Ecological site R042CY005NM
Loamy Terrace

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General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

MLRA notes

Major Land Resource Area (MLRA): 042C–Central New Mexico Highlands

To view this ESD in its most complete form refer to the PDF Version found in the New Mexico NRCS Field Office Technical Guide, section 2. The Loamy Terrace Ecological Site predominantly occurs in LRU 42.8, which is a subunit of MLRA 42 (Southern Desertic Basins, Plains, and Mountains) It is possible, though very rare, that the Loamy Terrace Ecological Site may occur outside of this proposed LRU boundary. To identify locations where this ESD has been mapped, refer to the most current natural resource soil survey data on Web Soil Survey or contact your local NRCS Conservation District field office.

Classification relationships

NRCS & BLM: NRCS & BLM: Loamy Terrace Ecological Site LRU 42.8 Northeastern Chihuahuan Desert Hills Major Land Resource Area 42, Southern Desertic Basins, Plains, and Mountains Land Resource Region D, Western Range and Irrigated Region (United States Department of Agriculture, Natural Resources Conservation Service, 2006). USFS: Loamy Terrace Ecological Site Artesia Plains Desert Grass-Shrubland Subsection Pecos Valley Section Southwest Plateau and Plains Dry Steppe and Shrub Province (Cleland, et al., 2007). EPA: Loamy Terrace Ecological Site24b Chihuahuan Desert Grasslands24 Chihuahuan Deserts (Griffith, et al., 2006).

Ecological site concept

The Loamy Terrace site occurs along stream terraces along the Guadalupe Ridge. The soils are non-skeletal and are deep to a petrocalcic horizon.

Associated sites

R042CY902NM	**Limestone Hills** This site has slopes > 25% which make up hillsides above the shallow ecological site and occasionally the Loamy Terrace. It is very shallow to bedrock.
R042CY003NM	**Shallow** This site is associated with the Loamy Terrace on hillsides above. It is shallow to a petrocalcic horizon.
R042CY004NM	**Gravelly** This site can form in a complex with the Loamy Terrace along streams. The heavy presence of black grama will show when you move onto the Gravelly.

R042CY007NM	**Draw** This site is associated with the Loamy Terrace along stream systems. The Loamy Terrace site occupies stream terraces above the Draw.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The Loamy Terrace Ecological Site is positioned on treads of stream terraces and alluvial fans, within the LRU 42.8. Elevation ranges from 4000 to 5500 feet. Soil depth is deep to very deep (>100 cm) over a petrocalcic horizon. Slopes range from 1 to 10 percent. Aspect plays a minor role on this site.

The Loamy Terrace Ecological Site consists of deep, well drained soils that formed in alluvium derived from limestone and sandstone sources. The Loamy Terrace Ecological Site is most closely associated with the Gravelly, Shallow, Limestone Hills, and Draw Ecological Sites. The Shallow Ecological site occurs on associated areas where a root restricting petrocalcic horizon is less than one meter deep. The Draw Ecological site is situated in an active floodplain. The Gravelly Ecological Site is sometimes interspersed with the Loamy Terrace Ecological Site on terrace tread positions.

Geology: The primary geologic formations that make up the parent material for the Loamy Terrace Ecological Site include the Seven Rivers, Tansil, Yates, and to a lesser extent, the Capitan Limestone. During Guadalupian time of the Permian Period, dynamic sedimentation of carbonate and evaproite rocks occurred around the rim of the Delaware Basin creating an ideal environment for the development of a large coral reef. The rim was topographically high; the waters were shallow, well-ventilated, agitated, and warm. In this excellent marine-life environment the great Capitan Reef began to form. The Capitan Reef grew rapidly and flourished throughout Guadalupian time, surrounding the Delaware basin, controlling environments and influencing sedimentation (Kelley, 1971).

