Research Natural Area

Name: Mesita de los Ladrones

Location:

State: NM County: San Miguel Forest: Santa Fe District: Las Vegas
T. 12N R. 16E S. 11, 12

Geology:

Description:

Area is underlain by the Santa Rosa Sandstone: light-red to green shale overlying a tan sandstone.

Reference:

Johnson, Ross B., 1974, Geologic Map of the Apache Springs Quadrangle, San Miguel County, New Mexico: U.S. Geol. Survey Geol. Quad. Map GQ-1163

Climate:

TES Gradient: HSC 4,-1
Precipitation: ___ Annual: 14 in. Warm season (May - Oct.)= 82 %
Cool Season (Nov. - Apr.)= 18 %
Mean Annual Snow: 28 in.

Mean Temperature: Annual 50 °F Jul. 70 °F Jan. 32 °F
Freeze Free Period: 160 days

Mean Temperature: Annual ___ °F Jul. ___ °F Jan. ___ °F
Freeze Free Period: ___ days

Trewartha's climate type: BSkw Cold steppe with dry winter

Reference: Forest Service, 1986, Terrestrial Ecosystem Handbook; Appendix B: USDA FS R3

Soils:

Research Natural Areas

USDA Forest Service, Rocky Mountain, Intermountain, Southwestern and Great Plains States

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A cooperative project of the

USDA Forest Service Northern Region, Rocky Mountain Region, Southwestern Region, Intermountain Region, Rocky Mountain Research Station, and the Montana Natural Heritage Program

MESITA DE LOS LADRONES

General Information S.USNAHP*92

- Created: 1988
- Size: 500 (acres)
- Elevation Range: 5750 - 5865ft
- Location: *Mesita de los Ladrones RNA lies approximately 22 miles south of Las Vegas in north-central New Mexico.*

Site Description

The RNA supports an excellent example of one-seed juniper (Juniperus monosperma) savanna situated atop a sandstone butte. This butte is partially capped by limestone and rises about 300 feet above the surrounding gently rolling hills. Occassional small pinyon (Pinus edulis) and open grassand communities are also present. Common grasses in the RNA include: blue grama (Bouteloua gracilis), black grama (Bouteloua eriopoda), sideoats grama (Bouteloua curtipendula) and New Mexico feather grass (Stipa neomexicana). The butte's isolation has resulted in limited livestock use for most of this century.

Climate and Enviromental Information

Data not Available

Vegetation - Mesita de los Ladrones

Interior Ponderosa Pine (SAF 237, K10) Pinyon-Juniper (SAF 239, K 21)

ESTABLISHMENT RECORD

MESITA DE LOS LADRONES RESEARCH NATURAL AREA

USDA FOREST SERVICE
SOUTHWESTERN REGION
SANTA FE NATIONAL FOREST
LAS VEGAS RANGER DISTRICT
SAN MIGUEL COUNTY, NEW MEXICO

Prepared by: _____ Date 10/23/87
William W. Dunmire, The Nature Conservancy
Mollie S. Toll, Department of Biology,
University of New Mexico

Recommended by: _____ Date 1-28-88
James R. Montoya, District Ranger
Las Vegas Ranger District

Recommended by: _____ Date 2-3-88
Maynard T. Rost, Forest Supervisor
Santa Fe National Forest

Recommended by: John W Russell Date 3/31/88
John W. Russell, Chairman
Southwestern Research Natural Area Committee

Recommended by: _____ Date 4/15/88
Sotero Muniz, Regional Forester
Southwestern Region

Recommended by: _____ Date May 16, 1988
Charles M. Loveless, Station Director
Rocky Mountain Forest and Range
Experiment Station

The abovesigned certify that all applicable land management planning and environmental analysis requirements have been met and that boundaries are clearly identified in accordance with FSM 4063.21, Mapping and Recordation and FSM 4063.41 5.e(3) in arriving at this recommendation.

DESIGNATION ORDER

By virtue of the authority vested in me by the Secretary of Agriculture under regulations 7 CFR 2.60(a) and 36 CFR 251.23, I hereby designate as the Mesita de los Ladrones Research Natural Area the lands described in the following establishment record prepared by William W. Dunmire and Mollie S. Toll, dated October 19, 1987. These lands shall hereafter be administered as a research natural area subject to the above regulations and instructions issued thereunder.

_____ _____

Chief Date

ESTABLISHMENT RECORD

for

MESITA DE LOS LADRONES RESEARCH NATURAL AREA

within

Santa Fe National Forest

San Miguel County, New Mexico

INTRODUCTION

The Mesita de los Ladrones Research Natural Area (RNA) comprises approximately 500 acres (203.5 hectares) of juniper (Juniperus monosperma) savannah in north-central New Mexico. The proposed RNA is located in the Las Vegas Ranger District, in San Miguel County, and is all acquired National Forest land.

Juniper savannah has been recognized as a significant open woodland community for protection and study in the RNA program (USFS Regional Guide 1983: Table 3-1). Difficulties in locating a suitable example of this ecosystem stem from the forage value of the accompanying grass understory. Vegetation composition in most juniper savannah has been substantially modified by grazing, and in many cases the landscape has been intentionally altered (as by chaining, or firewood harvesting) with the aim of favoring forage production. The Santa Fe National Forest suggested Mesita de los Ladrones as a potential suitable representative due to its minimal use history. A task group of the Regional RNA Committee visited this and several other candidate savannah areas in September, 1982, and concurred that this was the only available example meeting all the requirements.

Land Management Planning

The need for representation of this biotic community was identified in the Southwestern Regional Guide (August 1983), although this particular site was not identified by name. The current Santa Fe National Forest planning documents, the Revised Draft Environmental Impact Statement and Proposed Forest Plan (January 1986) include the Mesita de los Ladrones proposed research natural area. The environmental analysis conducted as part of the planning process supports the recommendation to establish this Research Natural Area.

JUSTIFICATION STATEMENT FOR ESTABLISHMENT OF AREA

The proposed Mesita de los Ladrones RNA provides the best alternative for maintenance of a juniper savannah within the Southwestern Region. The RNA encompasses the top of a butte with steep sandstone escarpments; the isolation of this butte and its general inaccessibility to domestic livestock have resulted in vegetation in advanced stages of succession after at least 70-80 years of minimum influence by man or his animals. The topography and soils of this mesa top vary considerably, producing conspicuous vegetation mosaics. The unique isolation of this butte and its grass mosaics provide one of the most desirable research oriented ecosystem representations possible.

PRINCIPAL DISTINGUISHING FEATURES

Mesita de los Ladrones is a sandstone butte partially capped by limestone, rising 200 to 350 feet (61 to 107 m) above the general topography of gently rolling hills. The butte has a high elevation of 5865 feet (1790 m) at the western margin, gently sloping to about 5750 feet (1750 m) on the east.

The aspect is predominantly a well developed one-seed juniper woodland, with scattered, scrubby pinyon pines (Pinus edulis). Close to 30 percent of the butte is open grassland, with grass species composition varying considerably from hillocks to swales, and according to parent material and texture of soils. Rockland at the south tip of the mesa supports a small grove of ponderosa pine (Pinus ponderosa), while rock outcrop and talus around the mesa provide a habitat for a rim of shrubby vegetation (Quercus undulata, Rhus trilobata).

LOCATION (Santa Fe National Forest)

Mesita de los Ladrones is located in the Las Vegas Range District, within the Apache Springs Quadrangle (USGS 15') at latitude 35 degrees 17', longitude 105 degrees 13', Township 12 N, Range 16 E, Sections 11 and 12 (with very small portions in Sections 2, 14, and 15; Map 1). **The boundaries are defined by the mesa itself. The 5600 ft contour subtends the mesa near its base and is the perimeter of the RNA (Map 3).** Elevations within this boundary range from 5600 ft (1720 m) to 5865 ft (1790 m). The proposed RNA comprises approximately 500 acres (204 hectares).

The area is located approximately 22 miles (35.4 km) south of Las Vegas, New Mexico (Maps 2 and 3). Access to the RNA is afforded by a 13 mile (20.9 km) drive on unpaved county and Forest Service roads beyond Interstate 25, followed by a short walk to the top of the mesa.

On Interstate 25, take the Bernal Exit, which is approximately 49 miles (78.9 km) east of Santa Fe and 15 miles (24.1 km) south of Las Vegas. Head south for one quarter of a mile (0.4 km), then turn right at the T intersection. One quarter of a mile (0.4 km) further, turn right on unpaved country road B 28A. Continue on this road past the first Forest Road 45 (on the left at 5.8 miles or 9.3 km). At mile 7.7 (km 12.4) turn left on the second Forest Road 45 (this eventually loops back to the first turnoff). At mile 9.5 (km 15.3) take the left fork at a cattle guard. Park at mile 13.0 (km 20.9), and hike to the top of the mesa via the break through the upper cliffs which is obviously visible from this point. The only easy access to the mesa top is here at the north end.

AREA BY COVER TYPES

The distribution of cover types was determined from field surveys conducted in the summer of 1986 and from interpretation of 1981 aerial photography. Table 1 outlines the estimated total areas of vegetation types baed on the Society of American Foresters forest type system (Eyre 1980) and the Kuchler Potential Natural Vegetation system (Kuchler 1964). Map 4 depicts the distribution of the SAF types on the candidate researchy natural area.

Close to 30 per cent of the mesa top is fairly open grassland; this portion could have been mapped as Küchler's Grama-Galleta Steppe (Bouteloua - Hilaria, K - 53) since most of the components for this type are present. However, one-seed junipers are scattered throughout the grasslands, which have very irregular boundaries. The entire mesa was therefore considered as a juniper-pinyon woodland, except for the small island of ponderosa pine.

Table 1. Estimated Areas of Vegetation Types in the Mesita de los Ladrones Research Natural Area.

Type	Society of American Foresters Cover Type[1]	Küchler PNV Type[2]	Surface Area Acres	Hectares
Pinyon-Juniper	SAF 239	K-21 Juniper-Pinyon Woodland	493	199.5
Interior Ponderosa	SAF 237	K-21 Juniper-Pinyon Woodland	7	4.0
		TOTAL	500	203.5

[1]Eyre 1980
[2]Küchler 1964

PHYSICAL AND CLIMATIC CONDITIONS

The proposed RNA comprises a sandstone butte rising 200 to 350 feet (61 to 107 m) above the hill terrain which forms a broad transition between the southern extension of the Rocky Mountains and the great plains of eastern New Mexico. The irregular shape of the mesa has been likened to an arrowhead, with the tip pointing south. It extends over a mile and a quarter (2.0 km) from north to south, and one mile (1.6 km) east to west.

Climate of the proposed RNA is classified as a cold steppe with a dry winter (Trewartha 1968), or as semi-arid (Tuan 1973). Precipitation falls principally (82%) in the warm season from May to October, with a mean annual accumulation of 14 inches (35.6 mm). Mean annual snowfall is 28 inches (7.1 cm), but snow does not last long on the ground. Temperature varies from a July mean of 70°F (21.1°C) to a January mean of 32°F (0°C); the annual mean temperature is 50°F (10.0°C).

DESCRIPTION OF VALUES

Flora

A survey of habitat types (HT) was conducted during the 1986 field work. At the time of this field work, no publication classifying woodland habitat types of this area was known to exist. Subsequently, however, Forest and Woodland Habitat Types of Southern New Mexico and Central Arizona (USDA Forest Service, Southwestern Region 1986) served as an appropriate key for habitat types at Mesita de los Ladrones.

Except for the ponderosa pine grove covering a few acres, Juniperus monosperma and Pinus edulis comprise the only trees, with a canopy cover totalling about 25 per cent. The pinyons are scrubby, seldom over 10 feet tall, and comprise less than 10 per cent of the conifer tree cover. The dominant juniper is also of low stature, typically under 16 feet high.

Quercus undulata is well represented on the north and east-facing escarpment of the mesa, which is included within the research natural area. These steep slopes and up to 200 feet (30.5 m) of the adjacent mesa top rim can be characterized as Juniperus monosperma/Quercus undulata HT, except for the absence of Fallugia and Cercocarpus, shrub components normally associated with this habitat type.

Most of the mesa top keys to Juniperus monosperma/Bouteloua gracilis HT. Shrubs are poorly represented with moderate occurrences of Gutierrezia sarothrae, Opuntia imbricata, and Yucca sp.

Limestone weathering has made strict delineation into sandstone and limestone communities difficult. In limestone influenced communities, grass composition varies with progression from gentle hillocks down into swales, from Stipa neomexicana to Bouteloua eriopoda, Bouteloua hirsuta, and finally Bouteloua gracilis. In the swale bottoms, Bouteloua gracilis and Panicum obtusum predominate. In heavy textured soils where small accumulations of runoff persist within the swales, patches of Bouteloua curtipendula hold forth. These and other grasses form well delineated matrices, especially where J. monosperma is less well developed. In sandier soils, Lycurus phleoides is mixed with B. gracilis, and individuals of Sporobolus cryptandrus are scattered almost randomly. Where evidence of limestone influence is minimal, Andropogon gerardii, Andropogon scoparius, Sorghastrum nutans and Leptoloma cognatum occur in varying amounts. Although more abundant on the sandier soils, Eragrostis intermedia is co-dominant almost throughout the butte.

A small grove of Pinus ponderosa, covering about 7 acres (4.0 hectares), is located midway along the west rim where their roots penetrate cracks in the exposed sandstone. This is a Pinus ponderosa/Rockland HT, with about 60 per cent bare rock exposed and very shallow soil development. Shrubs are poorly represented, and include Brickellia sp., Nolina microcarpa, Pinus edulis, and Quercus undulata. Grasses form about 15 per cent of the cover here, and are principally comprised of Sorghastrum nutans, Andropogon scoparius, and Sporobolus cryptandrus. Chrysopsis canescens is the most common forb.

No threatened or endangered plants are known to occur on Mesita de los Ladrones. The following plant list was compiled from field observations by Reggie Fletcher, USFS Southwestern Region Botanist, on September 16, 1982 and May 12-13, 1983.

Abbreviated Plant List for Mesita de los Ladrones R.N.A.

