USDA Natural Resources Conservation Service

Ecological site R036XB005NM
Limy

Accessed: 05/05/2024

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.

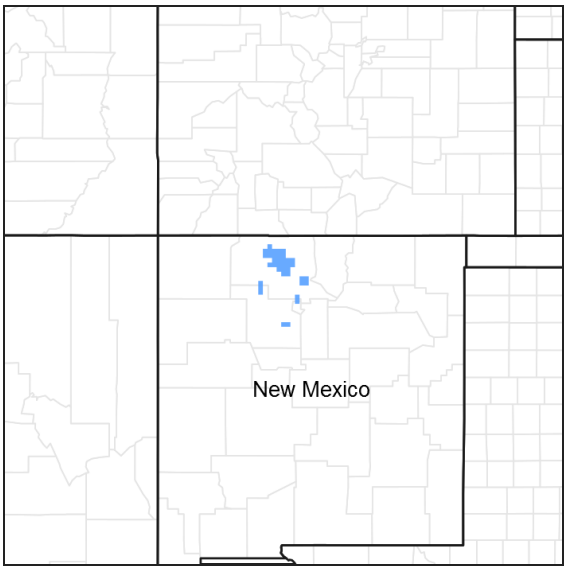

Figure 1. Mapped extent

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.

MLRA notes

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

R036XB005NM – Limy is an ecological site that is alluvial fans and valley sides 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 (Cleland, et al., 2007).

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 (Cleland, et al., 2007).

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 ecological site was drafted from the existing R036XB005NM – Limy range site MLRA 36XB (NRCS, 2003). This site is commonly located on alluvial fans and valley sides. The soils typically are very calcareous throughout the profile. Surface textures are generally a silt loam. Surface texture clay is about 22% on average. It has an aridic ustic/ustic arid moisture regime and mesic temperature regime. The effective precipitation ranges from 10 to 16 inches.

Associated sites

F036XA001NM	**Pinyon Upland** Pinyon Upland (Formerly South of Gallup 13-16")- Soils are very shallow to shallow and non-skeletal; soil surface is loam, channery loam or clay loam. Landforms are broad mesas, cuestas, and hills interspersed with numerous deep canyons and dry washes.
R036XB006NM	**Loamy** Loamy - Slopes 1-15%; soils are very shallow to shallow and skeletal and not skeletal; soil surface are loam, stony to very stony loam, very cobbly loam, fine sandy loam, very cobbly fine sandy loam, stony silt loam, stony silty clay loam, and cobbly silty clay loam; Parent materials are basalt influences but can have sometimes influence from sandstone and/or shale. Landforms nearly level to gently sloping mesas, lava plateaus, lava flows, lava flows on valley floors, and ridges.
R036XB017NM	**Swale** Swale - This site is enhanced by runoff during periods of high runoff (intermittent). The water table depth is greater than 6 ft. Soils are deep to very deep soils that have surface textures of loams, silt loams to clays with loamy subsoil. Landforms are broad valley bottoms, floodplains, and in depressions.

R036XB018NM	**Stony Loam** Stony Loam - Slopes 0-15%; soils are deep to very deep and skeletal and non-skeletal; Surface soil textures are cobbly loam, or loam. Subsoils are loamy. Landforms are nearly level alluvial fans, stream terraces, plateaus, mesas and volcanic cones.