On the landward side of the reef (the backreef) the Seven Rivers, Yates, and Tansil formations formed. The first was the Seven Rivers Formation. The sediments of the Seven Rivers deposited at a time when conditions became drier, and the basin tended toward hypersalinity. The Seven Rivers contain gray to white dolomitic limestone, white to red gypsum, orange-red siltstone, and shale. Within the LRU, the Seven Rivers Formation is considered the surface layer on Azotea Mesa, Seven Rivers Hills, and West Hess Hills.

Deposited above the Seven Rivers during a quiet period within an unrestricted lagoon is the Yates Formation. The Yates is characterized by layers of very pale orange to yellowish-gray fine-grained, laminated dolomite, alternating with grayish-orange to pale yellowish-orange, calcareous quartz siltstone or very fine-grained sandstone. The Yates is the surface formation over much of Carlsbad Caverns National Park, starting at Walnut Canyon and extending North through the Cueva Escarpment and up to Living Desert State Park.

Landward of the unrestricted lagoon was a restricted lagoon, (the Tansil Formation). Here freshwater mixed with seawater. Large amounts of sediments were carried in by streams causing a hostile environment for marine organisms. Like the Yates, the Tansil is characterized by clastic sediments such as siltstone and sandstone as well as layers of dolomite. Unlike the Yates, however, the Tansill contains many thin clay layers (Burger, 2007). The Tansil Formation is the surface layer at the Carlsbad Caverns Visitor Center.

About 15 million years ago, the ancient reef rock that had been buried by younger layers of rock began to rise, creating the Guadalupe Ridge and Mountains while exposing the Seven Rivers, Tansil, and Yates Formations. Over the years, especially during the glacial periods of the Pleistocene, alluvial fan construction occurred as material from mountain drainages formed a semi conical deposit of variously sorted and stratified alluvium (Peterson, 1981). Over time, ephemeral streams have wound themselves through the Guadalupe hills and mountains, depositing alluvium and building stream terraces. The Loamy Terrace Ecological Site occurs where alluvial deposits have formed deep soils over a petrocalcic horizon.

Ecological Site Key for LRU 42.8 and 42.9, Northwestern Chihuahuan Hills and Mountains

1. Site is within LRU 42.8, which is within the ustic-aridic soil moisture regime, and the thermic soil temperature regime. (Often contains the presence of red berry juniper)
2. Soils are loamy and not skeletal, and reside in low areas that are stream terraces and fan remnants. - Loamy Terrace ESD

2. Soils are skeletal (Greater than 35% by volume rock fragments greater than 2mm.)
3. Soils are deep to very deep. (Greater than 100cm to root restrictive layer)
4. Site exists in an active floodplain.-Draw ESD
4. Site exists on a stream terrace or alluvial fan-Gravelly ESD
4. Site exists on steep slopes on limestone colluvium over gypsum.-Limy Gyp
Escarpment
3. Soils are very shallow to moderately deep (5-100cm).
5. Root restrictive layer is a petrocalcic horizon.-Shallow ESD
5. Root restrictive layer is bedrock.
6. Slopes are less than 25%-Very Shallow ESD
6. Slopes are greater than 25%- Limestone Hills ESD
1. Site is located within LRU 42.9, and is represented by the aridic-ustic soil moisture regime, and the mesic soil temperature regime. (It often contains the presence of alligator juniper and pinon pine.)
7. Slopes are less than 25%- Shallow Limestone ESD
7. Slopes are greater than 25%- Limestone Mountains ESD

Glossary:

Colluvium: “Unconsolidated, unsorted earth material being transported or deposited on side slopes and/or at the base of slopes by mass movement (e.g. direct gravitational action) and by local, concentrated runoff” (Schoenberger, et al., 2012).

Petrocalcic Horizon: The petrocalcic horizon is an illuvial horizon in which secondary calcium carbonate or other carbonates have accumulated to the extent that the horizon is cemented or indurated (Keys to Soil Taxonomy, 2010).

Residuum: “Unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place” (Schoenberger, et al., 2012).

