USDA Natural Resources
Conservation Service

Ecological site R036XB016NM
Loamy Savanna

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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.

MLRA notes

Major Land Resource Area (MLRA): 036X–Southwestern Plateaus, Mesas, and Foothills

Loamy Savanna is an ecological site that is found on nearly level to undulating plains, hills, ridges, and mesa tops, although it may occur on more rolling landscapes 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

The 36XB Loamy Savanna ecological site was drafted from the existing Loamy Savanna (R036XB016NM) range site MLRA 36XB (NRCS, 2003). This site occurs on nearly level to undulating plains, hills, ridges, and mesa tops, although it may occur on more rolling landscapes. Surface textures range from fine sandy loams to clay loams. It has an aridic ustic/ustic arid moisture regime and mesic temperature regime. The effective precipitation ranges from 10 to 16 inches.

Associated sites

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.

R036XB009NM	**Salt Meadow** Salt Meadow - Water table 36-72” in depth; slopes are 1-5%; soils are deep, Surface textures are loam, fine sandy loam, clay loam, silty clay loam with a subsoil of clay or clay loam. Landform is nearly level to gently sloping floodplains. This site is dependent on sub-irrigation and overflow for its moist condition. This site is affected by sodium.
R036XB015NM	**Shallow Savanna** Shallow Savanna - 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.

Similar sites

R036XB015NM	**Shallow Savanna** Shallow Savanna - 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.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site typically occurs on nearly level to undulating plains, hills, ridges, and mesa tops, although it may occur on more rolling landscapes. Slopes range from 1 to 15 percent but average about 5 percent. Elevation ranges from 6,800 to 7,500 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	2,073–2,286 m
Slope	1–15%
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)	126 days
Freeze-free period (average)	145 days
Precipitation total (average)	330 mm

Climate stations used

- (1) NAVAJO DAM [USC00296061], Navajo Dam, NM
- (2) COCHITI DAM [USC00291982], Pena Blanca, NM
- (3) SANTA FE 2 [USC00298085], Santa Fe, NM
- (4) ABIQUIU DAM [USC00290041], Gallina, NM
- (5) CUBA [USC00292241], Cuba, NM
- (6) LYBROOK [USC00295290], Dulce, NM
- (7) EL RITO [USC00292820], El Rito, NM

Influencing water features

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

Soil features

Soils are generally moderately deep to deep. Surface textures range from very fine sandy loam to clay loam. Sub-soils in the control section are fine.

This ecological site is used in following soil survey: NM682. It is correlated to Cantina and Montecito soil components in Map units 579 & 540.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale (2) Slope alluvium–sandstone and shale
Surface texture	(1) Sandy loam (2) Fine sandy loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to moderately slow
Soil depth	51–152 cm
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	12.7–17.78 cm

Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–5%

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 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. The fire return interval is 10 to 203 years (USFS, 2012). Pinyon-Juniper woodland fires were 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