Latin Name	Common Name[1]	Frequency[2]
GRASSES AND OTHER GRASS-LIKE PLANTS:		
Andropogon springfieldii	Cane bluestem	I
Andropogon gerardii	Big bluestem	I
Andropogon scoparius	Little bluestem	I
Aristida adscenionis	Sixweeks three-awn	R
Aristida arizonica	Arizona three-awn	C
Aristida divaricata	Poverty three-awn	R
Aristida longiseta	Red three-awn	R
Bouteloua curtipendula	Side-oats grama	C
Bouteloua eriopoda	Black grama	C
Bouteloua gracilis	Blue grama	C
Bouteloua hirsuta	Hairy grama	C
Bromus purgans	Canada brome	R
Cyperus esculentus	Chufa flat-sedge	I
Cyperus fendlerianus	Tuber flat-sedge	I
Cyperus rusbyi	Hillside flat-sedge	I
Eragrostis intermedia	Plains lovegrass	C
Hilaria jamesii	Galleta	I
Leptochloa dubia	Green sprangletop	R
Leptoloma cognatum	Fall witchgrass	R
Lycurus phleoides	Wolftail	C
Muhlenbergia emersleyi	Bullgrass	R
Muhlenbergia pauciflora	New Mexico muhly	R
Muhlenbergia richardsonis	Mat nuhly	R
Muhlenbergi torreyi	Ring muhly	C
Muhlenbergia wrightii	Spike muhly	R
Oryzopsis micrantha	Littleseed ricegrass	R
Panicum hallii	Halls panicum	I
Panicum obtusum	Vine-mesquite	C
Poa fendleriana	Muttongrass	R
Sitanion hystrix	Bottlebrush squirreltail	I
Sorghastrum nutans	Yellow Indiangrass	R
Sporobolus contractus	Spike dropseed	R
Sporobolus cryptandrus	Sand dropseed	C
Stipa neomexicana	New Mexican needlegrass	C
Tridens pilosus	Hairy tridens	I
Tridens pulchella	Fluffgrass	I
FORBS:		
Allium perdulce	Onion	R
Amaranthus viridus	Pigweed	R
Arabis fendleri var. spatifolia	Fendler rockcress	R
Arabis perennans	Rockcress	R
Asclepias asperula	Milkweed	R
Asclepias macrotis	Milkweed	R

Asclepias nyctaginifolia	Milkweed	R
Asclepias uncialis	Milkweed	R
Astragalus mollissimus var. mollissimus	Milkvetch	I
Baccharis wrightii	Baccharis	R
Bahia dissecta	Ragleaf bahia	I
Berlandiera lyrata	Berlandiera	I
Cassia roemeriana	Senna	R
Castilleja integra	Wholeleaf paintbrush	R
Cheilanthes eatonii	Lipfern	R
Chryopsis canescens	Goldaster	C
Cirsium canescens	Thistle	R
Commelina dianthifolia	Birdbill dayflower	C
Convolvulus incanus	Climbing bindweed	R
Cryptantha crassisepala var. elachantha	Plains hiddenflower	I
Cryptantha jamesii	James hiddenflower	R
Cuscuta salina	Saltmarsh dodder	R
Cymopterus montanus	Water-parsnip	C
Dalea jamesii	Indigobush	R
Descurainia richardsonii var. viscosa	Western tansymustard	R
Desmanthus cooleyi	Love bundleflower	I
Drymaria fendleri	Indian dry mary	R
Dyssodia papposa	Ring hair	R
Erigeron bellidiastrum var. bellidiastrum	Fleabane	R
Erigeron divergens	Spreading fleabane	I
Erigeron flagellaris	Trailing fleabane	I
Erigeron nudiflorus	Sprawling fleabane	C
Eriogonum jamesii	Wee Mary buckwheat	I
Eriogonum tenellum	Buckwheat	I
Eupatorium herbaceum	White joe-pye-weed	R
Euphorbia dentata var. dentata	Toothed spurge	R
Euphorbia fendleri var. chaetocalyx	Spurge	R
Euphorbia fendleri var. fendleri	Fendler spurge	R
Evolvulus pilosus	Evolvulus	R
Evolvulus sericeus	Evolvulus	R
Franseria confertifolia	Bur-sage	R
Gaillardia pinnatifida	Hopi blanketflower	I
Gaura coccinea	Scarlet gaura	R
Gnaphalium wrightii	Cudweed	I
Guilleminea densa var. aggregata	Guilleminea	R
Haplopappus spinulosus	Spiny goldenweed	I
Hedyotis rubra	Bluets	R
Heterosperma bipinnata	Heterosperma	I
Hybanthus verticillatus	Green violet	R
Hymenopappus filifolius var. cinereus	White ragweed	I

Hymenoxys scaposa var. linearis	Rubberweed	C
Ipomoea costellata	Morningglory	R
Ipomoea leptophylla	Bush morningglory	R
Ipomopsis aggregata	Skyrocket	R
Ipomopsis longiflora ssp. longiflora	Ipomopsis	R
Kuhnia chlorolepis	False boneset	I
Lappula redowski	Stickseed	R
Lesquerella fendleri	Bladderpod	C
Lesquerella praecox	Bladderpod	I
Leucelene ericoides	White aster	C
Linum lewisii	Blue flax	R
Linum puberulum	Flax	R
Lithospermum incisum	Stoneseed	R
Melampodium leucanthum	Plains blackfoot	I
Mirabilis multiflora	Silvestre four o'clock	C
Nicotiana trigonophylla	Desert tobacco	R
Notholaena standleyi	Cloak-fern	R
Oenothera albicaulis	Evening primrose	R
Oxybaphus linearis var. subhispidus	Desert four o'clock	R
Pectis angustifolia	Fetid marigold	I
Penstemon barbatus	Beardlip	R
Penstemon fendleri	Beard tongue	I
Penstemon jamesii var. jamesii	Beard tongue	R
Petalostemon purpureus	Purple prairieclover	R
Physalis sp.	Groundcherry	R
Plantago purshii	Wooly Indianwheat	I
Polygala alba	White milkwort	R
Portulaca mundula	Purslane	I
Portulaca retusa	Notchleaf purslane	I
Psoralea tenuiflora	Slender scurfpea	R
Ratibida columnifera	Coneflower	R
Sanvitalia abertii	Sanvitalia	R
Sarcostemma crispum	Climbing milkweed	R
Selaginella densa var. scopulorum	Spikemoss	C
Senecio douglasii	Groundsel	R
Sisymbrium linearifolium	Tumblemustard	I
Solanum eleagnifolium	White horsenettle	C
Solidago mollis	Goldenrod	I
Solidago wrightii	Goldenrod	I
Sphaeralcea digitata var. digitata	Globemallow	C
Stephanomeria pauciflora	Wirelettuce	R
Thelesperma megapotamicum	Hopi-tea greenthread	R
Thelypodium wrightii	Thelypodium	R
Tragia stylaris	Noseburn	I
Tragopogon dubius	Salsify	R
Verbena bipinnatifida	Dakota vervain	R
Verbena plicata	Fanleaf vervain	R

Vicia exigua	Slim vetch	R
Viguiera dentata	Goldeneye	I
HALF-SHRUBS, SHRUBS, AND TREES:		
Artemisia bigelovii	Slender gray sagebrush	R
Artemisia carruthii	Flat sagebrush	R
Artemisia dracunculoides	False tarragon sagebrush	I
Artemisia ludoviciana	Louisiana wormwood	C
Atriplex canescens	Fourwing saltbush	I
Baccharis pteronoides?	Yerba-de-pasmo	R
Cercocarpus montanus	Mountain mahogany	R
Dalea formosa	Indigobush	R
Echinocereus fendleri	Fendler echinocereus	R
Echinocereus triglochidiatus var. triglochidiatus	Claretcup echinocereus	R
Echinocereus triglochidiatus var. melanacanthus	Claretcup echinocereus	R
Echinocereus triglochidiatus var. neomexicanus	Claretcup echinocereus	R
Echinocereus viridiflorus var. viridiflorus	Green pitaya	C
Eurotia lanata	Winterfat	I
Gutierrezia sarothrae	Broom snakeweed	I
Juniperus monosperma	One-seed juniper	C
Lycium pallidum	Pale wolfberry	I
Mammillaria meiacantha	Mammillaria	I
Mammillaria wrightii	Mammillaria	R
Menodora scabra	Rough cods	R
Nolina microcarpa	Beargrass	I
Opuntia erinacea	Grizzlybear pricklypear	I
Opuntia imbricata	Candelabra cactus	C
Opuntia phaeacantha	Pricklypear	C
Opuntia polyacantha	Plains pricklypear	C
Pinus edulis	Pinyon	C
Pinus ponderosa	Ponderosa pine	R
Quercus grisea	Gray oak	R
Quercus undulata	Wavyleaf oak	C
Rhus trilobata var. pilosissima	Squawberry	R
Yucca baccata	Datil yucca	I
Yucca glauca	Small soapweed	I

[1]Common names follow Field Guide to Native Vegetation of the Southwestern Region (USDA, Forest Service 1974) or Martin & Hutchins (1981)

[2]Frequency index: C = common; I = infrequent; R = rare

Fauna

Mule deer appear to be the only native ungulate currently using the mesa. The absence of any sign of pocket gopher activity on the mesa top is of interest. Generally, Thomomys sp. would be expected to thrive in these juniper savannas, but apparently a viable population never became established in post-pleistocene times due to the rocky escarpment barrier.

The following animal list was derived from the RUN WILD III data base (Lehmkuhl and Patton 1982; Patton 1979) for Great Basin conifer woodland biome, pinyon-juniper series, for San Miguel county, New Mexico:

Abbreviated Animal List for Mesita de los Ladrones R.N.A.

Common Name	Latin Name
AMPHIBIANS:	
Spadefoot, western	Scaphiopus hammondi
BIRDS:	
Bluebird, mountain	Sialia currucoides
Bluebird, western	Sialia mexicana
Chickadee, mountain	Parus gambeli
Cowbird, brown-headed	Molothrus ater
Crow, American	Corvus brachyrhynchos
Falcon, peregrine	Falco peregrinus
Falcon, prairie	Falco mexicanus
Finch, house	Carpodacus mexicanus
Flicker, northern	Colaptes auratus
Flycatcher, ash-throated	Myiarchus cinerascens
Goldfinch, lesser	Carduelis psaltria
Grosbeak, black-headed	Pheucticus melanocephalus
Hawk, Cooper's	Accipiter cooperii
Hawk, feruginous	Buteo regalis
Hawk, red-tailed	Buteo jamaicensis
Hawk, sharp-shinned	Accipiter striatus
Hawk, Swainson's	Buteo swainsoni
Hummingbird, black-chinned	Archilochus alexandri
Jay, pinyon	Gymnorhinus cyanocephalus
Jay,scrub	Aphelocoma coerulescens
Junco, dark-eyed	Junco hyemalis
Kestrel, American	Falco sparverius
Kingbird, Cassin's	Tyrannus vociferans
Magpie, black-billed	Pica pica
Nighthawk, common	Chordeiles minor
Nuthatch, pygmy	Sitta pygmaea
Oriole, Scott's	Icterus parisorum
Phoebe, Black	Sayornis nigricans
Pygmy-owl, northern	Glaucidium gnoma
Quail, scaled	Callipepla squamata
Raven, common	Corvus corax
Roadrunner, greater	Geococcyx californianus
Robin, American	Turdus migratorius
Shrike, loggerhead	Lanius ludovicianus
Shrike, northern	Lanius excubitor
Siskin, pine	Carduelis pinus
Solitaire, Townsend's	Myadestes townsendi
Sparrow, black-throated	Amphispiza bilineata
Sparrow, Brewer's	Spizella breweri
Sparrow, chipping	Spizella passerina
Sparrow, lark	Chondestes grammacus
Swift, white-throated	Aeronautes saxatalis

Tanager, western	Piranga ludooviciana
Titmouse, plain	Parus inornatus
Towhee, Brown	Pipilo fuscus
Towhee, rufous-sided	Pipilo erythrophthalmus
Vireo, gray	Vireo vicinior
Warbler, black-throated gray	Dendroica nigrescens
Waxwing, cedar	Bombycilla cedrorum
Woodpecker, Lewis'	Melanerpes lewis
Wood-pewee, western	Contopus sordidulus
Wren, Bewick's	Thryomanes bewickii
Wren, rock	Salpinctes obsoletus

MAMMALS:

Chipmunk, Colorado	Tamias quadrivittatus
Deer, mule	Odocoiles hemionus
Lion, mountain	Felis concolor
Mouse, brush	Peromyscus boylii
Mouse, deer	Peromyscus maniculatus
Mouse, northern grasshopper	Onychomys leucogaster
Mouse, pinyon	Peromyscus truei
Mouse, plains pocket	Perognathus flavescens
Mouse, rock	Peromyscus difficilis
Mouse, western harvest	Reithrodontomys megalotis
Mouse, white-footed	Peromyscus leucopus
Porcupine	Erethizon dorsatum
Rat, hispid cotton	Sigmodon hispidus
Rat, Ord's kangaroo	Dipodomys ordii
Shrew, desert	Notiosorex crawfordi
Shrew, dwarf	Sorex nanus
Skunk, striped	Mephitis mephitis
Squirrel, golden-mantled ground	Spermophilus lateralis
Squirrel, rock	Spermophilus variegatus
Weasel, long-tailed	Mustela frenata
Woodrat, bushy-tailed	Neotoma cinerea
Woodrat, Mexican	Neotoma mexicana
Woodrat, white-throated	Neotoma albigula

REPTILES:

Coachwhip	Masticophis flagellum
Kingsnake, common	Lampropeltis getulus
Lizard, collared	Crotaphytus collaris
Lizard, eastern fence	Sceloporus undulatus
Lizard, short-horned	Phrynosoma douglassi
Lizard, side-blotched	Uta stansburiana
Lizard, tree	Urosaurus ornatus
Racer	Coluber constrictor
Rattlesnake, western	Crotalus viridis
Rattlesnake, western diamondback	Crotalus atrox
Snake, corn	Elaphe guttata
Snake, gopher	Pituophis melanoleucus

Snake, lined	*Tropidoclonion lineatum*
Snake, milk	*Lampropeltis triangulum*
Snake, mountain patchnose	*Salvadora grahamiae*
Snake, night	*Hypsiglena torquata*
Snake, western terrestrial garter	*Thamnophis elegans*
Whiptail, Colorado checkered	*Cnemidophorus tesselatus*
Whiptail, plateau striped	*Cnemidophorus velox*

Geology

Mesita de los Ladrones is located on the easternflanks of the southern tip of the Sangre de Cristo uplift, where the Raton Basin begins. The Raton Basin is the southern most of the Laramide intracratonic fold basins at the eastern margin of the Rocky Mountains (Clark 1966:64), and lies in the western part of the Great Plains Province. Quartz diorite porphyry and Dakota sandstone (uppermost in the Cimarron Range to the west) dip below formations prominent in the basin (Pierre shale and Niobrara Formation; Clark 1966:63, Figure 3). The area within the RNA is partially capped by limestone (Johnson 1974).

Soils

Mesita de los Ladrones is situated in the Rednun-Tricon association, an area in north-central and southwestern San Miguel county including two major, geographically associated soil series (Maker et al. 1972:9). In this general soil area, soils are developing in medium to fine-textured alluvial and eolian sediments. This association supports a good cover of grass, with juniper and pinyon occurring here along the western margin of this unit, where it joins areas of Rough Broken and Stony Land.

Soils are classified as Typic Ustochrepts, fine-loamy mixed, mesic, and are calcareous throughout. Variability in soil texture and geologic parent material contribute to some marked changes in vegetation composition across the RNA. In particular, patchy distribution of grasses on the mesa top savanna relate in part to concentrations of sandier soils on hillocks, and soils with larger components of silts and clays in swales.

The primary soil component on Ladrones Mesa is Unit 174 (Table 2). Unit 281 occurs as small islands near the edge of the mesa, and Unit 173 makes up a small proportion of the mesa.

Table 2. Existing soils in the Mesita de los Ladrones RNA[1].

Mapping Unit		Slope
173	Typic Haplustalfs [fine, mixed, mesic]	0-15%
174	Typic Haplustalfs [fine, mixed, mesic]	0-15%
	Lithic Haplustalfs [clayey-skeletal, mixed, mesic]	15-40%
281	Typic Ustoschrepts [fine-loamy, mixed, mesic]	0-15%

[1]Soils information summarized here and a soils map can be found in the report titled "Soil Survey of the Las Vegas Ranger District", on file in the Supervisor's Office for the Santa Fe National Forest.

Lands

All the land encompassed in the proposed RNA was withdrawn from Gross Kelly & Co. to the United States government in 1939. The land was transferred to Forest Service administration in 1947, then given National Forest status in 1952 by PL 419. This land has Weeks Law status (closed to mining entry, open to mining leasing), but minerals are reserved to Tom W. Neal.

Cultural

A single, limited archeological survey has been conducted on the mesa, and no prehistoric sites were located. Remains of a rock structure typical of those made by sheepherders is present near the ponderosa pine grove along the west rim of the mesa. Vegetational indicators (abundance of Opuntia imbricata in open parks, low density and diversity of forbs) suggest the mesa top was grazed by sheep, possibly for a long duration but probably not more recently than the nineteenth century.