Soil moisture regime: Refers to the presence or absence either of ground water or of water held at a tension of less than 1500 kPa in the soil or in specific horizons during periods of the year. Water held at a tension of 1500 kPa or more is not available to keep most mesophytic plants alive. Major differences in soil moisture are often reflected in different vegetative communities. The two major soil moisture regimes for the Guadalupe Mountains are Aridic and Ustic (Keys to Soil Taxonomy, 2010).

Soil Temperature Regime: This is the range of temperatures experienced by a soil at a depth of 50 cm. When the average temperature of a soil falls between 46 degrees F and 59 degrees, it falls into the mesic soil temperature regime. The thermic soil temperature regime falls between 59 degrees F and 72 degrees (Keys to Soil Taxonomy, 2010).

Table 2. Representative physiographic features

Landforms	(1) Stream terrace (2) Fan remnant
Flooding frequency	None
Elevation	1,220 − 1,680 m
Slope	0 − 20 %
Aspect	Aspect is not a significant factor

Climatic features

The mean annual precipitation is 10.4 inches to 18.3 inches, occurring mostly as high intensity, short-duration afternoon thunderstorms from July through September. Mean annual air temperature is 55 to 70 degrees F, and the frost-free season is 207 to 243 days.

Annual weather patterns, influenced by global climate events, such as El Niño and La Nina, affect and alter production and composition across the Loamy Terrace Ecological Site. In general, because precipitation is minimal through the winter but increases during the summer, warm-season (C4) plants dominate the landscape. However, from year to year the production and composition can greatly shift

due to variable weather patterns. The years that produce the most species richness and production are those that get slow, steady moisture through the months of May, June, and July. Late summer thunderstorms may induce heavy runoff on this site, creating flash-flooding in the draws, drainages, and canyons below.

The climate trend of the area is one toward warmer temperatures and lower precipitation. According to the Carlsbad Caverns Climate Station, during the years 2001-2011, five years received less than 10 inches or rain. Three of those years, (2003, 2005, and 2011) were below 5 inches of rain. And 2011 was both the lowest rainfall and hottest year on record. Similarly, in 1947-1957, 6 out of 11 years were below the mean low of 10.4 inches. But in that stretch, only one year, 1951, was below 5 inches. To put this in perspective, in the dry 1930's only 2 years were below the mean low of 10.4 and none were below 5 inches. The 2001-2011 decade has been much warmer and drier than any in recorded history. In addition, during the two years of 2010 and 2011, Carlsbad Caverns National Park (CCNP) experienced extreme events of drought, wildfire, and flash flooding which have led to shifts in plant communities.

Table 3 Representative climatic features

Frost-free period (average)	240 days
Freeze-free period (average)	260 days
Precipitation total (average)	460 mm

Influencing water features

The Loamy Terrace Ecological Site is not associated with a wetland or riparian system; it is an upland ecological site.

Soil features

Every ecological site and associated soil component has static soil properties that help define the physical, chemical, and biological characteristics that make the site unique. The following soil profile information is a description of those unique soil properties. To learn about the dynamic processes of the soil component, refer to the "plant communities" section of the ESD.

The Loamy Terrace Ecological Site is tied to the Mudgetts component of map units CC3 and MU1 within LRU 42.8. The CC3 and MU1 map units are almost identical, each consisting of a complex of soil components which is dominated by about 80% Mudgetts and similar soils.

In normal years this soil is driest during the winter and moist in the upper part for greater than 90 cumulative days, but fewer than 90 consecutive days during the growing season. The soil moisture regime is aridic bordering on ustic. The mean annual soil temperature: is 62 to 66 degrees F, which is classified as the thermic temperature regime.

The Mudgetts component is well drained, with low to negligible surface runoff. The soils are on treads of stream terraces and alluvial fans. They formed in alluvium derived from Permian aged limestone and sandstone. The Mudgetts taxonomic class is: Fine-loamy mixed, superactive, thermic Ustic Petrocambids. The Mudgetts component has about .2-1.0% % organic matter in the A1 horizon and .8-1.5% in the A2. Surface horizons lack effervescence.