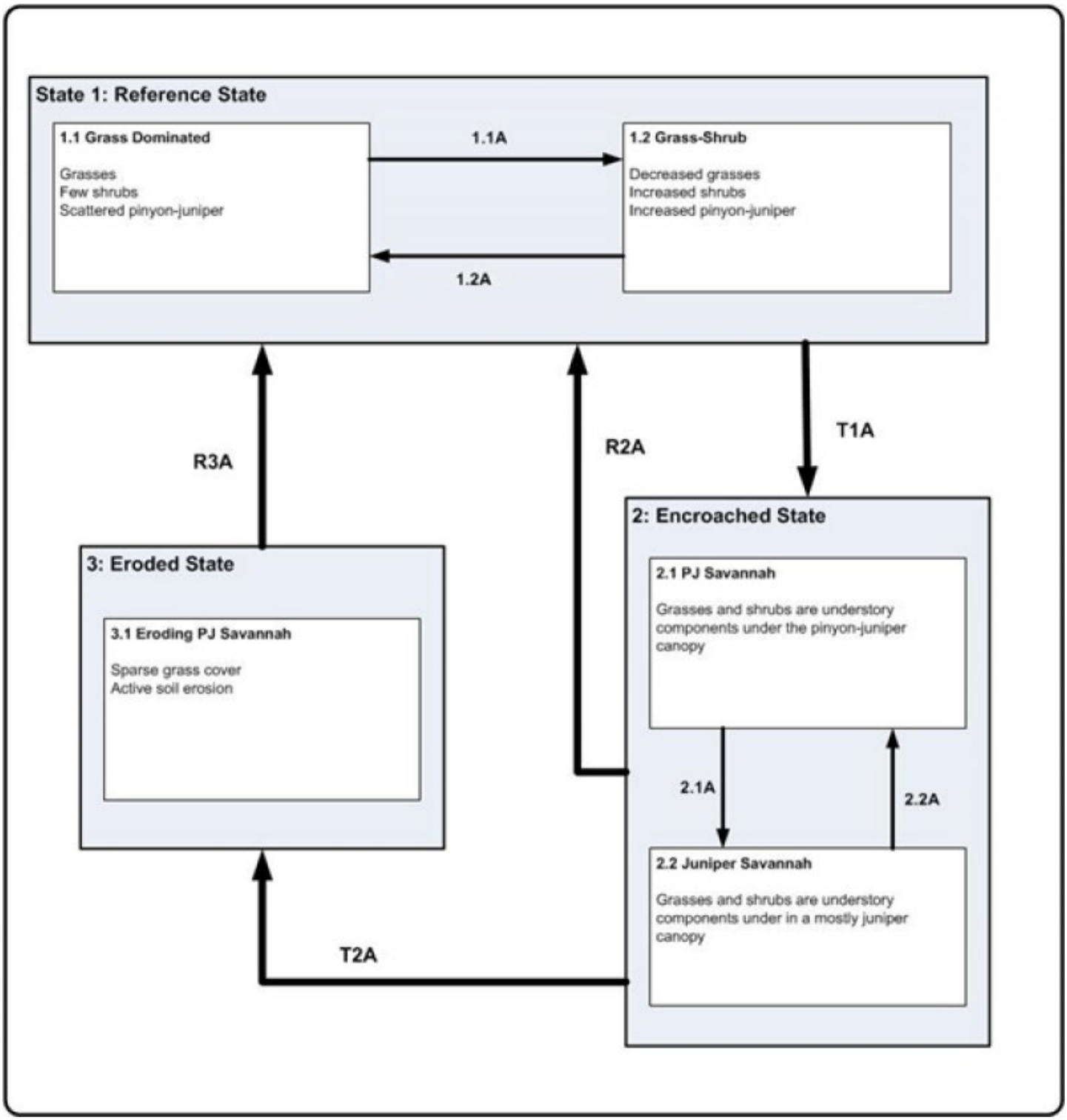
State 1: Reference State
1.1 Grass Dominated
Grasses
Few shrubs
Scattered pinyon-juniper
1.1A
1.2 Grass-Shrub
Decreased grasses
Increased shrubs
Increased pinyon-juniper
1.2A
R3A
R2A
T1A
2: Encroached State
2.1 PJ Savannah
Grasses and shrubs are understory components under the pinyon-juniper canopy
2.1A
2.2A
2.2 Juniper Savannah
Grasses and shrubs are understory components under in a mostly juniper canopy
3: Eroded State
3.1 Eroding PJ Savannah
Sparse grass cover
Active soil erosion
T2A