Sites recorded in the minimal archeological work in the vicinity include prehistoric field house sites and other historic sites. The likelihood of locating within the bounds of the RNA a truly important site which is not duplicated elsewhere is low. Upon establishment as an RNA, the area will be withdrawn from any archeological research that would in any way modify the existing locale.

IMPACTS AND POSSIBLE CONFLICTS

Mineral Resources

No known mineral resources exist in this area. An expired lease for gypsum occurred in an area about 4 miles (6.4 km) north of the RNA.

Grazing

Mesita de los Ladrones represents 500 acres (202.3 hectares) of potential capacity rangeland which will be withdrawn from grazing use. Historically, use has been low due to inaccessibility of the area. A small amount of fencing (costing approximately $300.00) at the single access point at the north end of the mesa may be needed to assure exclusion of livestock.

Timber

This area consists primarily of juniper with small amounts of pinyon pine. Although technically considered forested, the potential for firewood harvest is very low due to the low density of trees and long travel distances.

Total forested: approximately 500 acres (202.3 hectares)

Commercial forest: none

Watershed Values

Mesita de los Ladrones is contained within the fifth order watershed known as Gallinas-Tecolote. Through a series of ephemeral and intermittent streams, the area drains to the Tecolote River and eventually to the Pecos River. The distance from the proposed RNA to the confluence with the Pecos River is about 5 miles (8.0 km).

Recreation Values

Due to its remoteness, this area is currently only being used for fall Mule Deer hunting. There should be no conflicts between this use and potential research.

Wildlife and Plant Values

This RNA falls within an area recently identified and utilized for the reintroduction of Pronghorn (Antilocapra americana). The state initiated the project in 1984 with the transfer of a small herd. No conflicts are expected in the maintenance of suitable habitat for the Pronghorn.

Mesita de los Ladrones contains potential habitat for the Grama grass cactus (Toumeya papyracantha) a New Mexico State listed T & E plant species. Several surveys in the RNA and adjacent area have failed to locate any specimens of this species.

Wilderness, Wild and Scenic River, National Recreation Area Values

None of the above congressionally designated areas have been proposed for the Mesita de los Ladrones RNA or vicinity.

Transportation Plans

This RNA is accessed by a spur originating from a Forest Service system road. The RNA itself has no roads. There are no transportation plans which would adversely affect the RNA.

Utility Corridor Plans

No existing or potential utility corridor plans exist in the vicinity of this RNA.

MANAGEMENT PLAN

The Santa Fe National Forest Plan prescribes that there will be no harvest of timber or firewood and no assigned grazing capacity on Research Natural Areas. The prescriptions also prohibit off-road vehicle travel, open campfires, the introduction of non-native plant or animal species, road or trail construction, and recreational use if degradation results. However, non-motorized dispersed recreation activities are permitted provided they do not significantly modify the area, or threaten or impair the research or educational value of the area. No collection of flora, fauna, or other materials will be allowed, other than for research approved by the Station Director.

1. Vegetation Management

The Forest Plan provides that prescribed fire, using planned and unplanned ignitions, will be allowed on the Mesita de los Ladrones RNA to maintain fire dependent ecosystems. A fire management plan for the RNA will be developed at a later time.

2. Fences

Livestock can ascend the escarpment to the mesa top at only one access point, at the north end of the RNA. This is an abandoned wagon road which is now barricaded with stones and brush. A more permanent barrier, in the form of a short stretch of fence, may be required at some point in the future.

ADMINISTRATIVE RECORDS AND PROTECTION

Administration and protection of the Mesita de los Ladrones RNA will be the responsibility of the Santa Fe National Forest. The District Ranger, Las Vegas District, Las Vegas, NM has direct responsibility.

The Director of the Rocky Mountain Forest and Range Experiment Station, or his designee, will be responsible for any studies or research conducted in the area, and requests to conduct research in the area will be referred to him. He, or his designee, will evaluate research proposals and coordinate all studies and research in the area with the District Ranger. All plant and animal specimens collected in the course of research conducted in the area will be properly preserved and maintained within university or federal agency herbaria and museums, approved by the Rocky Mountain Station Director.

Records for the Mesita de los Ladrones RNA will be maintained in the following offices:

Regional Forester, Southwestern Region, Albuquerque, NM
Rocky Mountain Station, Fort Collins, CO
Santa Fe National Forest, Santa Fe, NM
District Ranger, Las Vegas Ranger District, Las Vegas, NM

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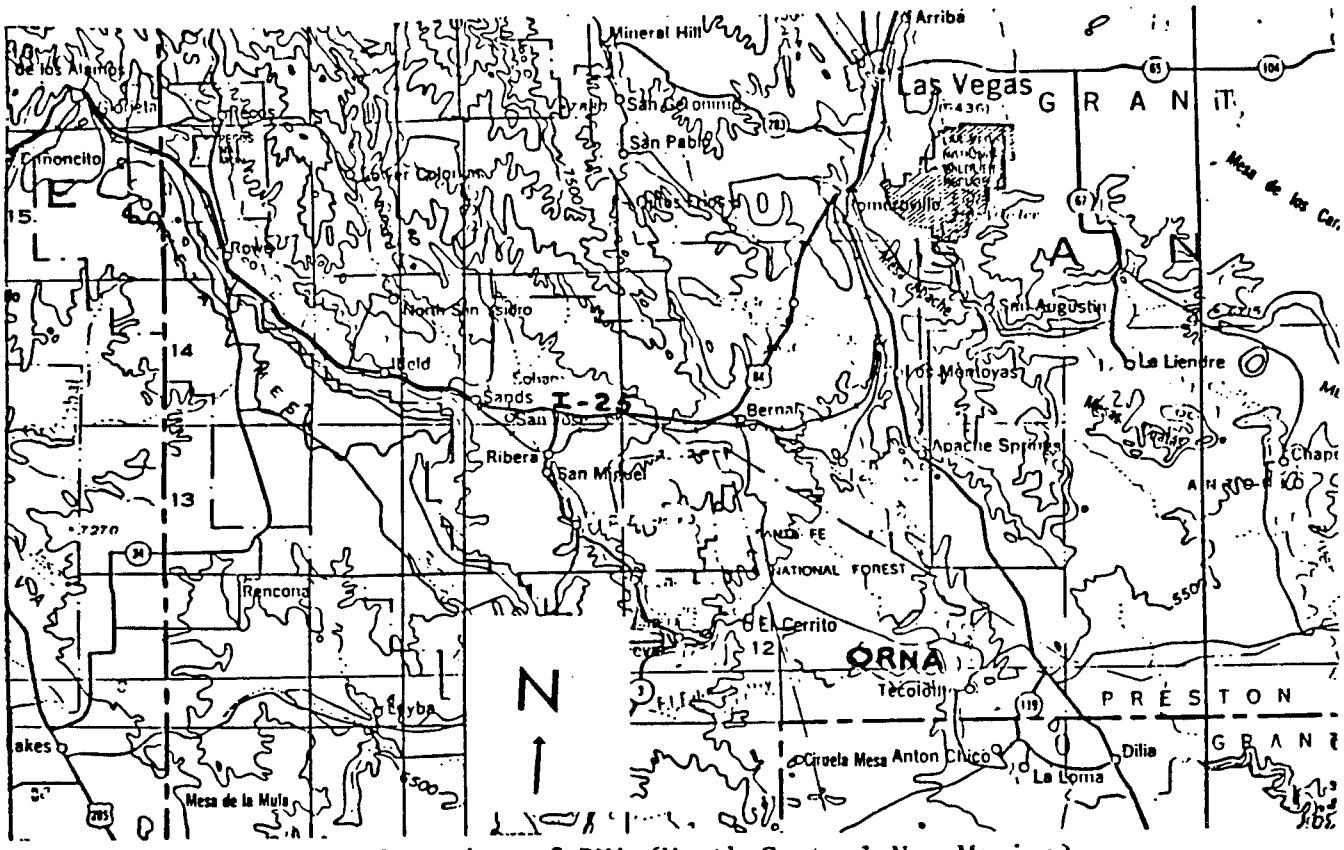
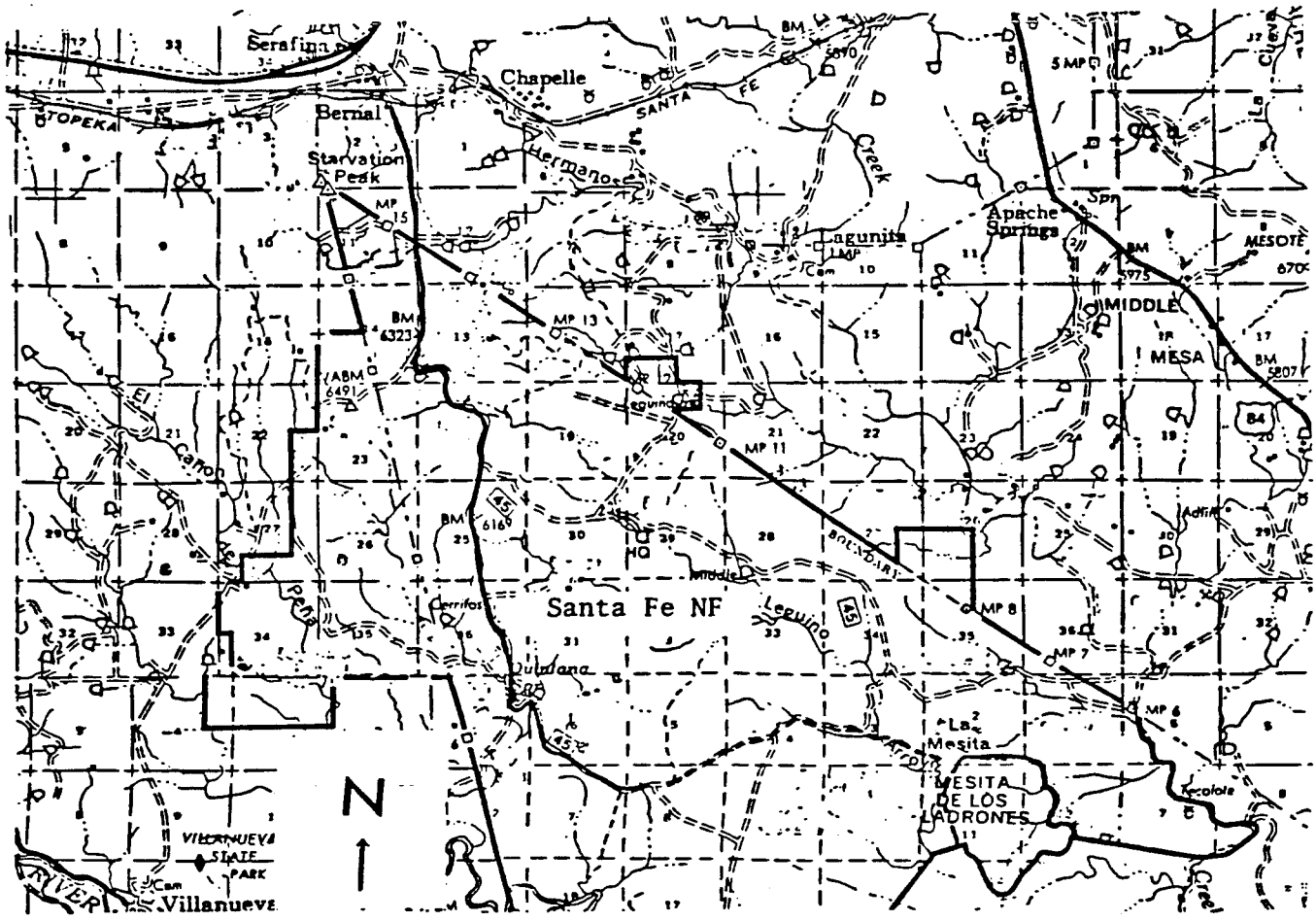
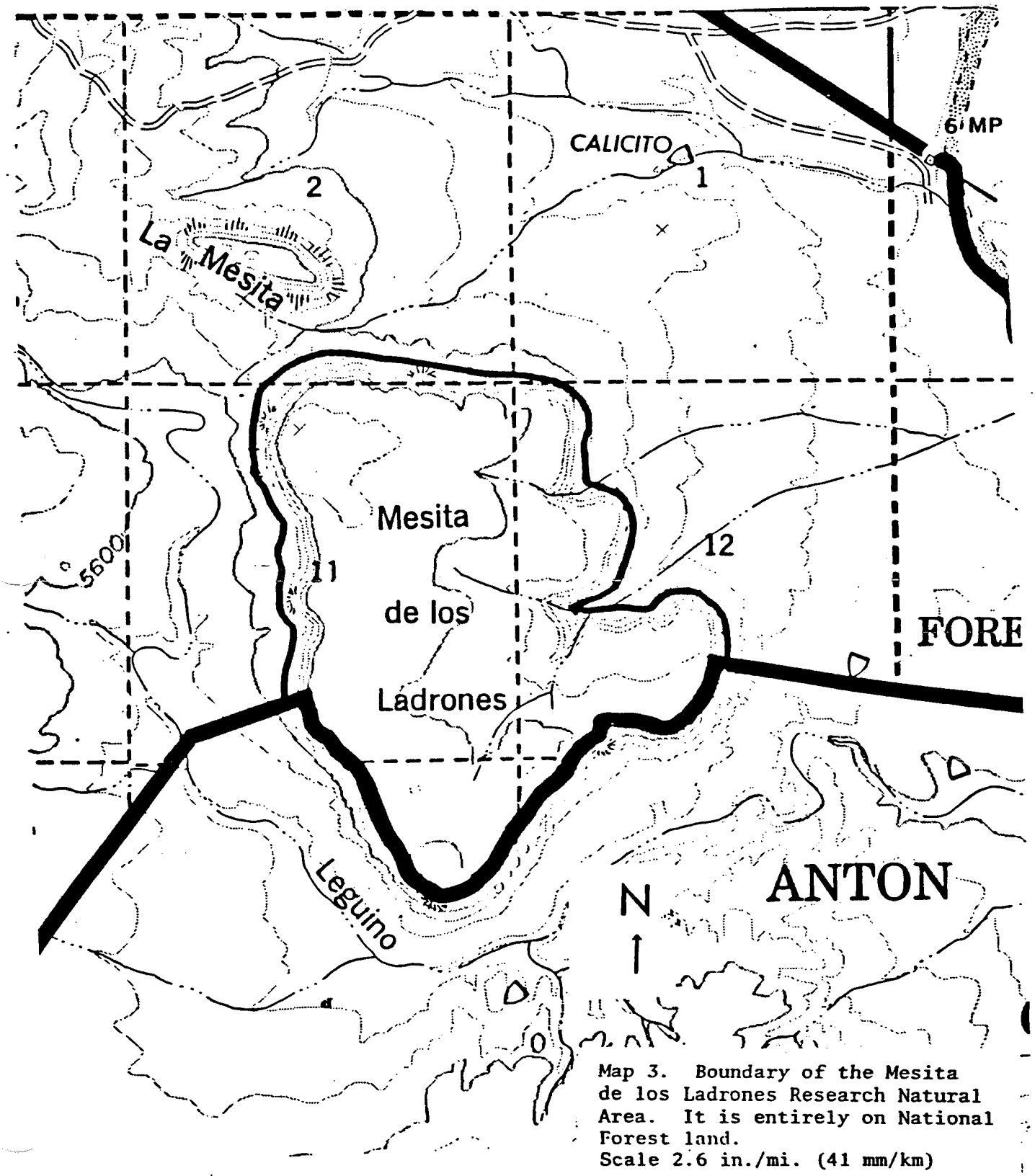


Map 1. Location of RNA (North Central New Mexico)