The Loamy Terrace Ecological Site is often situated in high traffic areas, and is prone to erosion due to the fine particle size of its soil. Roads, recreation, and livestock handling facilities often occur on this site. It is important to keep healthy vegetation communities present, so water erosion is held in check. This site has historically lost large quantities of soil in many locations. In areas where soil loss has historically been minimized, and a thick topsoil layer exists, plant communities are extremely productive, sometimes producing over 2500 lbs/acre.

TYPICAL PEDON: Mudgetts very fine sandy loam--on a stream terrace sloping 1 to 2 percent to the south east at 4,513 feet elevation-National Parkland. (Colors are for dry soil unless otherwise noted. When described on April 6th, 2011, the soil was dry from 0 to 19 inches and slightly moist throughout the rest of the profile to bedrock.)

A1--0 to 3 cm, (0 to 1.2 in); yellowish red (5YR 5/6) very fine sandy loam, dark reddish brown (5YR 3/3) moist; moderate medium platy structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; few very fine irregularly shaped pores and few fine tubular pores; non effervescent (about1 percent calcium carbonate equivalent); five percent gravel; neutral (pH 7.3); clear smooth boundary. (1 to 3 inches thick)

A2--3 to 15 cm, (1.2 to 5.9 in); reddish brown (5YR 5/3) silt loam, dark reddish brown (5YR 3/3) moist; moderate coarse subangular

blocky structure; very hard, friable, moderately sticky and moderately plastic; few fine and very fine roots; few medium and common fine tubular pores; non effervescent (about1 percent calcium carbonate equivalent); three percent gravel; neutral (pH 7.0); gradual smooth boundary. (3 to 8 inches thick)

Bw1--15 to 48 cm, (5.9 to 18.9 in); reddish brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/4) moist; moderate medium prismatic structure parting to moderate fine wedge-shaped aggregates; very hard, friable, moderately sticky and moderately plastic; few fine and common very fine roots; few fine and medium tubular pores; many discontinuous, distinct pressure faces on vertical faces of peds; 3 reversible trans-horizon cracks per meter; non effervescent (about1 percent calcium carbonate equivalent); three percent gravel; neutral (pH 7.2); diffuse smooth boundary. (10 to 15 inches thick)

Bw2--48 to 108 cm, (18.9 to 42.2 in); red (2.5YR 4/6) silty clay loam, dark reddish brown (2.5YR 3/4) moist; moderate medium prismatic structure parting to moderate fine wedge-shaped aggregates; extremely hard, friable, very sticky and very plastic; very few fine and common very fine roots; few fine and medium irregularly shaped pores along vertical ped faces; very many discontinuous, distinct pressure faces on vertical faces of peds; 3 reversible trans-horizon cracks per meter; non effervescent (about1 percent calcium carbonate equivalent); seven percent gravel; slightly alkaline (pH 7.4); abrupt smooth boundary. (20 to 30 inches thick)

Bkkm--108 to 200 cm, (42.5 to 78.7 in); very strongly cemented petrocalcic horizon consisting of cemented calcium carbonate with embedded rock fragments.

Total Average Available Water Capacity (cm H2O/cm soil): 18.42 cm

Figure 3. Mudgetts very fine sandy loam

Table 4. Representative soil features

Parent material	(1) Alluvium – calcareous sandstone
Surface texture	(1) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to rapid
Soil depth	200 – 340 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	17.78 – 19.05 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified

Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.9 – 7.8
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

There are only a couple of variables that historically affect plant communities on the Loamy Terrace Ecological Site: elevation and fire frequency. At the lower end of the range, (about 4000 feet) temperatures are warmest and driest and tend to promote more Chihuahuan Desert species, such as creosote. Below 4,000 feet, this site transitions into the 42.3 Loamy Ecological Site. For the most part, this site should be heavy grassland with abundant amounts of cane bluestem, vine mesquite, sideoats grama, and blue grama. Black grama seems to increase where gravels increase. Vine Mesquite will be thicker in minor swale areas throughout the site.