Similar sites

R036XB002NM	**Clayey** Clayey - Slopes are 0-15%; Soils are moderately deep to deep; soil surface loam, clay loam, silty clay loam, and silty clay over clayey subsoil with textures of clay loam, clay to silty clay loam or silty clay. Landforms are stream terraces, valley floors, fan remnants, alluvial fans, dipslopes on cuestas, mesas, hills, and valley floors.
R036XB006NM	**Loamy** Loamy - Slopes 1-15%; soils are very shallow to shallow and skeletal and not skeletal; soil surface are loam, stony to very stony loam, very cobbly loam, fine sandy loam, very cobbly fine sandy loam, stony silt loam, stony silty clay loam, and cobbly silty clay loam; Parent materials are basalt influences but can have sometimes influence from sandstone and/or shale. Landforms nearly level to gently sloping mesas, lava plateaus, lava flows, lava flows on valley floors, and ridges.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on nearly level to gently alluvial fans and valley sides. Slopes vary from 3 to 8 percent. Elevation ranges from 6,900 to 8,400 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Valley side
Flooding frequency	None
Ponding frequency	None
Elevation	2,103–2,316 m
Slope	3–8%
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) SANTA FE 2 [USC00298085], Santa Fe, NM
- (2) COCHITI DAM [USC00291982], Pena Blanca, NM
- (3) EL RITO [USC00292820], El Rito, NM
- (4) ABIQUIU DAM [USC00290041], Gallina, NM
- (5) CUBA [USC00292241], Cuba, NM
- (6) LYBROOK [USC00295290], Dulce, NM
- (7) NAVAJO DAM [USC00296061], Navajo Dam, NM

Influencing water features

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

Soil features

The soils are deep and well drained. The soils typically are very calcareous throughout the profile. Surface textures are generally a silt loam. Surface texture clay is about 22% on average. Subsoils are silt loam to loam. The clay percentage at 20 inches in depth averages 28%. The parent material consists of fan alluvium derived from limestone and sandstone or alluvium derived from sandstone and shale.

This site is found in NM650, NM678, NM698 and NM672 soil survey. This ecological site has been correlated to the following soils with the listed particle control sections:

Fine-Loamy:
Berryman

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone and sandstone (2) Alluvium–sandstone and shale
Surface texture	(1) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%

Available water capacity (0-101.6cm)	22.86–30.48 cm
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

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.

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 grass dominated ecological sites. LANDFIRE modelled southwest desert grasslands fire return interval as 10 to 833 years (USFS, 2012). Historically, fires were of mixed severity, and various patchy sizes which formed mosaics. Fires varied in intensity and frequency depending on the site’s productivity. So, the variability in severity, patchy sizes, intensity and frequency has led to large variabilities in the fire regimes and fire return intervals.

Shrub vegetation is able to reestablish from seed dispersal from the adjacent non burned shrub stands; however the process is relatively slow. Fire also decreases the extent of One-seed 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.

Variability in climate, soils, aspect and complex biological processes will cause the plant communities to differ.