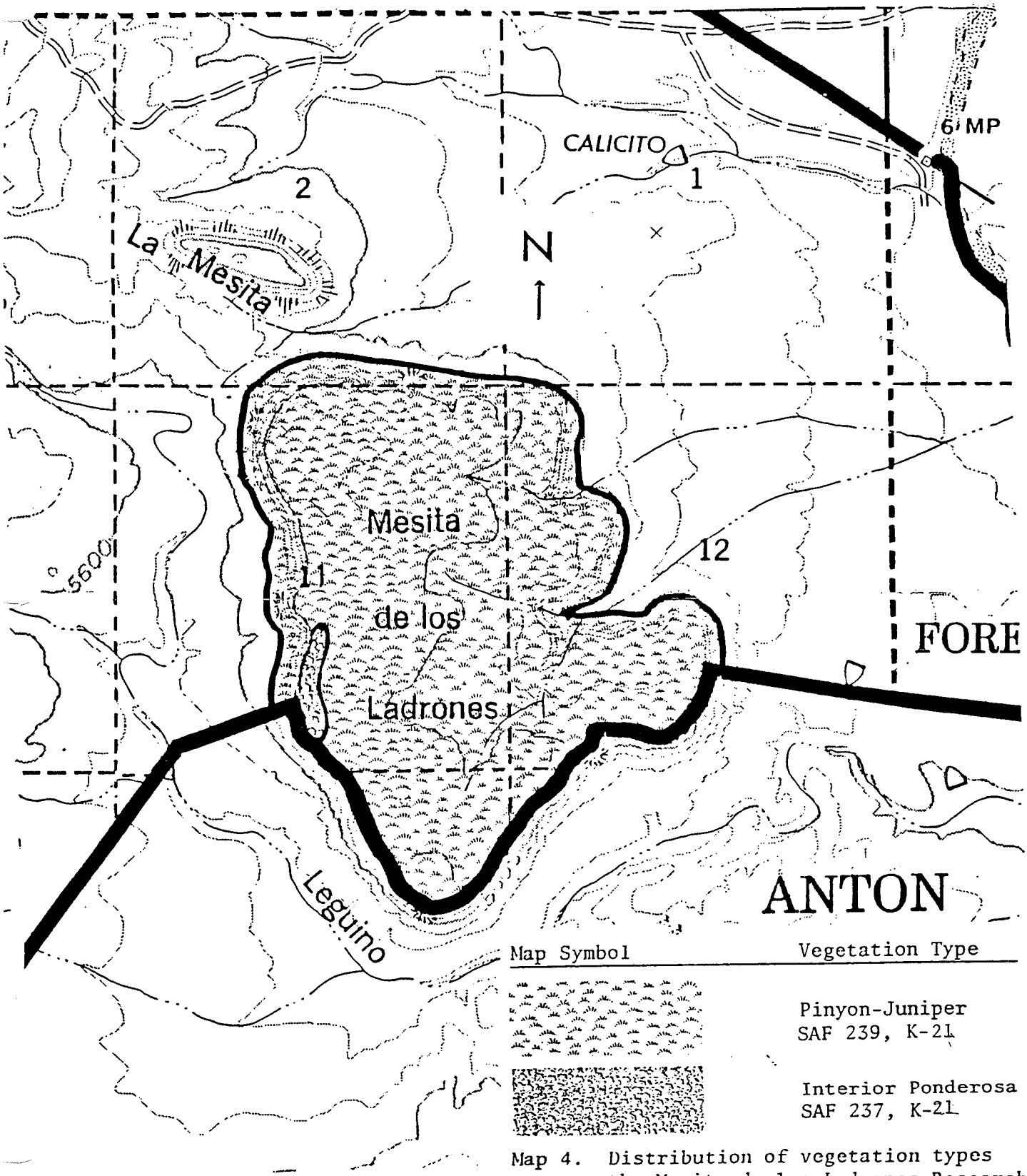


Map 2. Access Route to Mesita de los Ladrones RNA

MESITA DE LOS LADRONES RNA 500 ac.
Apache Springs Quadrangle (USGS 15')



Map 3. Boundary of the Mesita de los Ladrones Research Natural Area. It is entirely on National Forest land.
Scale 2.6 in./mi. (41 mm/km)



Map Symbol	Vegetation Type
	Pinyon-Juniper SAF 239, K-21
	Interior Ponderosa SAF 237, K-21

Map 4. Distribution of vegetation types the Mesita de los Ladrones Research Natural Area.

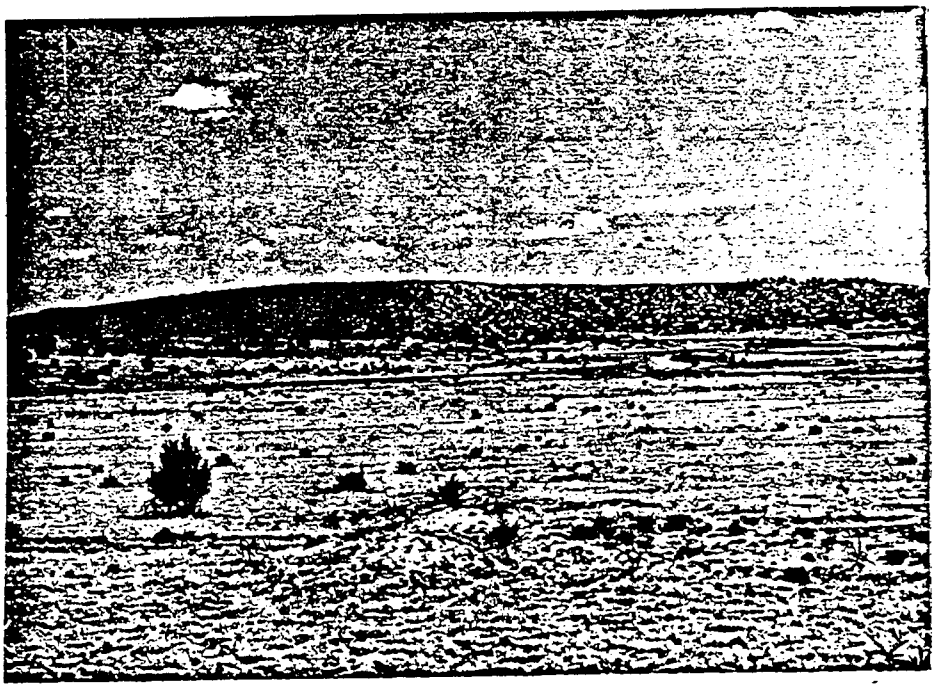


Photo 1. Southeast from access road FS45, Mesita de los Ladrones dominates the distant skyline.

Photo 2. East escarpment of the mesa with Juniperus monosperma, Pinus edulis and Quercus undulata comprising the dominant vegetation of this JUMO/QUUN Habitat Type.

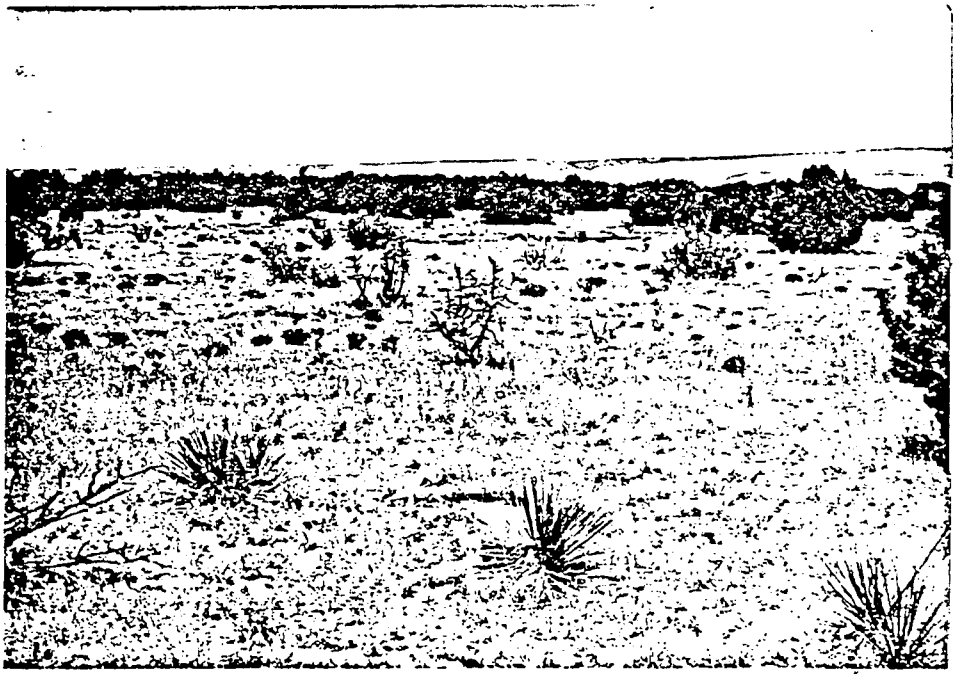


Photo 3. A grassland opening within the JUMO/BOGR Habitat Type which comprises most of the juniper savannah on the mesa top. Widely scattered shrubs include Yucca glauca, Opuntia imbricata and Gutierrezia sarothrae.

Photo 4. An immense, old, one-seed juniper, DBH over 6 feet (1.8 M), with Bouteloua gracilis the principal grass cover.

Photo 5. Islands of Stipa neomexicana are found where highly calcareous soils are derived from nearby limestone surface rock.

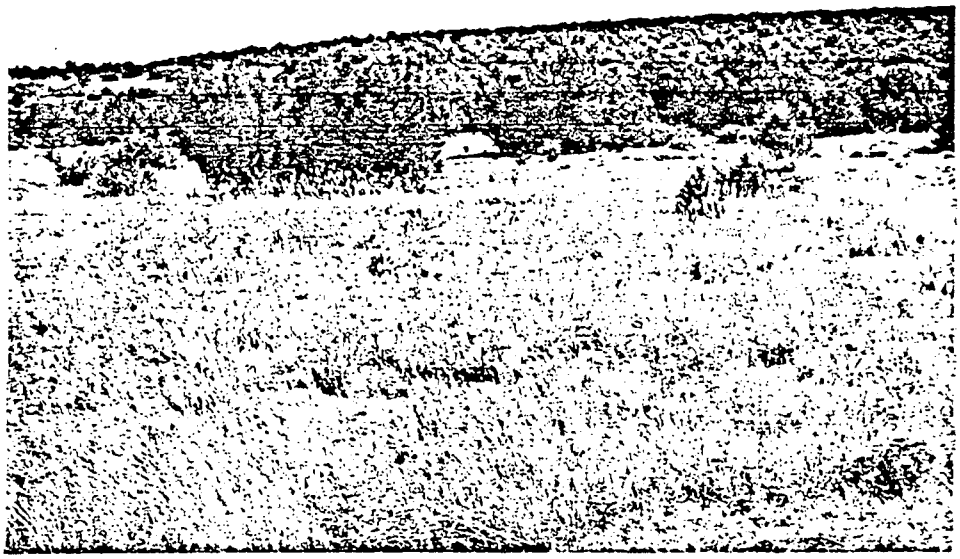


Photo 6. An island of little bluestem (Andropogon scoparius) is surrounded by side-oats grama (Bouteloua curtipendula) in a sandy swale within the JUMO/BOGR Habitat Type.

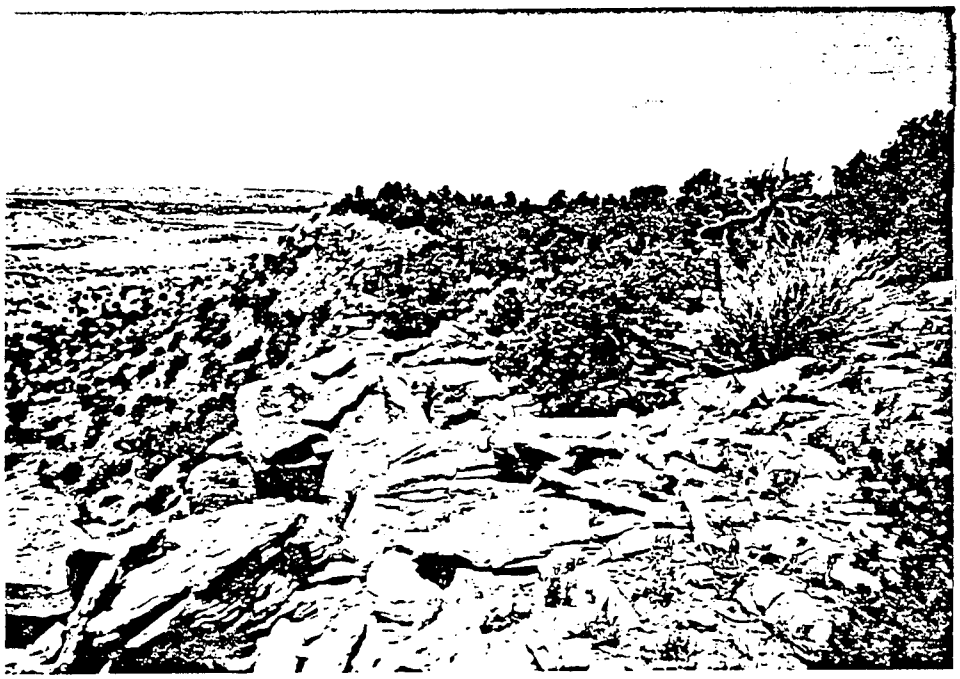


Photo 7. West escarpment of Mesita de los Ladrones. The isolated ponderosa grove is on the center skyline.