Figure 6. STM

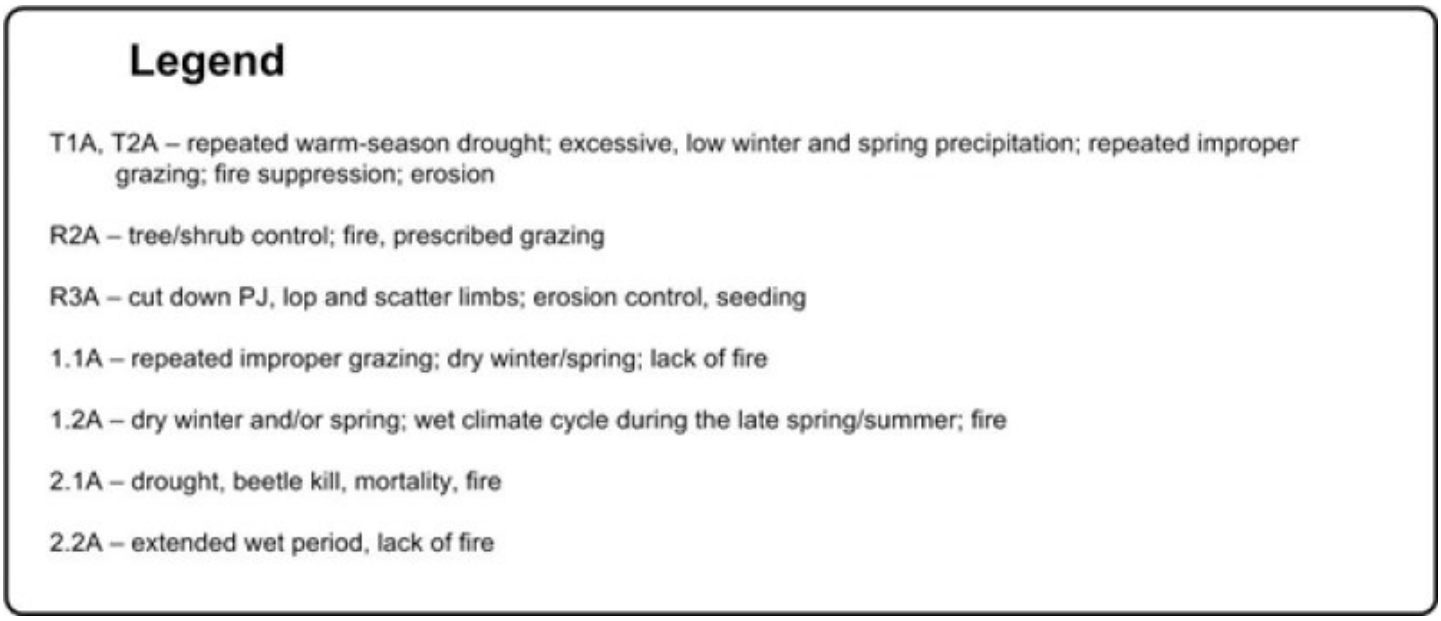

Figure 7. Legend

State 1
Reference

The reference state represents the plant communities and ecological dynamics of this ecological site. This state includes the biotic communities that become established on the ecological site under the natural disturbance regime prior to pre-European settlement. The main pathways on this site are fire and climate (drought/wet cycles). Drought is frequent on this site. The reference state is self-sustaining and resistant to change due to high resistance to natural disturbances and high resilience following natural disturbances. When natural disturbances occur, the rate of recovery is variable due to disturbance intensity. Once invasive plants establish, return to the reference state may not be possible. Approximately 75% of the vegetation produced on this site is suitable for grazing or browsing by domestic livestock and wildlife. Grazing distribution is generally not a problem if adequate waterings are properly located. However, continuous grazing leads to a repetitive, selective grazing of the most desirable species, which reduces their vigor and productivity. The result is a deterioration of the potential plant community. This deterioration is indicated by a decrease in western wheatgrass, muttongrass, prairie junegrass, spike muhly, winterfat, and fourwing saltbush. Species that increase include blue grama, galleta, mat muhly, ring muhly, rabbitbrush, big sagebrush, and broom snakeweed. The pinyon and/or juniper may also increase to give the appearance of a pinyon/juniper woodland with little herbaceous understory present. This site is most stable against forces of erosion when the equilibrium between the grasses and trees is maintained.