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

State and transition model

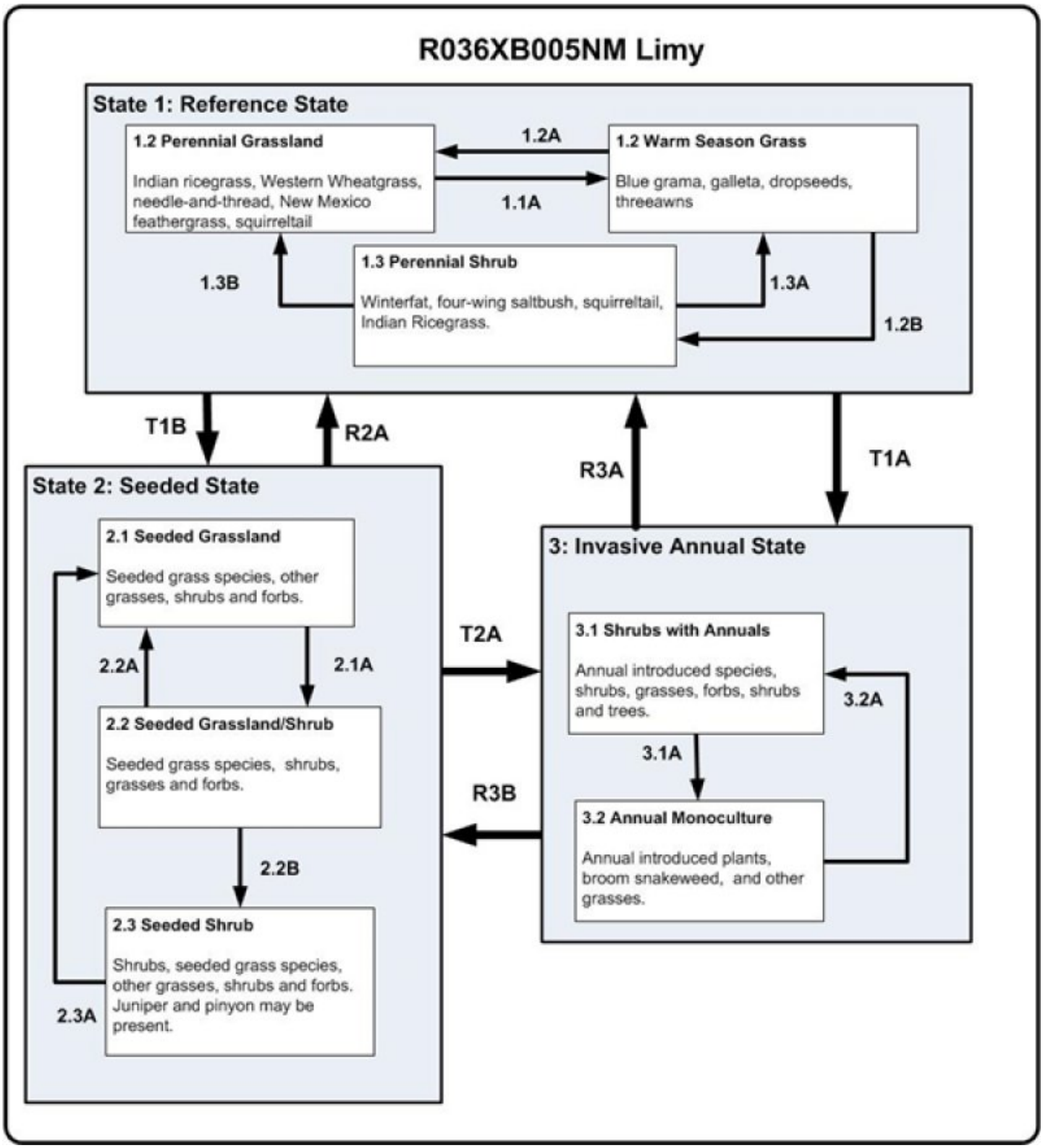

Figure 6. STM

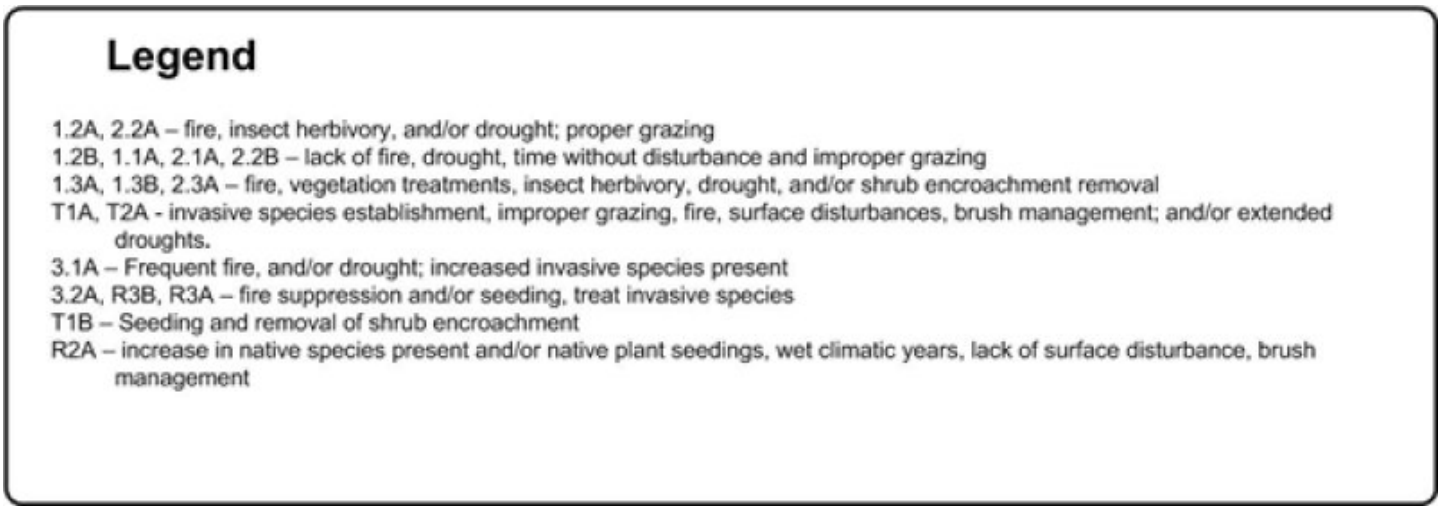

Figure 7. Legend

State 1
Reference State

The reference state represents the plant communities and ecological dynamics of the Limy 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 drought. This is a winterfat-grass site with other shrubs scattered throughout the site. Grasses are dominant and cover is fairly uniform with few large bare areas. Dominant Grasses present are Indian ricegrass, western wheatgrass, needle-and-thread, New Mexico feathergrass and squirreltail are the dominant grass species. Winterfat is the dominant shrubs with four-wing saltbush, and rubber rabbitbrush occurring in lesser amounts. Annual forbs occur in high abundance in spring and summer month during years of above-average precipitation. Typically, species such as Indian ricegrass, needle-and-thread, four-wing saltbush, and winterfat decrease in response to a combination of heavy grazing and drought. 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. Continuous grazing, which allows repetitive grazing of the desirable species, eventually leads to a decrease in these species from the plant community. Such deterioration is indicated by a decrease in needle-and-thread, New Mexico feathergrass, Indian ricegrass, squirreltail, four-wing saltbush, and winterfat. Species that increase include galleta, blue grama, dropseeds, threeawn spp., rubber rabbitbush, and broom snakeweed.

Community 1.1
Perennial Grassland