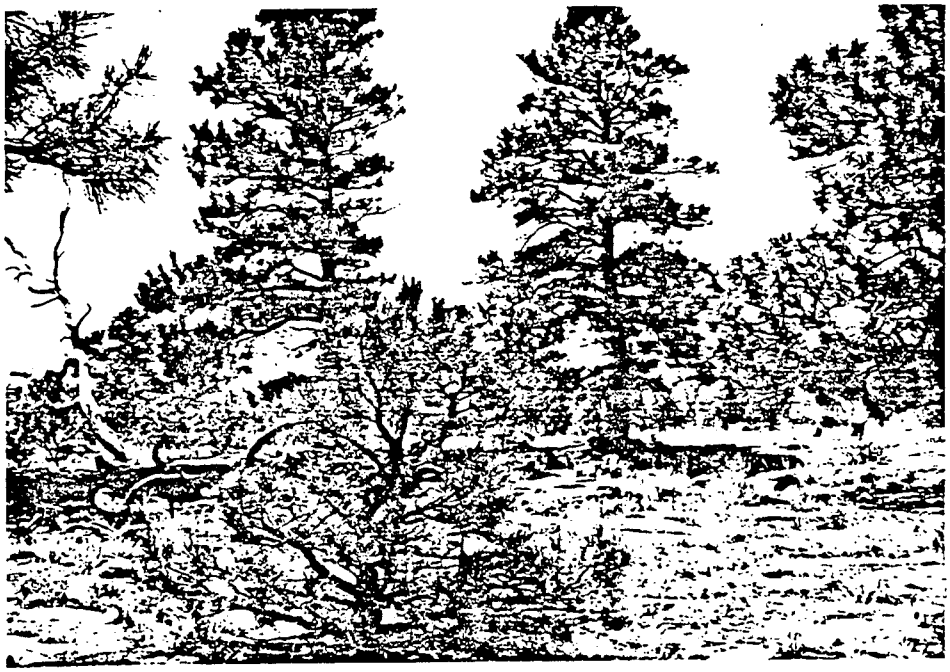
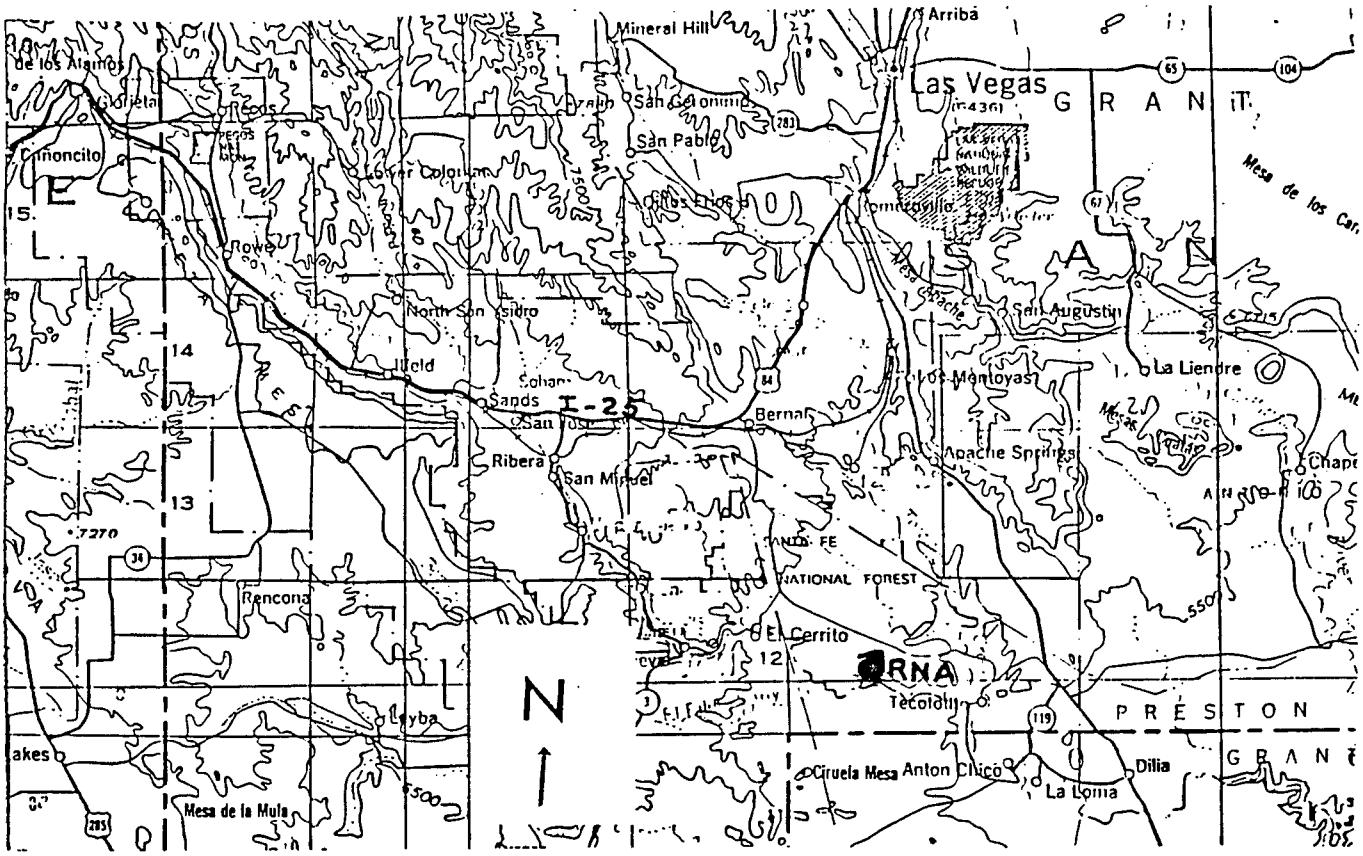


Photo 8. A sandstone outcrop midway along the west rim of the RNA supports a grove of reproducing Pinus ponderosa, PIPO/Rockland Habitat Type.

Photo 9. The remains of a rock structure typical of those made by early sheepherders exists just east of the ponderosa grove.



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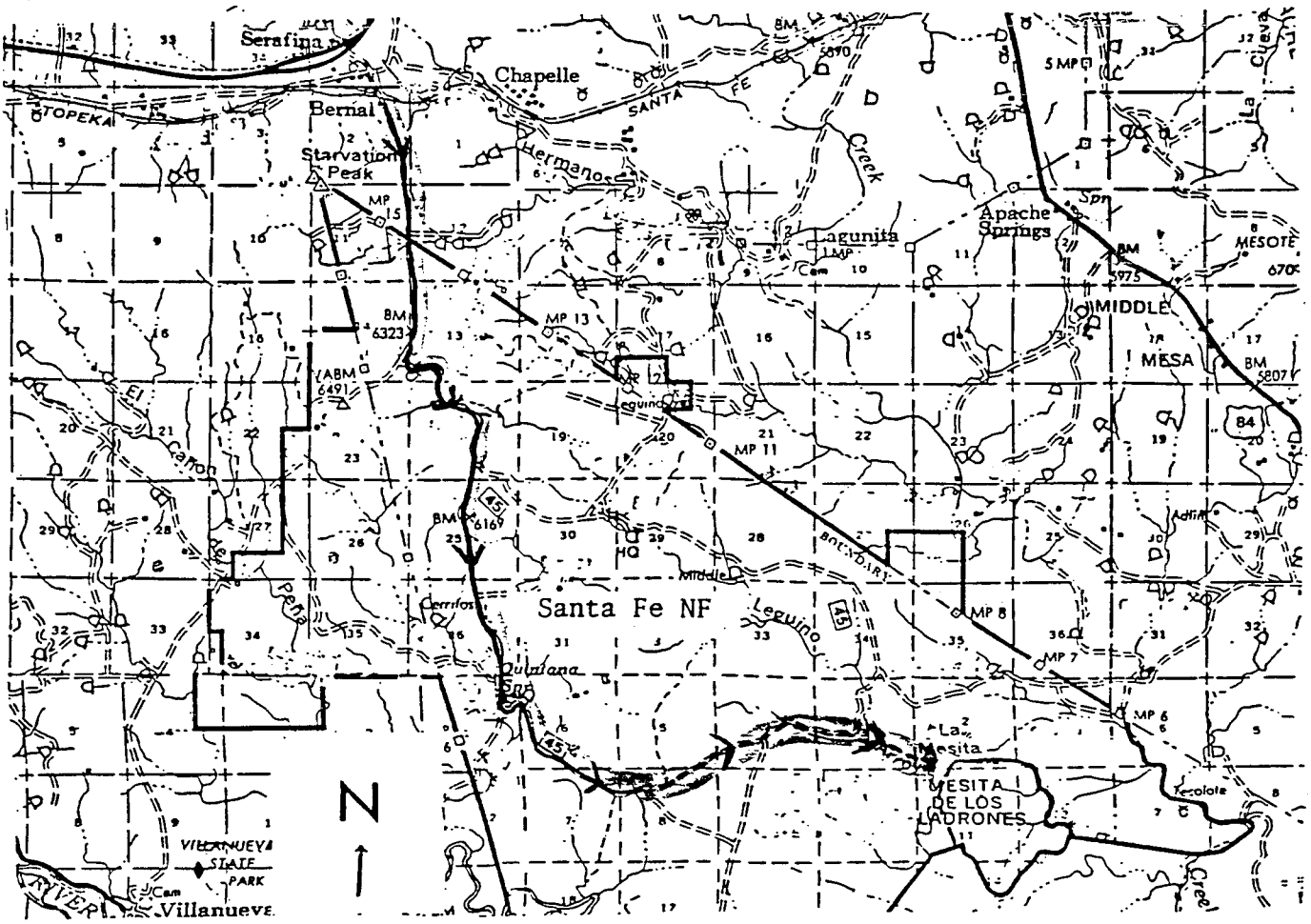

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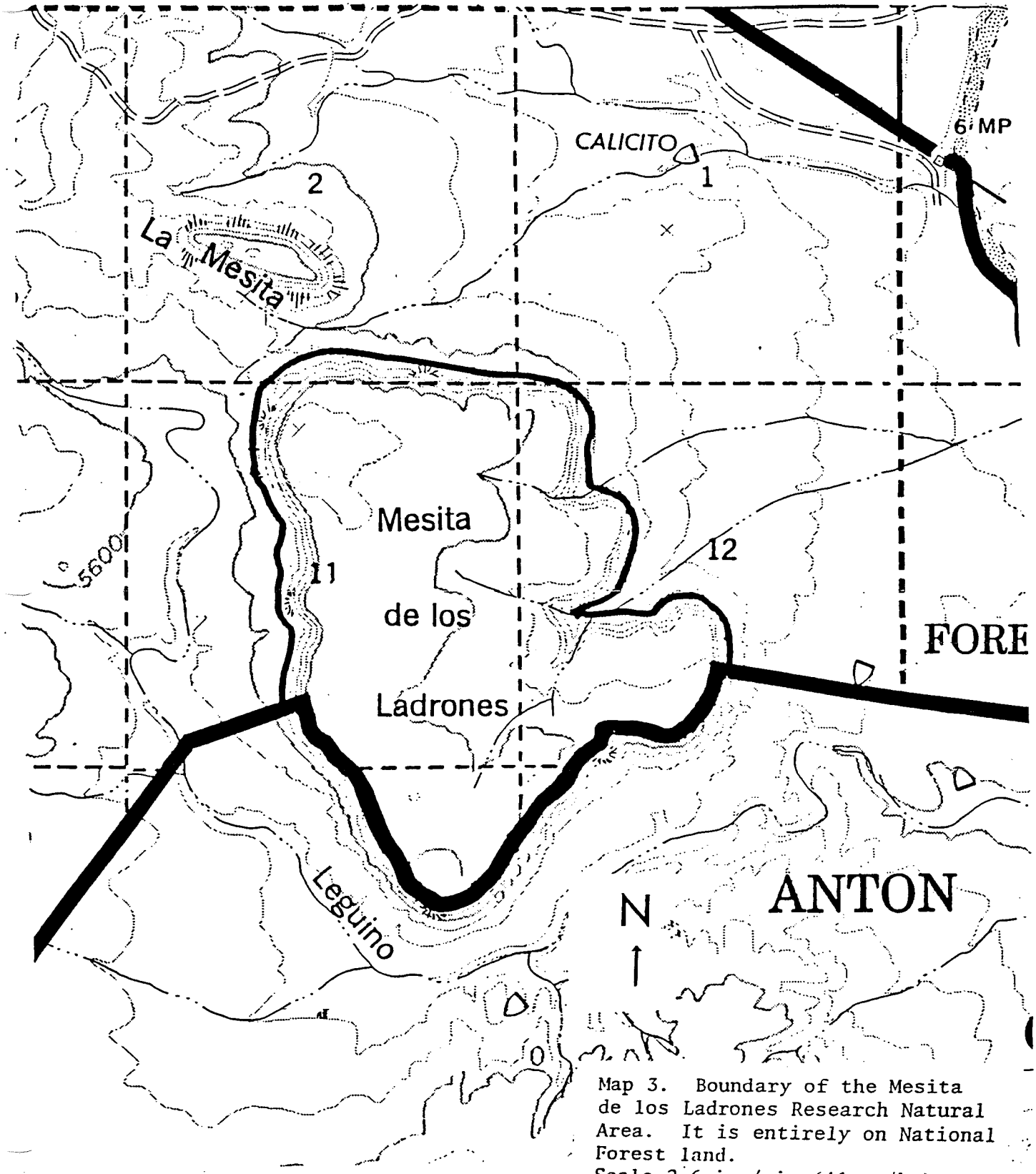

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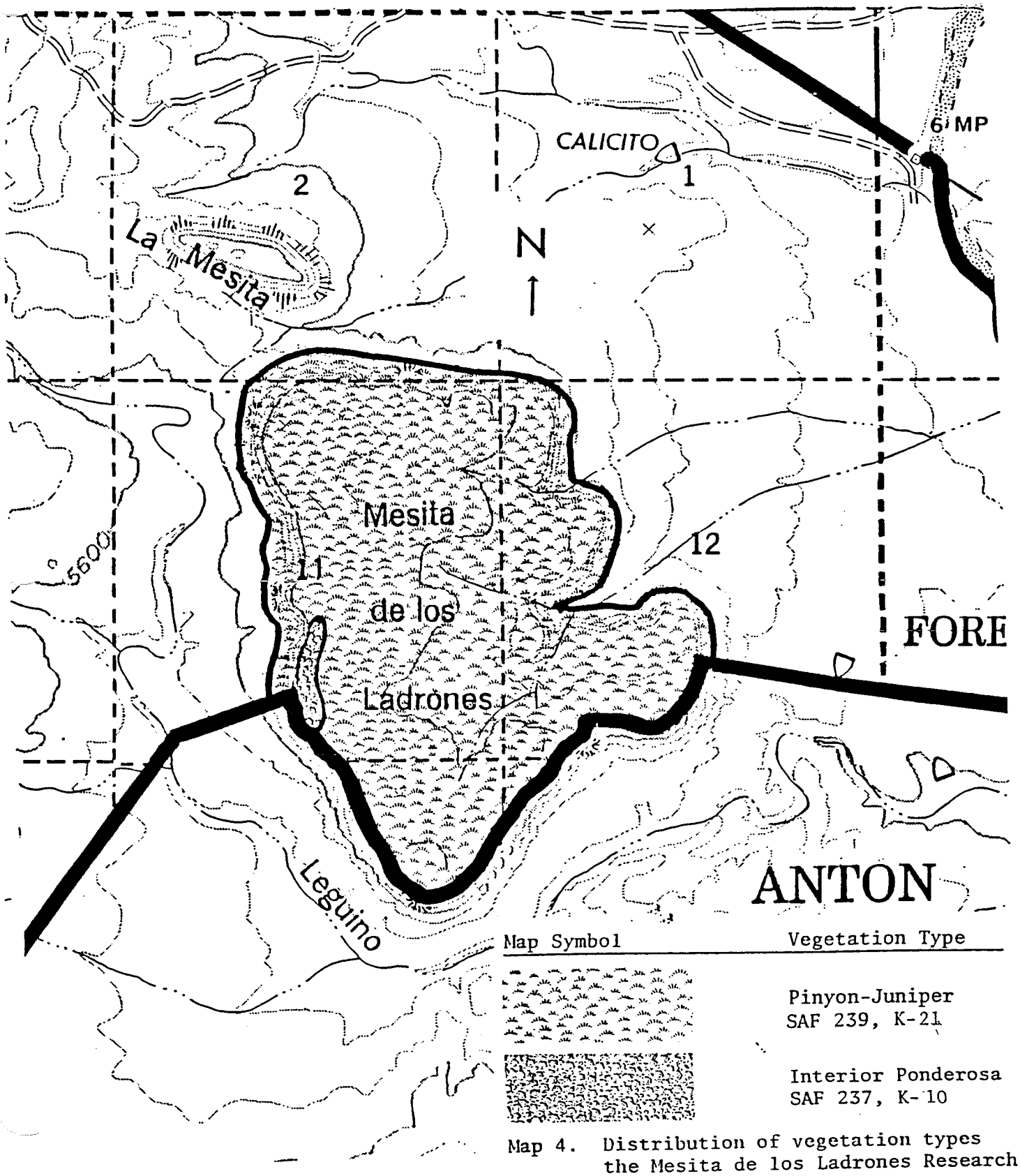

Map Symbol	Vegetation Type
	Pinyon-Juniper SAF 239, K-21
	Interior Ponderosa SAF 237, K-10

Map 4. Distribution of vegetation types the Mesita de los Ladrones Research Natural Area.