Community 1.1
Grass Dominated

The tree overstory is at equilibrium with the herbaceous understory at climax. It appears as a grassland site with a fairly evenly spaced stand of pinyon and/or juniper. Tree canopy ranges from 5 to 15 percent (12-40 trees/acres). Shrubs are common on this site. Forbs are a minor component.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	392	628	863
Shrub/Vine	112	179	247
Forb	34	56	78
Tree	22	34	45
Total	**560**	**897**	**1233**

Table 6. Soil surface cover

Tree basal cover	0-5%
Shrub/vine/liana basal cover	10-20%
Grass/grasslike basal cover	20-30%
Forb basal cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	15-25%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	40-50%

Figure 9. Plant community growth curve (percent production by month). NM0016, R036XB016NM Loamy Savanna HCPC. R036XB016NM Loamy Savanna HCPC Grassland with an evenly spaced stand of pinyon and/or juniper and a minor forb component..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	3	5	10	10	25	30	12	5	0	0

Community 1.2
Grass and Shrub

This community consists of shrubs with sparse understory. Scattered juniper and two-needle pinyon might be present. Biological crusts are typically well developed in the interspaces. Improper grazing use can aid the establishment of pinyon and juniper seedlings through reduced competition from grass loss, exposure of mineral soil which will result in accelerated erosion, and reduction of fuel to carry fires. Two-needle pinyon and juniper are natural invaders if stands are found adjacent to this site.

Pathway 1.1A
Community 1.1 to 1.2

Community phase 1.1 transitions to community phase 1.2 to a state that is dominated by unpalatable and/or drought resistant shrubs and grasses. This pathway happens when fire does not occur within the historical fire regime interval for the site. Continuous heavy grazing, drought and/or insects can reduce grasses, and palatable shrubs. This will lead to an old decadent stand of shrubs with little to no understory. This allows the possibility of juniper and/or two-needle pinyon to become established on the site.

Pathway 1.2A
Community 1.2 to 1.1

This transition is caused by naturally occurring fires, dry winter and/or spring will help in decreasing shrub establishment; and/or wetter climate during late spring and summer will aid in grass and forb establishment. With a mature shrub community, this pathway can be caused by high intensity fire that burns hot enough to remove shrubs. Low-intensity fire after shrubs has had a chance to set seed, proper grazing and or browsing by native ungulates.

State 2
Encroached

This state (Encroached State) is characterized by a noticeable increase in P-J and decreased grass cover and production compared to the Reference State. Other species that may increase include pingue and broom

snakeweed. Grass cover is patchy, large bare areas may be present under P-J canopies. Evidence of erosion such as small rills and pedestalled plants may be present. 5 to 15% tree species canopy cover is usually characterized of this state. This state will have scattered mature trees with open areas and grasses in the understory.

Community 2.1
Pinyon-Juniper Savanna

Proportion of pinyon pine in the Encroached State varies with cycles of drought (reduces the ability of pinyon pine to manufacture pitch which is used to expel boring beetles), insect damage, and subsequent mortality and possible fire. Following fire, there may be a brief (4 to 5 years) flush of forbs and grasses. This increase in fine fuels sets the stage for fire to return the site to the reference state. Without fire, juniper increases in subsequent dry years, pinyon increases in subsequent wet years. Succulents replace grasses in the Encroached State under repeated, continuous grazing. This site have scattered trees across the landscape and the canopy will not make a woodland.

Community 2.2
Juniper Savanna

The overall aspect of this community phase is grasses and shrubs with sparse pinyon and Utah juniper. The herbaceous understory has a mix of grasses and forbs.

Pathway 2.1A
Community 2.1 to 2.2

This pathway occurs during and after events such as drought or insect/pathogen outbreaks. Droughts and insects will kill the pinyon first, increasing nutrient availability in the system. Due to the natural conditions of drought, grasses typically do not take up the extra nutrients in the long term. In the short term, grasses and forbs may increase for a few years until juniper and pinyon recover.

Pathway 2.2A
Community 2.2 to 2.1

This pathway occurs when events create a wetter climate cycle, favor pinyon and perennial bunch grass establishment. Following several favorable precipitation years and lack of surface disturbances, native perennial plants will reestablish. Pinyon and juniper filling in on the landscape.