Winterfat dominates the community with perennial grasses well distributed throughout the site. Other shrubs, such as four-wing saltbush, are scattered throughout the site. Annual grasses and forbs are in relative abundance in spring months but generally are a minor component on this site. Dominant Grasses present are Indian ricegrass, western wheatgrass, needle-and-thread, New Mexico feathergrass and squirreltail are the dominant grass species. Winterfat is the dominant shrubs with four-wing saltbush, and rubber rabbitbrush occurring in lesser amounts. *On very moist sites and sites with finer-textured soils, western wheatgrass would be the dominant perennial grass. On drier sites and sites with coarser-textured soils, Indian ricegrass would be the dominant perennial grass.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	161	296	430
Shrub/Vine	158	289	421
Forb	17	31	45
Total	**336**	**616**	**896**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	35-45%
Grass/grasslike basal cover	17-27%
Forb basal cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-20%
Surface fragments >0.25" and <=3"	5-15%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	43-63%

Figure 9. Plant community growth curve (percent production by month). NM0005, R036XB005NM Limy HCPC. R036XB005NM Limy HCPC Winterfat dominated community with well distributed perennial grasses..

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
Warm Season Grass

Blue grama is both drought and grazing resistant and may persist, but in a less productive, less vigorous form. This is a plant community phase that is dominated by blue grama with galleta as subdominant may result. Western wheatgrass, blue grama, galleta will have increased while needle-and-thread, New Mexico feathergrass, squirreltail and Indian ricegrass have decreased in abundance. Nonnative invasive species, such as cheatgrass may be present but in insignificant amounts. Bare ground is most common in this community phase.