United States Department of Agriculture | Forest Service | WO

Typical of past comments

Reply to: 4060-3 (TMR)

Date: August 9, 1989

Subject: Mesita de los Ladrones and Five Other RNA Establishment Records

To: Reggie A. Fletcher, Ecologist, Southwestern Region
Earl F. Aldon, Project Leader, Rocky Mountain Station

Thank you for submitting six Research Natural Area (RNA) proposals and for requesting a careful review of them so that this review may guide you in preparing future RNA Establishment Records. I've taken you at your word and reviewed these Establishment Records carefully. Following are my observations:

Enclosed, along with the establishment record (original and 3 ?? copies), is the latest copy of FSM 4063. Your attention is called particularly to FSM 4063.41 (the entire section), but especially to the the first paragraph. Note use of the cover 6200-M7 and where the various parts are to be affixed (see 1. Maps and Photographs and 3. Signature Page). See also 5. Text, which states that all of the underlined titles that follow are to be used in the Establishment Record (and, from the first paragraph under 4063.41, "in the sequence listed").

The Establishment Records were not assembled and the Establishment Record for the Haufer Wash RNA had no photos and had the maps included in the text rather than affixed to the back of the front cover. The original copy is to contain all original materials (the original signature page was in one of the copies in several of the Establishment Records; see 4063.42). We do not have the staff nor the time to assemble Establishment Records nor to search for the original material. The better shape these Records are when they arrive, the faster they are going to be reviewed and processed. We process them in the order in which they arrive unless they are in poor shape; in that case, we take first those that are in the best shape. In the recent past, Establishment Records from R-3/RM have been in poor shape because the FSM was not followed. This batch is much improved. It really does not take that much longer to follow the Manual, and it precludes aggravation and extra work by all concerned. We know you realize this and mention it here only for emphasis.

The enclosed Form FS-1600-1 mentions that the pictures were made from slides. No slides were enclosed. The pictures are really good. Send the slides.

The Designation Order used was not from the latest amendment of FSM 4063. Your letter said a new Designation Order had been prepared. No matter on this item since the Code of Federal Regulations changed in February necessitating yet another change in the Designation Order. I've modified the copy in the FSM enclosed so that it conforms to the copy that was approved only last week. A Manual revision is being processed and may be out in about a month.

The section "Land Management Planning" on page 1 in most of the Establishment Records states that the proposed RNA is in a draft version of the Forest Plan (January 1986 or thereabouts). I suspect that they may have been approved within the last few years. If so, the information in this section should be made current because, unless the proposed RNA is in an approved Forest Plan, a separate Environmental Impact Statement will have to be prepared--and you don't need to do that.

There is no "Objective" on page 1 of the Establishment Records. It should follow "Land Management Planning." This may not have been a requirement at the time the Establishment Record was prepared, so do not rewrite page 1. But do include an "Objective" in future Establishment Records.

At the first mention of a common and scientific name, the source of the document for the name should be footnoted on that page. "E. L.Little, Jr. 1979. Checklist of United States Trees. . .Agric. Handb. 541" is the Forest Service authority for tree names. This information should be footnoted.

See FSM 4063.41 5.e.(3). Lands said that all the boundary descriptions are OK, but that one or two could be improved somewhat. Your Regional Surveyor or Regional Engineer might want to talk with Tom Neenan of WO-Lands about future boundary descriptions (FTS 235-2495).

Under "Location" (Access)--What is the mode of travel (car, horse, 4WD, shanks-mare)? Are the roads all-season roads? Also under" Location"--How large an area is the RNA (acres and hectares)? I know this info appears in the "Introduction," but it belongs here also (see the FSM).

What is the distance and direction to the nearest weather station (climatological installation)? What is the length of the Record? Was the climatological data compiled from the Southwestern Region Terrestrial Ecosystem Survey taken from weather station data? If so, so state; it's not clear.

Grazing--Will fencing be done or won't it? Be definite! Maintained? By whom?

Transportation Plan--"No roads will be built within (or immediately adjacent to) the RNA." Be definite! Make the decision now, so it is on record.

Utility Corridor Plan--State that "No corridors will be permitted within or immediately adjacent to the RNA."

Management Plan--delete "if degredation results" from sentence 2. If degredation results, then it's too late.

Vegetation Management Plan--Do not leave items for future decisions, else this is not a Plan. Remember that the Management Plan for this RNA contained in the Establishment Record will be substituted for the one presently in the Forest Plan. 1) Outline the Fire Management Plan in this Establishment Record. Incidentally, what is a prescribed burn from an unplanned ignition? 2) Decide

now whether or not a fence will be constructed. If livestock encroachment is likely either now or in the future, build the fence. Don't wait until after damage is done. It may be too late then.

Remember that no duplicate samples of flora and fauna may be collected and that a special permit is needed to collect specimens of rare and endangered species. It is for these reasons that the herbarium and the museum where these samples will be available for use by other researchers should be identified. Where does a body go to examine the specimens?

Actually, these Establishment Records are in pretty good shape. It shouldn't take much to bring them up to snuff. I look forward to reviewing the final drafts. Thanks again for requesting the review--it shows that y'all're on the right track and that future Establishment Records will probably be in great shape. If any changes are needed then, we will probably be able to make them over the phone, using pen and ink.

My only advice is to carefully read and then follow FSM 4063, specifically the directions under 4063.41 and 4063.42. If you would like a sample Establishment Record to use as an example, contact Chuck Wellner in R-1, FTS 8-208-882-3557 (Office) or 0567 (Home). He's a volunteer at the Intermountain Station, 1221 S. Main, Moscow, Idaho 83843, and has been establishing RNAs since the 1930's. You'll find no one more knowledgeable.

Herewith enclosed are your six RNA Establishment Records; I've left tabs on several of the Establishment Records to help locate items. Unfortunately, I did not do this on all of them, nor at all locations.

Russell M. Burns

RUSSELL M. BURNS, Coordinator
Forest Service RNA Program

Enclosures (6)

Historic Changes in the Piñon-Juniper Vegetation Type in the Negrito Creek Watershed, Gila National Forest

A Research Proposal

Prepared By

Mark E. Miller
Department of Geography
New Mexico State University

29 May 1993

TABLE OF CONTENTS

INTRODUCTION

Vegetation by its very nature is dynamic (Miles 1979, Burrows 1990). Over thousands of years, dramatic vegetation changes can and have occurred as a consequence of climatic changes, soil development, migration of species, and evolutionary developments (e.g., see review by Baker 1983). Over shorter periods of time, on the order of 0 to 1000 years, vegetation characteristics and patterns may change as a result of biotic influences (i.e., plant and animal interactions), climatic fluctuations, or abiotic disturbance events (e.g., fires and storms) which alter the availability of resources within a community (Vale 1982, Sousa 1984, White and Pickett 1985).

Human activities also can have significant impacts on vegetation (e.g., Bahre and Bradbury 1978, Bahre 1991). Activities such as mining, logging, clearing for agriculture, building roads, and developing urban areas generally have dramatic and easily recognizable effects on vegetation (Vale 1982). Yet even the wide-open, "natural" landscapes of western North America have undergone extensive vegetation changes as a result of the introduction of exotic species (Harris 1966), livestock grazing (Madany and West 1983), the alteration of fire regimes (Cooper 1960), and recreational use (Cole 1981). Many of the changes attributable to these activities are subtle and go unrecognized by casual observers; nevertheless, they are so widespread that "A person amid vegetation that might seem to be entirely natural would most likely be surrounded by a plant cover that is a cultural artifact" (Vale 1982:1).

It is important that we develop a greater understanding of human contributions to vegetation change. Among the reasons warranting such an improved understanding is the increased emphasis on the conservation of biological diversity (Salwasser 1991). Vegetation often is used as an indicator of biodiversity since it can serve as a basis for predicting the distributions of animals that depend on certain vegetation types or associations (Scott et al. 1991). Thus human impacts on vegetation not only can affect the diversity of plant species in a community but can affect the diversity of other life forms by altering the spatial or structural characteristics of the vegetation (Begon et al. 1986). The ability to distinguish human-caused changes from patterns of natural variability is especially important within wilderness areas, parks, and preserves where management objectives typically are to maintain biodiversity, natural ecosystem processes, and landscape conditions as they existed

prior to the arrival of Europeans (White and Pickett 1985, Vale 1987, Vankat and Major 1978, Vale 1977).

Yet because of their limited extent, areas such as parks and preserves cannot be depended on as the sole foci of efforts to conserve biodiversity (Salwasser 1991). In the western United States, public lands managed for multiple uses by agencies such as the U.S. Department of Agriculture's Forest Service (USDA Forest Service) may be relatively more important to the conservation of biodiversity because of their much greater extent (ibid.). Such multiple-use areas increasingly are being managed to restore and protect natural ecosystem processes while at the same time continuing to meet a variety of traditional human resource needs (ibid.). In the Southwest, for example, new approaches to the management of public multiple-use lands (such as "Ecology Based Multiple-use Management"—USDA Forest Service 1992) emphasize the maintenance of biological diversity but also recognize the ongoing dependence of rural communities on the resources found on public lands. A better understanding of how past human activities have affected vegetation on specific portions of public lands is essential for managers and the public in the future to conserve both natural biodiversity and rural communities that depend on those lands.

This document proposes a study of historic changes in the piñon-juniper vegetation type in the Negrito Creek watershed southeast of Reserve, New Mexico. This watershed is on multiple-use lands within the Gila National Forest and is the site of a cooperative project designed to demonstrate sustainable ecosystem management on a landscape scale. The purpose of the proposed study is to address two research questions of fundamental importance to establishing the historical context for the larger project. First, how has the piñon-juniper vegetation type within the watershed changed since the area was first settled by Europeans in the late nineteenth century? Second, how have human land-use activities contributed to the changes that have occurred? In addition, during the course of the vegetation-change study I propose to evaluate piñon-juniper communities in the watershed for their potential designation as Research Natural Areas (RNAs) for future comparative studies.

STUDY AREA

The Negrito Creek watershed lies within the Gila National Forest in west-central New Mexico (Figure 1). Geographically, the 52,000-hectare watershed is bounded to the north by the Tularosa Mountains, to the east by the Continental Divide, to the south by the Mogollon Mountains, and to the west by the San Francisco River. This region lies at the southeastern end of the Mogollon Rim, a broadly elevated escarpment that

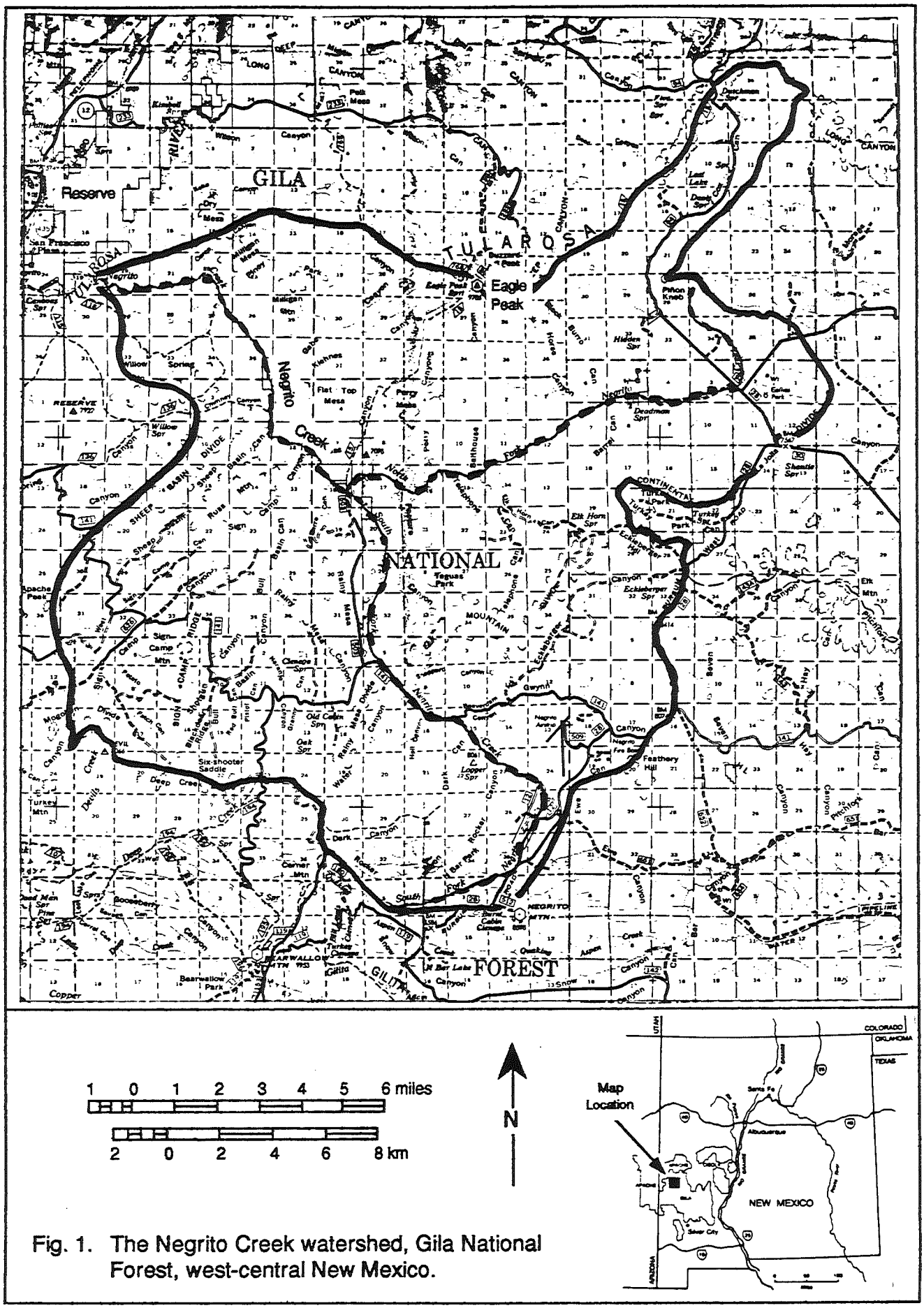

Fig. 1. The Negrito Creek watershed, Gila National Forest, west-central New Mexico.

trends southeastward from north-central Arizona to southwestern New Mexico. Elevation in the study area ranges from 1750 meters (5740 feet) where Negrito Creek joins the Tularosa River, to 2983 meters (9784 feet) at the top of Eagle Peak. Temperatures in the nearby town of Reserve, elevation 1783 meters (5847 feet), vary annually from an average minimum of minus 21.6° C. to an average maximum of 37.4° C. (Williams 1986). Average annual precipitation in Reserve is 40.6 cm; about 46 percent of this typically occurs as a result of convective thunderstorms during the months of July through September (ibid.). Based on 38 years of record, about 60 percent of all years receive less than the average amount of precipitation (ibid.).

Hill et al. (1992) recently developed a habitat-type classification system for piñon-juniper communities found in the Gila National Forest. Two sample plots within the Negrito watershed were both classified as the same habitat type—one dominated by*Pinus edulis* and *Juniperus deppeana* with *Quercus grisea* in the shrub layer and *Muhlenbergia dubia* in the ground layer (ibid.). *Bouteloua gracilis* also is an important graminoid in this habitat type, typically accounting for a greater percentage cover than *M. dubia* (ibid.).

BACKGROUND

A considerable body of literature exists on vegetation dynamics and human impacts on vegetation. To help set the context for the proposed study, this section provides a brief review of vegetation change in general and, more specifically, of human impacts on the piñon-juniper vegetation type of western North America.

Factors Influencing Vegetation Change

Vale (1982) grouped the majority of natural, ecological influences on vegetation characteristics (i.e., composition, structure, spatial and temporal distribution) into five broad categories. These are (1) regional climate, which largely is responsible for the provision of energy and moisture required by vegetation; (2) topography, which often acts to modify the local microclimate; (3) soil, which affects moisture availability and usually is the medium through which the chemical requirements of vegetation are met; (4) biotic influences, which include herbivory and plant-plant competition; and (5) disturbance events, which may alter the microclimate, soil, or biotic interactions (ibid.).