This site has the potential to be very productive, and in places where historic erosion has been minor, this site can produce over 2500 lbs/acre and produce a thick topsoil layer resembling a mollic epipedon. The petrocalcic horizon probably aids as an impediment to loss of deep moisture thus keeping plant available moisture more accessible through drought years.

Fire is a consistent disturbance regime that reduces succulents and a few shrubs while stimulating grasses and forbs. During intervals between fires, shrubs encroach on the site, slowly spreading and out-competing grasses and forbs for water and nutrients. Fire re-balances the system by providing a boost for grass and forb colonization. Not all fires are equal. According to Gebow, 2001, “fire effects in the same location will vary, especially with fire timing, both seasonally and within the scheme of year-to-year moisture variation. Precipitation during seasons before and after fire has a major effect on recovery of plants. Fire researchers in the area and region suggest a 10-to-15-year fire regime is common.” (Gebow, 2001)

Small and more frequent fires were more common before the mid-1800’s, with the Apache likely responsible for many small burns. With Europeans, intervals between fires have lengthened and the average fire size has increased (Ahlstrand, 1981). Small fires are important for creating a patchy mosaic across the landscape, which is beneficial for many habitat requirements.

Human caused disturbance such as recreation, livestock grazing, and infrastructure for oil and gas production has recently (over the last 100 years), promoted a species shift to favor the colonization of nitrogen fixing shrubs, especially catclaw mimosa and mesquite. These nitrogen fixing shrubs affect soil chemistry and hydrology, altering the dynamics of the site.

State and transition model

Figure 4. Loamy Terrace State and Transition Model

Additional community tables

Table 5. Community 1.1 plant community composition

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

Grass/Grasslike					
1	**Warm Season Tallgrasses**			353-706	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	280-616	10-20
	silver beardgrass	BOLA2	*Bothriochloa laguroides*	56-224	1-9
2	**Warm Season Midgrasses**			588-1177	
	sideoats grama	BOCU	*Bouteloua curtipendula*	280-560	6-20
	vine mesquite	PAOB	*Panicum obtusum*	140-420	3-17
	plains lovegrass	ERIN	*Eragrostis intermedia*	56-224	1-7
	purple threeawn	ARPU9	*Aristida purpurea*	56-112	1-5
	sand dropseed	SPCR	*Sporobolus cryptandrus*	28-84	1-4
3	**Warm Season Shortgrasses**			504-1009	
	blue grama	BOGR2	*Bouteloua gracilis*	336-560	10-18
	tobosagrass	PLMU3	*Pleuraphis mutica*	28-252	2-10
	black grama	BOER4	*Bouteloua eriopoda*	28-140	1-5
	Hall's panicgrass	PAHA	*Panicum hallii*	28-84	1-3
	streambed bristlegrass	SELE6	*Setaria leucopila*	15-43	1-4
	sand muhly	MUAR2	*Muhlenbergia arenicola*	15-43	1
	bush muhly	MUPO2	*Muhlenbergia porteri*	15-43	1
	slender muhly	MUTE4	*Muhlenbergia tenuifolia*	15-43	1
	low woollygrass	DAPU7	*Dasyochloa pulchella*	1	1
4	**Cool Season Grasses**			17-34	
	New Mexico feathergrass	HENE5	*Hesperostipa neomexicana*	15-43	1
Forb					
5	**Perennial Forbs**			50-101	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	28-84	1-4
	Davis Mountain mock vervain	GLBIC	*Glandularia bipinnatifida var. ciliata*	28-84	1-4
	croton	CROTO	*Croton*	15-43	1-2
	spreading fleabane	ERDI4	*Erigeron divergens*	1-28	1
	hawkweed buckwheat	ERHI3	*Eriogonum hieraciifolium*	1-28	1
	twinleaf senna	SEBA3	*Senna bauhinioides*	1-28	1
	lyreleaf greeneyes	BELY	*Berlandiera lyrata*	1-28	1
6	**Annual Forbs**			1	
Shrub/Vine					
7	**Shrub**			67-135	
	Pinchot's juniper	JUPI	*Juniperus pinchotii*	28-84	1-4
	algerita	MATR3	*Mahonia trifoliolata*	15-43	1-2
	mariola	PAIN2	*Parthenium incanum*	15-43	1-2
	javelina bush	COER5	*Condalia ericoides*	1-28	1
	Wright's beebrush	ALWR	*Aloysia wrightii*	1-28	1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0-1	0-1
	whitethorn acacia	ACCO2	*Acacia constricta*	0-1	0-1
	catclaw acacia	ACGR	*Acacia greggii*	0-1	0-1
	roundflower catclaw	ACRO	*Acacia roemeriana*	0-1	0-1
	honey mesquite	PRGL2	*Prosopis glandulosa*	0-1	0-1
	littleleaf sumac	RHMI3	*Rhus microphylla*	0-1	0-1
	skunkbush sumac	RHTRT	*Rhus trilobata var. trilobata*	0-1	0-1