Community 1.3
Perennial Shrub

This community consists mature shrubs with sparse understory. Bare ground is most common in this community phase. Improper grazing use can aid the establishment of invasive plants through reduced competition, exposure of mineral soil to carry fires. The loss of herbaceous cover due to overgrazing, fire suppression, and consequent surface soil horizon loss from water or wind facilitate the transition invasive state.

Pathway 1.1A
Community 1.1 to 1.2

This pathway favors shrub establishment. Events that cause this pathway are cause by time without disturbance (i.e. lack of fire), wet winter cycles, drought and improper grazing of grasses.

Pathway 1.2A
Community 1.2 to 1.1

This transition is caused by naturally occurring fires and/or drought. With a mature shrub community, this pathway can be caused by high intensity fire that burns hot enough to remove the mature shrubs. Low-intensity fire after the shrubs has had a chance to set seed, improper grazing and or browsing by native ungulates, and possible stem-root pathogens will revert a young shrubs community to a grassland with the potential to become a shrub-grass community once again.

Pathway 1.2B
Community 1.2 to 1.3

This transition is from the native shrub and perennial warm and cool season grass state, to a state that is dominated by mature shrubs. This pathway happens when fire does not occur within the historical fire regime interval for the site. Improper continuous grazing of perennial grasses will speed up this pathway. This will lead to an old decadent stand of shrubs with little to no understory.

Pathway 1.3B
Community 1.3 to 1.1

Pathways can be one or more of the following: brush treatments, seeding, insect herbivory/ pathogen, proper grazing, drought, and fire. Insect herbivory and/or root and stem pathogen die-off will thin the stands and allow perennial plants to establish if it is properly grazed.

Pathway 1.3A
Community 1.3 to 1.2

This pathway is caused by naturally occurring fires, drought and/or insect herbivory removes the shrubs and possible trees if they have encroached on this site. It reverts the system back to a grassland phase. Vegetation treatments can mimic this natural pathway.

State 2
Seeded State

This state results from seeding introduced perennial grasses (i.e. crested wheatgrass and Russian wildrye). Native perennial grasses, forbs and shrubs may be included in the seed mix. This state behave similar community dynamics to the current potential state community. Other vegetation treatments may be necessary to get to this state, they include chaining, mowing, disking, prescribed burning and other techniques which manipulate the plant community. Applying vegetation treatments to plant communities to either the invasive annuals or pinyon-juniper encroachment states to create a seeded state is often the first step in assisted restoration to plant communities an intermediate step to get to the Reference State. The seeded state could persist for long periods of time with proper management. Native grasses and forbs may reestablish over time from nearby seed sources.

Community 2.1
Seeded Grassland

This community is dominated by seeded plants such as crested wheatgrass, Russian wildrye, smooth brome, and intermediate and pubescent wheatgrasses. Shrubs have little to no production in this phase. This site has high production due to the seed grass production. This production typically is higher than the current potential or reference state. This site usually has low species diversity.

Community 2.2
Seeded Grassland/Shrubland

This phase has shrubs co-dominant with the seeded grass.

Community 2.3
Seeded Shrubland

This community consists shrub overstory with sparse understory. Scattered one-seed juniper and maybe two-needle pinyon might have encroached. Two-needle pinyon and one-seed juniper are natural invaders if stands are found adjacent to this site. Trees left uncontrolled can form dense stands and eventually dominate the site. Nonnative invasive species, such as cheatgrass are present but in insignificant amounts. Bare ground is most common in this community phase.

Pathway 2.1A
Community 2.1 to 2.2

Time without disturbance and climatic conditions that favor establishment of shrub will assist this pathway. Improper grazing on the grasses species can favor shrub establishment and reduce their competitiveness. Also, several consecutive years of droughts can reduce grass cover.