Of these five groups of factors, human activities most often affect vegetation by changing natural disturbance patterns (ibid.). A disturbance may be defined as "...any relatively discrete event in time that disrupts ecosystem, community, or population structure and changes resources, substrate availability, or the physical environment"

(White and Pickett 1985:7). This definition includes destructive events as well as environmental fluctuations (ibid.). Accompanying the concept of disturbance is that of a disturbance "regime" characteristic of a given type of disturbance in a natural system. A disturbance regime may be described by several measures, including spatial distribution, temporal frequency, predictability, size (area affected per event), magnitude, and synergism (influence of the disturbance on the occurrence of other disturbances) (ibid.). Examples of human-caused alterations of natural disturbance regimes include the reduction of fire frequencies that have accompanied both fire suppression efforts in western forests and the removal of ground fuels by overgrazing of rangelands. Trampling of vegetation by recreational users and logging are examples of the introduction by humans of new disturbances (ibid.).

Human Impacts on Piñon-Juniper Communities

Despite the widespread perception that piñon-juniper communities throughout the West have changed greatly since the settlement period, only a few quantitative studies have been conducted; no studies have been published regarding changes in habitat types found in the Gila National Forest. Findings of research conducted in other piñon-juniper habitat types found in the West suggest that increases in woodland densities generally are attributable to reductions in fire frequencies both as a consequence of active suppression efforts and the reduction in ground fuels following livestock grazing, as well as the coincident reduction in grass competition due to grazing (Johnsen 1962, Blackburn and Teller 1970, Burkhardt and Tisdale 1976, West 1988, Dick-Peddie 1993). In some cases woodland communities also have expanded into mid-elevation grasslands as a result of these same alterations of disturbance regimes (Johnsen 1962, Blackburn and Teller 1970, Burkhardt and Tisdale 1976). In a study using the technique of rephotography, Sallach (1986) concluded that most woodlands in New Mexico have not increased in range over the past 100 years, but many have increased in density; she attributed some of the increases in density to the recovery of woodlands that were cut over for fuel wood and mine-shaft materials in the nineteenth century. Increases in woodland density have consequences for wildlife species such as deer, elk, turkey as well as for livestock (Springfield 1976).

METHODS

To assess site-specific, historic changes in the piñon-juniper vegetation type in the Negrito Creek watershed, I propose to use several methods in combination. These include measurement of changes in the spatial distribution and density of the

vegetation type through analysis of sequential aerial photographs, analysis of within-type vegetation dynamics by use of size structure data obtained for tree species rooted in 600-m^2 study plots, and comparison of current conditions in the study area with those documented during nineteenth-century land surveys. Results of these analyses will be evaluated by comparisons with climatic data, land-use and fire histories, and relevant literature pertaining to the theoretical and empirical aspects of vegetation change in the region. In addition, I propose to compare data collected in the study area with similar information (e.g., areal extent and density from aerial photographs, and size-structure data) collected from the Largo Mesa RNA located between Reserve and Quemado in the Apache National Forest.

Analysis of Sequential Aerial Photographs

I propose to use aerial photos taken during surveys in years 1950 and 1992 to document shifts in the distribution of the vegetation type. Type boundaries will be delineated on acetate sheets covering the photographic prints and then will be transferred to mylar sheets overlaying 1:24,000 orthophoto base maps of the entire watershed (available from the Forest Service); separate vegetation overlays will be produced for each of the two years. The minimum map-unit size will be approximately 100 m^2 on the ground, which corresponds to 17.4 mm^2 on a 1:24,000 scale map and 1 mm^2 on a 1:100,000 scale map. Vegetation map overlays will be suitable for future incorporation into a Forest Service geographic information system (GIS) at a scale of 1:100,000.

Areal extent of the vegetation type will be measured by means of a polar planimeter, and differences in surface area between years will be determined by simple subtraction. I will count numbers of trees intercepted by randomly located 0.5-km transects superimposed on the photographs in order to quantify changes in tree density over time. Sample size (number of transects per type) will be determined by plotting the running mean against the number of transects sampled. The null hypothesis of no change in tree density over time will be tested by use of the nonparametric Wilcoxon paired-sample test of means (Zar 1984).

Sampling Within Study Plots

In order to make inferences about the current dynamic status of the type, I will sample stand composition and structure in 600-m^2 (20 m x 30 m) study plots (Daubenmire 1968, Vale 1982). Plots will be located throughout the range of the type in the watershed; specific locations will be selected on an objective basis after photo

interpretation. Within each plot, I will record the species and diameter at root crown (drc, less than 30 cm above the ground) of all trees rooted in the plot. Trees less than 1 m in height will be categorized as seedlings. Sample size (number of plots) will be determined in the field by maintaining a running diameter-class distribution for trees of the dominant species in the type. The sample size will be considered adequate when the relative shape of the distribution does not change appreciably with additional plots; a minimum of sample size of 15 plots is expected. Cumulative size-structure data for species occurring in the vegetation type will be interpreted in the context of theoretical and empirical relationships between age structure and population and community dynamics (e.g. Daubenmire 1968, Parker and Peet 1984).

Use of Surveyor's Field Notes

To supplement the data obtained from aerial photographs and ground plots, I propose to attempt to replicate vegetation samples recorded by surveyors of the General Land Office during their surveys of the study area in 1891 and 1892. Copies of the surveyors' original field notes are available on microfiche at the Las Cruces Bureau of Land Management office; data included in them represent the earliest available quantitative information on vegetation in the watershed. At all township corners and at many section corners within the study area, surveyors recorded the species (in general terms—pine, piñon, oak, or juniper), diameter, distance, and bearing of the nearest tree in each of the four quadrants surrounding the survey corner (the point-centered quarter method of sampling). A qualitative description of grass and other understory vegetation also was recorded in most cases. By following the surveyors' tree-selection process and repeating their measurements, I can quantify differences in species composition and mean distances (density) of these so-called "bearing trees" (assuming enough sites can be relocated to obtain an adequate sample size) as well as qualitatively assess changes in grass and understory cover. I propose to coordinate with Forest Service surveyors to relocate and sample current vegetation at as many survey corners as is possible. Use of Forest Service GPS (global positioning system) equipment in the field likely would aid in the relocation of sample points.

Three types of analyses can be conducted using quantitative data obtained by this method and grouped according to current vegetation type. Assuming an adequate sample size, the hypothesis of no change in tree distance (a measure of relative density) in a given vegetation type over time will be evaluated by means of a paired sample t test. For this test, the 4 distance measures obtained at each sample point will

first be averaged to obtain a single value per point. Chi-square analysis will be used to evaluate the null hypothesis of no change over time in the relative-frequency distribution (i.e., composition) of tree species selected by the point-centered quarter method. Chi-square analysis also will be used to evaluate null hypotheses of no change over time in size-class distributions for each common species.

Synthesis and Comparison with Other Data

Finally, to assess the influence of land-use activities on changes in piñon-juniper communities in the watershed, I propose to analyze my findings in the context of several other sources of information. These include land-use records (e.g., grazing, fuel-wood cutting, and fire histories) of the Forest Service, climatic data from the town of Reserve (precipitation data are available from the mid-1920's to the present), and dendroclimatic data available from the University of Arizona's Laboratory of Tree-Ring Research (much of the dendroclimatic data for the Gila National Forest region are based on samples taken from Rainy Mesa in the Negrito watershed—C. Baisan, personal communication).

The assessment of the impact of various land-use activities on vegetation in the Negrito study area clearly would be made much more rigorous by comparing changes there with those found in an area where the same vegetation types have not been subjected to the same human activities. Thus I propose to compare my results from the Negrito analyses with similar measurements made in the piñon-juniper type found in the Largo Mesa RNA. Given the small size of the Largo Mesa site (~ 121.4 hectares), measurements there likely will be limited to changes in density (from aerial photographs) and size structure (from ground plots). Because the piñon-juniper habitat type found on Largo Mesa (*Juniperus monosperma* phase of the *Pinus edulis/Bouteloua gracilis* type) differs from that found in the Negrito watershed, comparisons likely will be limited to qualitative discussions of temporal changes in density and current dynamic status.

Assessment of Potential RNA Sites

In conjunction with the vegetation-change study, I propose to evaluate piñon-juniper communities in the Negrito watershed for potential RNA-designation. Assessments will be made on the basis of aerial photo analysis, size-structure plots, and consultation with Forest Service ecologists. Areas recommended for further consideration as RNAs will be those which appear from the vegetation-change analyses to have been least disturbed by human activities due to their remote location

and distance from water. (See Budget page for estimated costs associated with RNA assessment.)

CONCLUSIONS

Vegetation change is a continuous process in nature. Human activities, generally by altering natural disturbance regimes, can significantly influence patterns of change. These human-related impacts in turn may have consequences for the maintenance of natural ecosystem processes and biodiversity, as well as for the sustainable livelihood of rural communities. A thorough analysis of vegetation change and an assessment of how changes are related to human land-use activities can provide a vital historical and ecological context for innovative management strategies designed to conserve both biodiversity and rural lifestyles.

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Estimated budget for project.

Labor

Task	Person Days	Rate	Amount
Photo Preparation and Interpretation*	30	$56/day†	1680.00
Photo Analysis*	5	$56/day	280.00
Field Work, Vegetation Change Study*	30	$56/day	1680.00
Field Work, RNA Assessment*	10	$56/day	560.00
Data Compilation and Analysis**	15	No Charge	0.00
Synthesis and Report Writing**	90	No Charge	0.00
		Subtotal, Labor	4200.00

Materials

Photocopies of literature, data forms - 2000 pp. @ 10¢/page		200.00
Telephone communications (Las Cruces-Reserve)		100.00
Acetate/Mylar		100.00
Miscellaneous Supplies		150.00
	Subtotal, Materials	550.00

Travel

Ground transportation (Las Cruces-Reserve) (10 round trips, 5000 miles at 25¢ per mile)	Subtotal, Travel	1250.00

Final Report Production

Printing, 10 copies of 150 pp. @ 10¢/page		150.00
Binding fees, 10 copies @ $8.00/copy		80.00
	Subtotal, Report Production	230.00
	TOTAL	6230.00

* work to be conducted in Reserve or in the field

** work to be conducted in Las Cruces

† $7/hour

Study plan: Small Patch Structure in Pinyon-Juniper Ecosystems in Research Natural Areas of the Southwest.

Prepared by Juanita A. R. Ladyman and Esteban Muldavin

New Mexico Natural Heritage Program

July 10, 1993

Summary.

The purpose of this study is to describe the spatial patterns of vascular plants and cryptogamic crusts in relation to surface components (soils, debris), landscape position, and stand structure in relatively low disturbance pinon-juniper woodlands. Vascular plant pattern will be sampled and analyzed at the scale of 0.5 meters and greater. Gross cryptogamic pattern will be analyzed at that scale, but also will be sub-sampled at a finer grain (1 cm) following the procedures and guidelines from the 1992 study.

Study Site.

Mesa at Mesita des Ladrones Research Natural Area (RNA) in north eastern New Mexico. The mesa top is approximately 200 ha in size and contains two small drainages that gently drain the mesa at 2-5% slope to the south, with a low divide that runs approximately half along the mesa from east to west. The vegetaion is dominated by an dopen stand of one seed juniper along with scattered pinyon, and intervening valleys bottoms dominated by blue grama and New Mexico needlegrass grasslands. A detailed description of the study area can be found in the Establishment Record for the RNA available (USFS, unpublished report, Region 3).

Sampling Methods.

The gently rolling topography of the study area is expected to exert an influence on vegetation expression, along with microsite soil differences and species competition. To incorporate this landscape structure, two 750m transects will be laid out at approximately right angles to the water courses across the mesa, running from divide, through the main channel over to the next divide. The transects ends will be permanently marked with stakes at each end, and at 100 meter intervals. Each stake will located within five meter accuracy using a global positioning system. This will allow later accurate positioning on USGS maps and associated aerial photos. Permanent markers will provide for long term monitoring for pattern change.

The percent canopy cover of vascular plants by species will be estimated along the each transect line in 1500 contiguous 50 cm x 20 cm quadrats (laid end to end). Also the percent surface cover of soil, gravel, rock, total cryptogam cover and total vascular plant basal area will be estimated.

Tree stand structure and spatial pattern will be measured on larger, but co-incident quadrats along the lines. A total of 75, 10 X 20m quadrats will be laid side by side along each transect. Measurements will include diameter at root grown to the nearest 5 cm and height to the nearest half meter of conifer species.

The measurement of micro-scale cryptogam pattern will follow methods detailed in the 1992 study of cryptogamic performed on two other New Mexico mesa top RNA's (Ladyman et. al. 1993). A live tree that will be relatively close proximity to its neighbors stand will be chosen. This will be denoted as the "central tree". North, South, East, and West compass bearings will be determined. In each quadrant a line unobstructed by canopy cover will be taken to a live tree. There will be a total of 16 lines (8-12m length each), 4 in each quadrant.

For all transects, the exact distance on a line between a live tree and a tree unobstructed by canopy will be measured and the cover on the transect will be recorded. The tape measure, graduated in mm, will be placed at ground level for the measurements. The spatial position of microphytic crust, vascular plant species, litter, dead trees and bare ground on the line will be recorded. Vascular plants will sampled for future, positive species identification. Basal and canopy area of grasses, and canopy area of forbs and shrubs will be measured. In each case influence of canopy on microphytic crust can then be estimated. Litter will be classified as either a) woody debris (obvious twigs) or b) needles etc. The degree of decomposition of dead trees on the line will also be noted. In addition, vascular plants within 0.5m of the line will be noted as a means of judging species diversity in the area. The height, diameter, and canopy cover over the line, of the central tree and the live tree at the end of the respective lines will be measured. Representative portions of cryptogams will be taken in paper bags for identification later. Where possible the mosses and lichens will be classified according to their morphological characteristics.

Field work will be carried out in July and August and possibly late September if the weather permits.

Analysis

Spatial pattern analysis will utilize quadrant-variance methods and sliding window boundary analysis for detecting pattern of species distributions at different scales as described by Ludwig and Reynolds (1988). Pattern will be related to environmental/biological factors using multi-variate correlation and regression techniques.

Cryptogamic micro-scale pattern will be analyzed according to the procedures outlined in Ladyman et al. (1993). Percentage-cover of the different components of the line will be analyzed by multi-variate analysis methods and such data will be related back to the data collected in 1992 which was analyzed by placing the transect lines of different lengths into like classes and testing the variation in percentage-cover among the classes by analysis of variance (ANOVA) after arc-sine transformation of the data. Lines will also be subdivided into 1m line lengths and the cover analyzed as percent cover on each subdivision and reviewed on a per line basis. Direct comparisons will made with the 1992 results that will include testing if :

a. crusts are less abundant in areas that have a dead tree.
b. crusts are absent in open clearings.
c. there is an association between the presence of grass and microphytic crusts.
d. there is a positive association between the presence of pebbles and microphytic crusts.
e. aspect influences crust abundance.

Report submission.

The final report will be submitted on December 31st, 1993.