State 3
Eroded

This state is characterized by reduced cover and production of grasses and accelerated erosion. P-J and shrubs dominate. About 25% tree canopy cover is thought to be the threshold for the transition from the P-J Encroached State to the Eroded State. Arnold (1964) analysis of possible explanations of these threshold include allelopathy, shade, precipitation interception by the canopy, and litter cover forming a physical barrier to germinating plants. Other explanations offered to explain the reduced under-canopy vegetation include root competition for soil moisture, and possible chemical properties of one-seed juniper litter (Arnold, 1964). Broom snakeweed and pingue are often found at increased densities. This state is characterized by soil loss from large, interconnected bare areas and hydrologic events carrying sediment off-site. Evidence of erosion such as rills, gullies, and pedestalled plants is common. The Eroded State is characterized by competition for nutrients, water, and light in the interstitial spaces; multiple age classes of P-J; and sparse understory. Fire return interval in Eroded State may exceed 100 years.

Community 3.1
Eroding Pinyon-Juniper Savanna

Grass cover may decline due to heavy grazing, drought, and increased competition by P-J for available soil moisture. As grass cover is reduced, infiltration, organic matter, and soil aggregate stability decrease, increasing susceptibility to erosion. Bareground increases in size and frequency. Erosion rates are site-specific and are influenced by such factors as watershed size, degree and length of slope, soil profile textures, soil structure, and amount of rock fragments. Loss of herbaceous cover may cause the site to cross a threshold resulting in increased

erosion rates, but the amount of cover loss required to cross the threshold varies both within and among areas. Erosion may vary substantially from site to site, or even within areas of a single site. Plants may show pedestalling which indicates an increase in length of water flow patterns and an increase in amount and size of rills.

Transition T1A
State 1 to 2

This transition is from the native shrub and perennial grass state (reference state), to a state that is dominated by pinyon and juniper (Encroached State). The resulting decreased competition by perennial grasses and forbs facilitates the encroachment of pinyon and juniper. Events include time without disturbance, drought, insect herbivory, continuous season long grazing of perennial grasses, and tree invasion. As tree canopy density increase, perennial grass and forb cover is reduced and composition has changed, bare ground will increase in size and frequency, accelerating erosion, increasing run-off and further affecting the watershed functionality. This transition also favors the establishment of invasive annual species such as cheatgrass. In wet years, high grass cover may suppress P-J seedlings by competing directly for available soil moisture; lower grass cover may facilitate P-J establishment.

Restoration pathway R2A
State 2 to 1

Restoration Pathway from Encroached State to Reference State (R2A). Removal of P-J will be necessary to reduce competition for resources. PJ removal could be from fire; treatments; drought; and/or insect/pathogen outbreaks. Prescribed grazing with adequate rest following PJ control will assist in the establishment and maintenance of grass cover. Seeding may be necessary depending on herbaceous cover present on the specific site. This pathway requires lots of energy input into the system.

Transition T2A
State 2 to 3

When this transition to state 3 (Eroded State) occurs the site has lost much of its expected resistance and resilience. At this point natural and/or management actions have decreased the understory to a point where erosion increases. Lack of from fire, insects, and drought could cause the tree canopy to close, effectively reducing the herbaceous understory and facilitating the transition. Improper grazing and or increase surface disturbance combined with periods of drought can facilitate this transition since soil stability is lost and susceptibility to soil loss increases.

Restoration pathway R3A
State 3 to 1

Restoration Pathway from Eroded State to Reference State (R3A). Removal of P-J will be necessary to reduce competition for resources. Erosion control structures in conjunction with seeding will be necessary to reestablish hydrology and grass dominance. Prescribed grazing will help ensure adequate rest following seeding and P-J removal and will assist in the establishment and maintenance of grass cover. The degree to which this site is capable of recovery is dependent on the extent of soil degradation.