Pathway 2.2A
Community 2.2 to 2.1

This transition is caused by naturally occurring fires, herbivory of shrub, and/or drought that suppresses shrub establishment. These events tend to favor grass establishment. With a mature shrub community, this pathway can be caused by high intensity fire that burns hot enough to remove the shrubs, if it has started to encroach. Low-intensity fire after the shrubs has had a chance to set seed, improper grazing and or browsing by native ungulates, and possible stem-root pathogens will revert a young shrub community back to a grassland with the potential to become a grassland community once again. Vegetation treatments (mechanically, prescribed fire, chemically, etc.) can also be employed to imitate the natural disturbances regime.

Pathway 2.2B
Community 2.2 to 2.3

This pathway favors shrub establishment. This pathway is cause by time without disturbance (i.e. fire) and favorable conditions for young shrub establishment. Also, Pinyon and juniper will start to encroach under these condition. Improper continuous grazing of perennial grasses will speed up this pathway. This will lead to an old decadent stand of sagebrush with little to no understory.

Pathway 2.3A
Community 2.3 to 2.1

This pathway is caused by naturally occurring fires, vegetation treatments (chemical and mechanical), and/or insect herbivory removes the shrubs and possible trees if they have encroached on this site. It reverts the system back to a grassland phase. Depending on the amount of understory present, grasses and forbs may need to be reseeded to aid reestablishment.

State 3
Invasive State

This state is dominated by invasive annual species. Invasive annual species can including cheatgrass, Russian thistle, kochia, halogeton, storksbill geranium, and annual mustards. Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible.

Community 3.1
Shrubs with Annuals

This state will look like shrub overstory with an invasive annual species understory. Frequently, shrub canopy cover will be dense due to little to none perennial understory being present. Cheatgrass, and other annual introduced species are now present in the understory. With repeated fire, it will then transition to an annual species plant community phase (3.2). This phase is at risk for becoming an annual grass-dominated community.

Community 3.2
Annual Monoculture

This community is characterized by an almost a complete monoculture of cheatgrass and/or other invasive annuals. This community can be long-lasting phase if fires and disturbance continue to be frequent.

Pathway 3.1A
Community 3.1 to 3.2

This pathway occurs when frequent fire or drought remove the non-sprouting shrubs such as winterfat, or big sagebrush, and favor the establishment of cheatgrass or other invasive annuals. In a degraded shrub community, cheatgrass will take advantage of the increased interspaces between plants will typically establish in the interspaces. Once annuals get established it creates a fine fuel load which will decrease the fire return interval. With more frequent fires, non-sprouting shrubs can be eliminated from the site and a monocultures of invasive annuals can become established. These monocultures can persist for long time periods. Frequent fires also prevent the re-establishment of non-sprouting shrubs on the site.

Pathway 3.2A
Community 3.2 to 3.1

This pathway occurs when there is a longer fire return interval. Longer fire return intervals can be enabled by using fire suppression and fire breaks to allow perennial vegetation to a change to get established. Along with this seeding and/or proper grazing may allow native perennial plants to return to this community. This pathway has very intensive energy inputs.

Transition T1B
State 1 to 2

This transition is from a shrub dominated state, to a state that has been seeded with introduced perennial grasses. High energy inputs are needed for this transition. Shrubs and/or trees will need to be removed with vegetation treatment techniques (I.e. chemical, mechanical, or fire) and introduced species that are adapted to the area and adapted to management needs have been seeded and become established.

Transition T1A
State 1 to 3

This transition is from the reference state to a state that is dominated by invasive species. Events would include establishment of invasive species, fire, and other methods of shrub removal with an understory that is dominated by invasive annual species (i.e. cheatgrass).

Restoration pathway R2A
State 2 to 1

Pathways can be one or more of the following: brush treatments, seeding, insect herbivory/ pathogen, proper grazing, drought, and/or fire. This pathway requires lots of energy input into the system. Proper grazing from livestock and wildlife will help ensure adequate deferment period or rest following brush control and/or seeding, and will assist in the establishment and maintenance of plant cover. Erosion control would be necessary to prevent further nutrient and soil loss. The addition of organic matter or other soil amendments may be needed to restore soil fertility and facilitate plant recovery. Also, this return path could possible occur as a result of long time frames without disturbance. Native plants from adjacent site would slowly establish in the seeded state.