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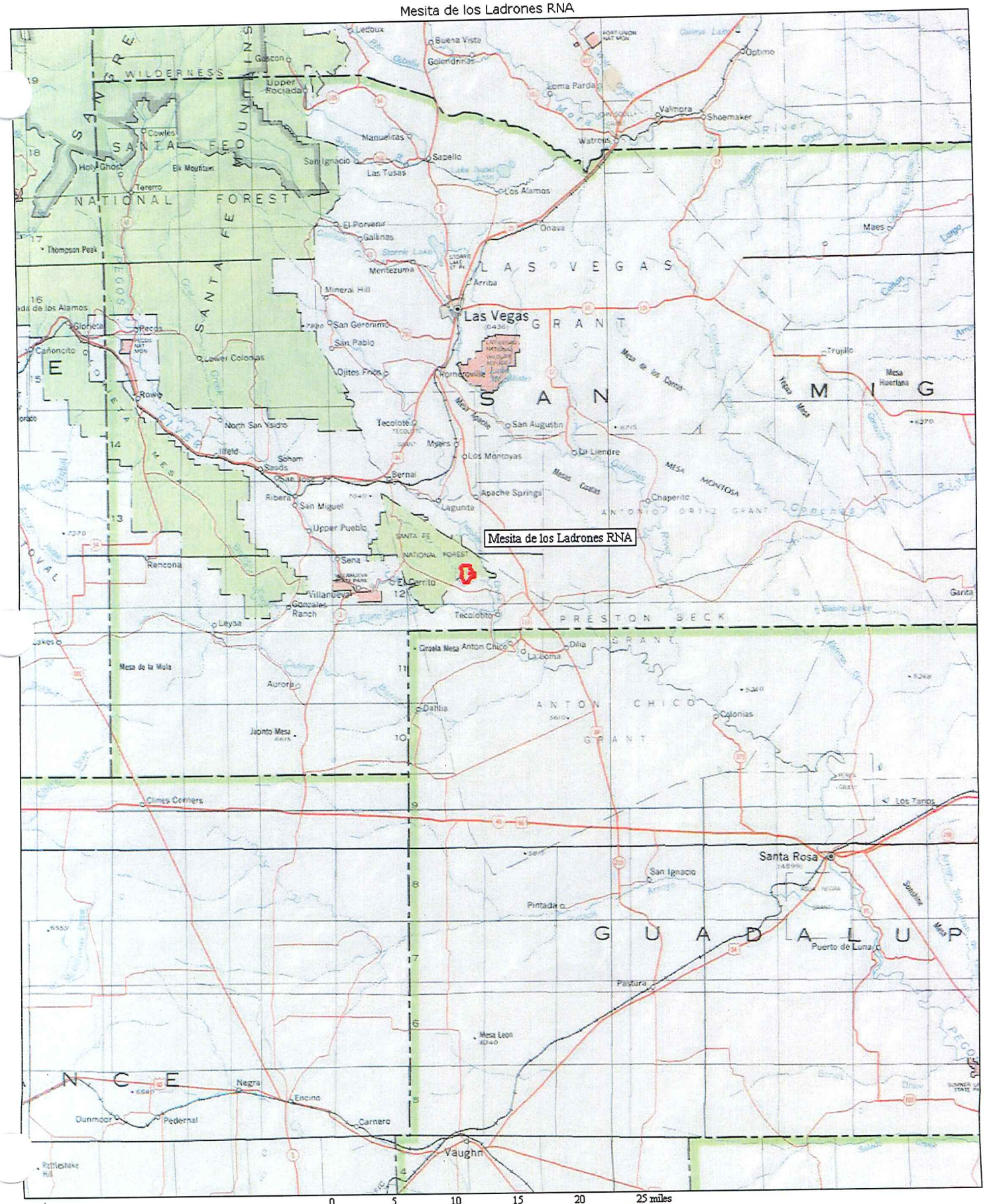
Mesita de los Ladrones RNA



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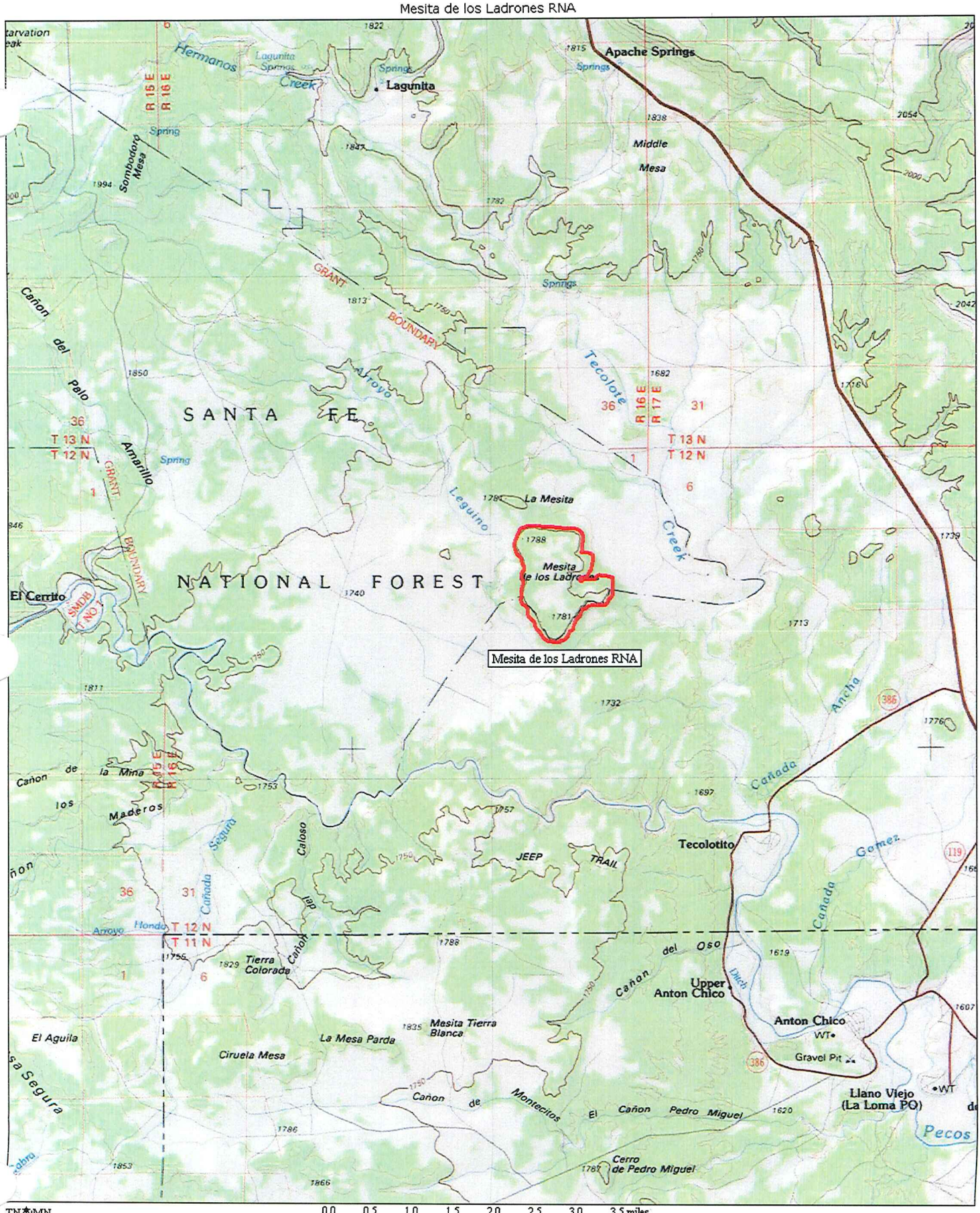

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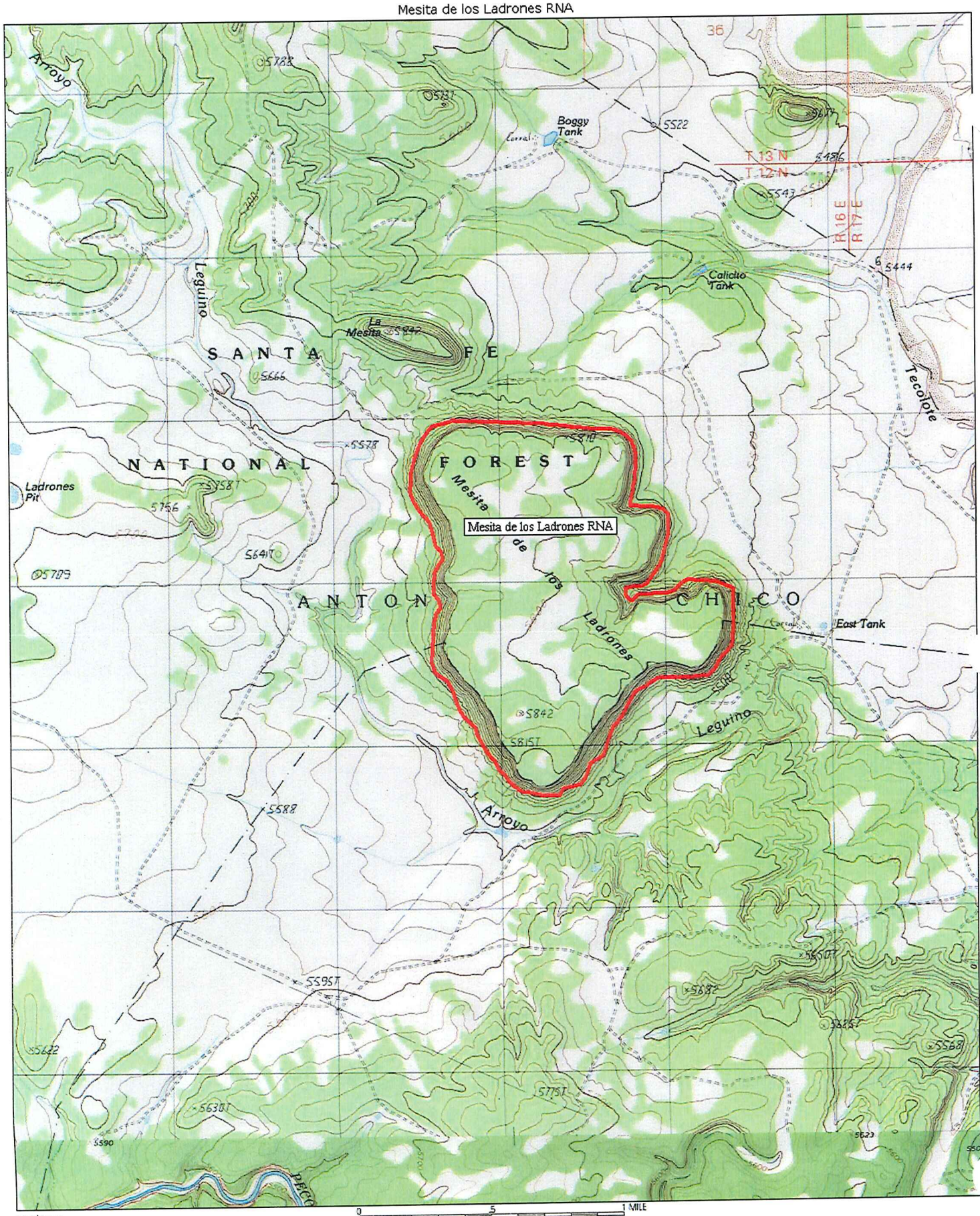

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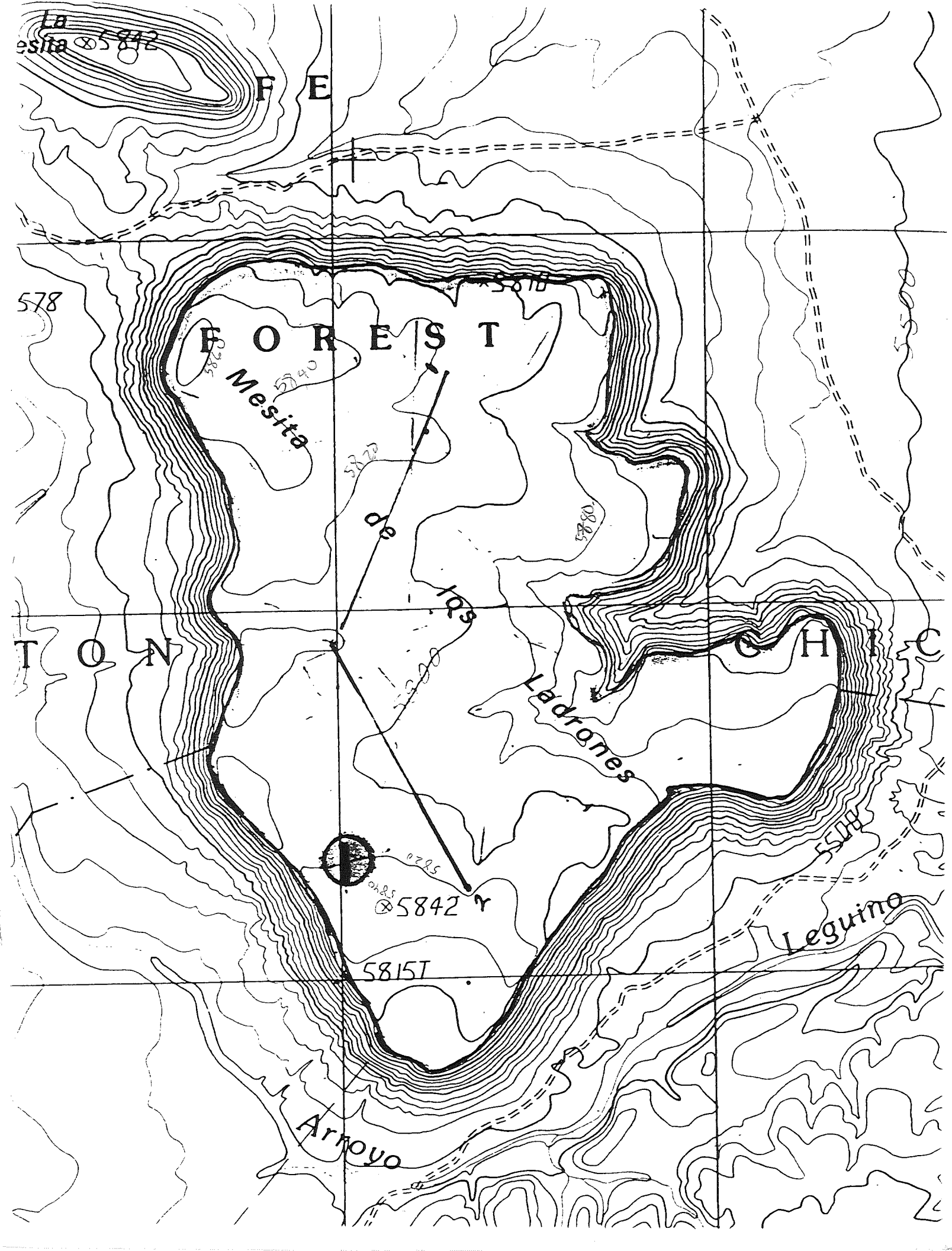
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				ALL: New Mexico Santa Fe NF Las Vegas Distr. San Miguel Co.		ALL: 24x36mm color slides
1			8-21-86		Southeast from Access Road FS 45, Mesita de los Ladrones on distant skyline	
2			8-21-86		East escarpment of the mesa exibiting Juniperus monosperma, Pinus edulis and Quercus undulata	
3			8-21-86		Grassland opening within one-seed juniper/blue grama habitat type on mesa top	
4			8-21-86		Immense, old, one-seed juniper on mesa top	
5			8-21-86		Island of Stipa neomexicana growing on calcareous soils	
6			8-21-86		Island of Andropogon scoparius surrounded by Bouteloua curtipendula	
7			8-21-86		West escarpment of Mesita de los Ladrones. Isolated ponderosa pine grove in background	
8			8-21-86		Ponderosa pine grove on sandstone outcrop on west rim of RNA	
9			8-21-86		Remains of rock structure on mesa top, east side of proposed RNA	