	lotebush	ZIOB	*Ziziphus obtusifolia*	0-1	0-1
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	0-1	0-1
	allthorn	KOEBE	*Koeberlinia*	0-1	0-1
8	**Half-Shrubs**			17-34	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	15-43	1-2
9	**Cactus**			50-101	
	tree cholla	CYIMI	*Cylindropuntia imbricata var. imbricata*	15-43	1-2
	tulip pricklypear	OPPH	*Opuntia phaeacantha*	15-43	1-2
	cactus apple	OPEN3	*Opuntia engelmannii*	1-28	1
	purple pricklypear	OPMAM	*Opuntia macrocentra var. macrocentra*	1-28	1
10	**Yucca**			1	
	soaptree yucca	YUEL	*Yucca elata*	0-1	0-1
11	**Yucca-like plants**			1	
	green sotol	DALE2	*Dasylirion leiophyllum*	0-1	0-1

Table 6. Community 1.2 plant community composition

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

Table 7. Community 1.3 plant community composition

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

Table 8. Community 1.4 plant community composition

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

Table 9. Community 2.1 plant community composition

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

Animal community

Part I: Wildlife The Loamy Terrace ecological site lies at the northern extent of the Chihuahuan Desert and provides home for many different wildlife species. Species of Special Interest: These are species of special interest that have habitat needs associated with the Loamy Terrace ecological site. Rock Rattlesnake: The rare mottled rock rattlesnake is found only in New Mexico, Texas, and Chihuahua, Mexico. In New Mexico, the rattlesnake is limited to the southern Guadalupe Mountains and exists within all canyons throughout the Guadalupe Ridge. It is the most frequently encountered rattlesnake in CCNP and is found around exposed bedrock where it feeds on lizards, snakes, and small mammals (SWCA Environmental Consultants, 2007). Texas Horned Lizard: Texas horned lizards have habitat needs that require healthy harvester ant communities. Harvester ants are the preferred food of horned lizards and when this food resource declines due to shifts to a degraded plant community, or through infrastructure development, lizard numbers will also decline (Henke & Fair, 1998). Feeding may occur at nest entrances or on ant foraging trails and mature lizards are capable of eating 70 to 100 ants per day. Although ants comprise a majority of the diet, Texas horned lizards are opportunistic predators and will consume crickets, grasshoppers, beetles, centipedes, bees and caterpillars. The diagnostic plant community phase (1.1) is best for providing a wide range of plant and insect species needed for Texas horned lizard habit. Gray Vireo: The gray vireo is species that is found in the desert Southwest. Over 80 percent of the Gray Vireo territories in New Mexico are found in 12 sites, with the largest site being found in the Guadalupe Mountains (Pierce, 2007). The Gray Vireo appears to not winter in New Mexico but move down to the Big Bend area where it is associated with various shrubs and cacti. Summer habitat in the Guadalupes seems to be linked to juniper and oak plant communities. During breeding season, (April-July) the Gray Vireo are insectivorous, taking grasshoppers, stinkbugs, crickets, moths, and caterpillars for food. In New Mexico, nests are primarily in Juniper trees (Pierce, 2007). Plant communities within the historic range of variability are important for the Gray Vireo to find nesting, breeding, and brood-rearing cover. The birds will find nesting cover in plant communities 1.1 and 1.2, while moving to community phase 1.3 to find food. Peregrine Falcon: The Peregrine Falcon is a species of concern that occurs throughout the west. According to experts at the “Living Desert Zoo and Gardens State park” in Carlsbad New Mexico, the peregrine falcon has only been spotted on rare occasions in the fall or winter. Common hog-nosed skunk: Hog-nosed skunks are distinguished from striped skunks primarily by the pelage, with a characteristic broad white marking beginning at the top of the head and extending down the back and tail. They make their dens in rocky areas, but probably utilize the Loamy Terrace ecological site for hunting. They are omnivorous, and they eat differently according to the season. They mainly eat insects and grubs but also eat fruit, small mammals, snakes and carrion. Because rattlesnakes react to skunk musk with an alarm reaction, it is believed that skunks may feed extensively on rattlesnakes. In search of food, this skunk can turn over large areas of earth with its bare nose and front claws as it searches for food (Buie, 2003). Mountain Lion: The mountain lion is an excellent stalk-and-ambush predator, pursuing a wide variety prey. Deer make up its