Transition T2A
State 2 to 3

This transition is from a seeded state, to a state that is dominated by invasive species. Events include increased of invasive species, shortened fire return interval, and long term drought. Improper continuous season long grazing of perennial grasses can reduce the time needed for this pathway.

Restoration pathway R3A
State 3 to 1

Invasive annuals will need to be treated and dominance suppress enough to allow desired seeded species the

ability to complete so that they can become established. Seeding of introduced species is the pathway to state 2. This transition will be difficult and require substantial inputs and management of the site. It may not be practical on a large scale. Research is needed for species adapted to compete with annual invasive plants, and seeding techniques to add with successful transition from the invasive annual state.

Restoration pathway R3B
State 3 to 2

Seeding of introduced/native species (grasses and forbs) is the pathway to state 2. Also, shrubs may need to be removed by mechanical or chemical treatments. This transition requires energy input into the system.

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				123–155	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	123–155	–
	western wheatgrass	PASM	*Pascopyrum smithii*	123–155	–
2				31–49	
	needle and thread	HECO26	*Hesperostipa comata*	31–49	–
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	31–49	–
3				31–49	
	squirreltail	ELEL5	*Elymus elymoides*	31–49	–
4				19–44	
	blue grama	BOGR2	*Bouteloua gracilis*	19–44	–
	James' galleta	PLJA	*Pleuraphis jamesii*	19–44	–
5				19–31	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	19–31	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	19–31	–
Forb					
6				19–44	
	Forb (herbaceous, not grass nor grass-like)	2FORB	*Forb (herbaceous, not grass nor grass-like)*	19–44	–
	prairie sagewort	ARFR4	*Artemisia frigida*	19–44	–
	buckwheat	ERIOG	*Eriogonum*	19–44	–
	woolly plantain	PLPA2	*Plantago patagonica*	19–44	–
Shrub/Vine					
7				151–216	
	winterfat	KRLA2	*Krascheninnikovia lanata*	151–216	–
8				19–31	
	fourwing saltbush	ATCA2	*Atriplex canescens*	19–31	–
9				19–31	
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	19–31	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	19–31	–
10				7–31	
	Shrub, deciduous	2SD	*Shrub, deciduous*	7–31	–
	yucca	YUCCA	*Yucca*	7–31	–

Animal community

Habitat for Wildlife:
This site provides habitats which support a resident animal community that is characterized by pronghorn antelope, coyote, white-tailed jackrabbit, deer mouse, horned lark, and prairie rattlesnake.

Typical summer resident birds include vesper, sage, and brewer sparrows and sage thrashers. Antelope were absent from approximately 1910 until the early 1940’s when wild captured animals were transplanted. Mule deer and elk will forage seasonally around the periphery of this site.

Bald eagles and peregrine falcons may use this site for hunting when it is located near the Rio Grande Gorge.

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
Berryman

Recreational uses

This site has little recreational value other than horseback riding and hunting. It has little aesthetic appeal and natural beauty.

Wood products

This site produces no significant wood products in the potential plant community.

Other products

Grazing:
Approximately 85 percent of the vegetation produced on this site is suitable for grazing or browsing by domestic livestock and wildlife. Grazing distribution generally is not a problem if adequate waterings are provided.

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. Winterfat is especially susceptible to reduced vigor as a result of continuous winter grazing. Continuous summer grazing is detrimental to the perennial grass component. A planned grazing system, which prevents the repetitive grazing of selected species and allows periodic replenishment of root carbohydrates, is desirable.

Other information

Guide to Suggested Initial Stocking Rate Acres per Animal Unit Month

Similarity Index----------Ac/AUM
100 - 76----------4.2 – 5.6
75 – 51----------5.5 – 8.3
50 – 26----------8.2 – 16.6
25 – 0----------16.6+

Type locality

Location 1: Taos County, NM

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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	
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:**