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				90–179	
	western wheatgrass	PASM	*Pascopyrum smithii*	90–179	–
2				63–108	
	blue grama	BOGR2	*Bouteloua gracilis*	63–108	–
	James' galleta	PLJA	*Pleuraphis jamesii*	63–108	–

3				45–90	
	prairie Junegrass	KOMA	*Koeleria macrantha*	45–90	–
	muttongrass	POFE	*Poa fendleriana*	45–90	–
4				27–63	
	spike muhly	MUWR	*Muhlenbergia wrightii*	27–63	–
	alkali sacaton	SPAI	*Sporobolus airoides*	27–63	–
5				27–63	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	27–63	–
	needle and thread	HECO26	*Hesperostipa comata*	27–63	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	27–63	–
6				27–45	
	squirreltail	ELEL5	*Elymus elymoides*	27–45	–
7				45–90	
	pine dropseed	BLTR	*Blepharoneuron tricholepis*	45–90	–
	pinyon ricegrass	PIFI	*Piptochaetium fimbriatum*	45–90	–
8				0–45	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–45	–
	Arizona fescue	FEAR2	*Festuca arizonica*	0–45	–
	mountain muhly	MUMO	*Muhlenbergia montana*	0–45	–
Forb					
9				9–28	
	Forb, perennial	2FP	*Forb, perennial*	9–28	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–28	–
	fleabane	ERIGE2	*Erigeron*	9–28	–
	buckwheat	ERIOG	*Eriogonum*	9–28	–
10				9–18	
	Forb, annual	2FA	*Forb, annual*	9–18	–
Tree					
11				27–72	
	oneseed juniper	JUMO	*Juniperus monosperma*	27–72	–
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	27–72	–
	twoneedle pinyon	PIED	*Pinus edulis*	27–72	–
Shrub/Vine					
12				27–72	
	fourwing saltbush	ATCA2	*Atriplex canescens*	27–72	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	27–72	–
13				27–72	
	sagebrush	ARTEM	*Artemisia*	27–72	–
	big sagebrush	ARTR2	*Artemisia tridentata*	27–72	–
14				9–27	
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	9–27	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	9–27	

	spineless horsebrush	TECA2	*Tetradymia canescens*	9–27	–
15				9–27	
	Shrub, deciduous	2SD	*Shrub, deciduous*	9–27	–

Animal community

Habitat for Wildlife:
No Data

Hydrological functions

The runoff curve numbers are determined by field investigations using hydrologic cover conditions and hydrologic soil groups.

Hydrologic Interpretations:
Soil Series----------Hydrologic Group
No Data

Recreational uses

This site is well adapted to hunting, horseback riding, and camping.

Wood products

This site is not a major source of wood products. However, selective harvesting can result in some wood products such as Christmas and landscape trees, fuelwood, and fence posts.

Other products

Grazing:
Approximately 75 percent of the vegetation produced on this site is suitable for grazing or browsing by domestic livestock and wildlife. Grazing distribution is generally not a problem if adequate waterings are properly located. However, continuous grazing leads to a repetitive, selective grazing of the most desirable species, which reduces their vigor and productivity. The result is a deterioration of the potential plant community. This deterioration is indicated by a decrease in western wheatgrass, muttongrass, prairie junegrass, spike muhly, winterfat, and fourwing saltbush. Species that increase include blue grama, galleta, mat muhly, ring muhly, rabbitbrush, big sagebrush, and broom snakeweed. The pinyon and/or juniper may also increase to give the appearance of a pinyon/juniper woodland with little herbaceous understory present. This site is most stable against forces of erosion when the equilibrium between the grasses and trees is maintained. A planned grazing system, which prevents the repetitive grazing of selected species and allows for periodic replenishment of carbohydrates in the roots, is desirable. In addition to domestic livestock, this site is used by deer, elk, pronghorn antelope, small mammals, and birds.

Other information

Other Information:
Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity----------Index Ac/AUM
100 - 76----------2.5 – 3.3
75 – 51----------3.3 – 5.1
50 – 26----------5.0– 10.0
25 – 0----------10.1+

Type locality

Location 1: McKinley County, NM

Location 2: Rio Arriba County, NM
Location 3: Sandoval County, NM
Location 4: Taos County, NM

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Approval

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--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	05/14/2025
Approved by	Kirt Walstad
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:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**