primary food source, but they will also hunt species as small as insects and rodents. The mountain lion stalks through shrubs and across ledges before delivering a powerful leap onto the back of its prey with a suffocating neck bite. The mountain lion is capable of breaking the neck of its prey with a strong bite and momentum bearing the animal to the ground. Kills are generally estimated at around one large ungulate every two weeks. This period shrinks for females raising young, and may be as short as one kill every three days when cubs are nearly mature at around 15 months. Only females are involved in parenting. Females are fiercely protective of their cubs, and have been seen to successfully fight off animals as large as black bears in their defense. Caves and other alcoves that offer protection are used as litter dens (Cougar, 2013). The Very Shallow and Limestone Hills ecological sites provide the best habitat for the mountain lion life cycle. Mountain lions can work the edge of hill summits and position themselves above prey where they can pounce with a killing blow. Eastern White-throated Wood Rat: This large rat is often called a packrat because of the large nest of sticks and other material that it incorporates into nests. The nocturnal rat feeds on a wide variety of plants and finds shelter around dense stands of cacti such as cholla and prickly pear. Plant communities 1.1 and 1.2 are ideal for nesting white-throated wood rats. Other species associated with the Loamy Terrace ecological site: Birds: Turkey Vulture Mississippi Kite Red-tailed Hawk American Kestrel Great Horned Owl Spotted Towhee Canyon Towhee Cassin's Sparrow Brewer's Sparrow Black-throated Sparrow White-crowned Sparrow Dark-eyed Junco Scaled Quail White-winged Dove Mourning Dove Eurasian Collared Dove (introduced) Lesser Nighthawk Common Nighthawk Black-chinned Hummingbird Ladder-backed Woodpecker Western Kingbird Cliff Swallow Barn Swallow Verdin Cactus Wren Rock Wren Northern Mockingbird Curved-billed Thrasher House Finch House Sparrow Mammals: Mexican Ground Squirrel Yellow-faced Pocket Gopher Merriam's Kangaroo Rat Merriam's Pocket Mouse Western Harvest Mouse Southern Plains Woodrat Cactus Mouse White-footed Mouse White-ankled Mouse Hispid Cotton Rat North American Porcupine Black-tailed Jackrabbit Desert Cottontail American Badger Striped Skunk Grey Fox Coyote Bobcat Mule Deer Collared Peccary Ringtail Reptiles: Green Toad Red-spotted toad Rio-Grande Leopard Frog Eastern Collared Lizard Greater Earless Lizard Round Tailed Horned Lizard Crevice Spiny Lizard Prairie Lizard Common Side-blotched Lizard Texas Banded Gecko Chihuahuan Spotted Whiptail Common Checkered Whiptail Ring-necked Snake Striped Whip Snake Western Ground Snake Note: This species list was composed with help from the Living Desert Zoo and Gardens State Park, Carlsbad, New Mexico. Part II Livestock The Loamy Terrace ecological site has traditionally been grazed by all kinds and classes of livestock, during all seasons of the year. In the early part of the 20th century, goats and sheep were used extensively along the Guadalupe Ridge, taking advantage of browse species. Currently though, there are very few goat and sheep operations in the area due to many market factors. Cattle numbers are down due to drought and extensive wildfire from 2001-2011. With a planned livestock grazing system, the Loamy Terrace Ecological Site could be managed for sustained agriculture while maintaining the historic range of variability. Also, prescribed fire may be a part of the management mix to move the system to community phase 1.3, which is primarily a grassland plant community. The loss of goat production probably plays a role in the overall increase in shrub production, especially in nitrogen fixing shrubs. This ecological site has been used extensively in the past for loading and handling. High traffic coupled with high density of grazing animals often quickly degrades this site and causes high amounts of erosion. Once erosion becomes extensive, this site crosses a threshold and loses its forage potential. Great care and management must take place for the Loamy Terrace to retain its excellent forage productivity.

