

USDA Natural Resources Conservation Service soil surveys and a Pinyon/Juniper technical reference (USDA-

NRCS 1997) were used in the location, identification, inventory, and data summary for this ESD. Standard NRCS forms were used to collect data, with summaries created in different formats to interpret data and make conclusions about current and historical plant community characteristics.

The NRCS Plants National Database, field identification, and the published soil survey were used in the development of the species list for this ESD.

Interpretive Plant Community: Locations containing the Deama and Cuate soil series were sampled to determine stand density, age structure, and tree species dominance (by frequency and canopy cover). This data is used to estimate HCPC plant composition and stand structure. The data is summarized and collectively used to estimate successional pathways.

Other Inventory Data Reference: A total of 17 plots have been sampled within similar elevation. Both north and south aspects were sampled. Sampling occurred in the fall/winter of 2007-2008 in Socorro County, NM.

Type locality

Location 1: Socorro County, NM	
Township/Range/Section	T5 S R7 E S14,17
General legal description	Chupadera Mesa, USDI-BLM land, intermixed with private and state land. T5S R7E: Sec. 14 is the gentler slope, Sec. 17 is the steep, north slope. Other type locations include T5SR7E Sections 1,2,9-12,14,16,17.

Other references

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Contributors

Michael Carpinelli
Noe Gonzalez

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	
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:**