Hydrological functions

The Mudgetts soil component is in hydrologic group C. The soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Plant diversity is important on this site, as various types of root systems help sustain plant communities through drought. Deep rooted shrubs take advantage of water and nutrients deep in the profile. Fibrous and tap root systems take advantage of moisture and nutrients in the top meter of the soil. This ecological site has the ability to retain moisture throughout the year due to the presence of a deep petrocalcic horizon. This horizon can store moisture and slowly release moisture over time to deep root systems. Deep, tap root systems tend to take advantage of the petrocalcic horizon. The Loamy Terrace may also receive overland flow from adjacent areas. That extra moisture, plus the presence of the petrocalcic horizon that acts as a barrier from deep percolation, creates a very productive substrate for grassland systems. In places, where a slight swale occurs, vine mesquite grows extremely thick.

Recreational uses

The Loamy Terrace ecological site provides limited recreational use due to its lack of drinking water. Hiking is limited to day trips and should not be attempted without adequate water and a large hat. Hunting can be good on this site as deer can be hunted where permitted. Often this site is used for camping, because it is relatively flat and there is usually a road or trail going through it. Care must be given to monitor the motorized recreational use of this site, so that erosion will not degrade the site across a threshold.

Other information

Inventory data references

Data was collected during the years of 2011 and 2012. For all tier one data points, ocular methods were used to collect estimates of production, ground cover, and canopy cover. The Doman-Krajina method was used for canopy cover estimates. Soil pits were dug for verification on many tier one plots. Tier two and three protocols always were verified and analyzed with soil pits. Other methods used were line-point-intercept (LPI), double-sampling (DS), canopy gap (CG), and soil stability (SS). This ecological site had a number of tier one and tier two plots, with one tier three at the diagnostic plant community. Historic data from BLM monitoring points were used as well.

Type locality

Location 1: Eddy County, NM	
UTM zone	N
UTM northing	545882
UTM easting	3560434
General legal description	The type locality is at the tier 3 sampling area along the Guadalupe Ridge Trail in Carlsbad Caverns N.P.

Other references

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Contributors

Scott Woodall

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):**

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

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

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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):**

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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:**
