

Research Natural Area

Name: Little Water Canyon

Location:

State: NM County: Valencia Forest: Cibola District: Mount Taylor  
T. 10N R. 13W S. 4, 5, 6, 7; 31, 32, 33

Geology:

Description:

Major portion of area underlain by the Glorieta Sandstone: yellow, buff, well-bedded, friable sandstone with minor interbedded gypsum.

Small area at north end underlain by the Yasa Formation: orange-red siltstone and sandstone, minor white sandstone, a few thin beds of limestone in the upper part

Reference:

New Mexico State Highway Department, Geology And Aggregate Resources District 3; map 38: NM Hwy Dept, Santa Fe, NM.

Climate:

TES Gradient: LSC 6/8

Elev. 7900-8250

Precipitation:      Annual: 27 in. Warm season (May - Oct.) = 60%  
Cool Season (Nov. - Apr.) = 40%

Mean Annual Snow: 59 in.

Mean Temperature: Annual 39 °F Jul. 61 °F Jan. 20 °F

Freeze Free Period: 90 days

Mean Temperature: Annual      °F Jul.      °F Jan.      °F

Freeze Free Period:      days

Trewartha climate type: Dcbf = Temperate continental with cool summer and no dry season

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

Soils:

## DESIGNATION ORDER

By virtue of the authority vested in me by the Secretary of Agriculture under regulations at 7 CFR 2.42, 36 CFR 251.23, and 36 CFR Part 219, I hereby establish the Little Water Canyon Research Natural Area (RNA). It shall be comprised of approximately 910 acres of land in Cibola County, New Mexico, in the Mount Taylor Ranger District of the Cibola National Forest, as described in the section of the Establishment Record entitled "Location."

The Regional Forester recommended the establishment of an RNA ("Little Water Canyon") in the Record of Decision for the Cibola National Forest Land and Resource Management Plan (Forest Plan) in 1985. That recommendation was the result of an analysis of the factors listed in 36 CFR 219.25 and Forest Service Manual 4063.41. Results of the Regional Forester's analysis are documented in the Forest Plan and Final Environmental Impact Statement which are available to the public.

The Regional Forester has reexamined the Little Water Canyon area to examine whether the environmental effects of establishing the area as an RNA have not changed since 1985. This analysis is documented in the attached environmental assessment. Based on the analysis in the environmental assessment, it is my decision to adopt Alternative A, to establish Little Water Canyon as an RNA. Alternative A is selected because it provides long-term protection and recognition of a blue spruce streamside forest ecosystem. The Little Water Canyon RNA will be managed in compliance with all relevant laws, regulations, and Forest Service Manual direction regarding RNA's, and in accordance with the management direction identified in the Forest Plan.

The alternative considered was Alternative B, the "No Action" alternative which would continue management of Little Water Canyon as a "proposed" RNA. Alternative B was not selected because it would only provide short-term protection of the Little Water Canyon area.

Alternative B is consistent with the Forest Plan. Although the proposed action (Alternative A) is consistent with the management direction, it is not consistent with the land allocation for the Little Water Canyon area in the Forest Plan. The Cibola Forest Plan is hereby amended to change the allocation of the Little Water Canyon area from "Proposed" to Established RNA. This is a nonsignificant amendment of the Forest Plan (36 CFR 219.10(f)).

Legal notice of this decision will appear in the Federal Register. The Forest Supervisor of the Cibola National Forest shall notify the public of this decision and mail a copy of the Decision Notice and Designation Order to all persons on the Cibola Forest Plan mailing list.

It has been determined through the environmental assessment that the proposed action is not a major Federal action that would significantly affect the quality of the human environment; therefore, an environmental impact statement is not needed. This determination is based on the following factors (40 CFR 1508.27):

## **Finding of No Significant Impact**

### **A. Context.**

Although this is an addition to the national system of RNA's, both short-term and long-term physical and biological effects are limited to the local area.

### **B. Intensity**

1. There are no known effects on public health and safety.
2. There are no known effects on historic or cultural resources, actual or eligible National Register of Historic Places sites, park lands, prime farmlands, wetlands, or wild and scenic rivers. Effects on ecologically critical areas are minimal.
3. Effects on the human environment are not uncertain, do not involve unique or unknown risks, and are not likely to be highly controversial.
4. The action is not likely to establish a precedent for future actions with significant effects.
5. There are no known cumulative effects.
6. The proposed action would not adversely affect an endangered or threatened species or its critical habitat.
7. The proposed action is consistent with Federal, State, and local laws and requirements for the protection of the environment.

This decision is subject to appeal pursuant to 36 CFR Part 217. Two (2) copies of the Notice of Appeal must be in writing and submitted to:

The Secretary of Agriculture  
14th & Independence Ave., S.W.  
Washington, D.C. 20250

The Notice of Appeal prepared pursuant to 36 CFR 217.9(b) must be submitted within 45 days from the date of legal notice of this decision. Review by the Secretary is wholly discretionary. If the Secretary has not decided within 15 days of receiving the Notice of Appeal to review the Chief's decision, appellants will be notified that the Chief's decision is the final administrative decision of the U.S. Department of Agriculture (36 CFR 217.17(d)).

\_\_\_\_\_

Chief

\_\_\_\_\_

Date



ESTABLISHMENT RECORD

LITTLE WATER CANYON RESEARCH NATURAL AREA

USDA FOREST SERVICE  
SOUTHWESTERN REGION  
CIBOLA NATIONAL FOREST  
MOUNT TAYLOR RANGER DISTRICT  
CIBOLA COUNTY, NEW MEXICO

Prepared by: \_\_\_\_\_ Date \_\_\_\_\_  
William W. Dunmire, The Nature Conservancy  
Mollie S. Toll, Department of Biology,  
University of New Mexico

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
John Caffrey, District Ranger  
Mount Taylor Ranger District

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
C. Phil Smith, Forest Supervisor  
Cibola National Forest

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
John W. Russell, Chairman  
Southwestern Research Natural Area Committee

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
Sotero Muniz, Regional Forester  
Southwestern Region

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
Charles M. Loveless, Station Director  
Rocky Mountain Forest and Range Experiment Station

ESTABLISHMENT RECORD

for

LITTLE WATER CANYON RESEARCH NATURAL AREA

within

Cibola National Forest

Cibola County, New Mexico

## INTRODUCTION

The Little Water Canyon Research Natural Area (RNA) comprises approximately 910 acres (368.3 hectares) in the Zuni Mountains of west-central New Mexico. The proposed RNA is located in the Mount Taylor Ranger District, Cibola National Forest, in Cibola County, and is all acquired National Forest land.

Blue spruce (Picea pungens) streamside forest has been noted as an important ecosystem for protection within the RNA program (USFS Regional Guide, 1983: Table 3-1). Little Water Canyon was selected as an ideal solution to the search for representation of this forest type with a minimal use history. Its isolation and steep canyon sides have minimized both grazing by livestock and human disturbance. The present riparian environment shows little effect of the intensive logging experienced elsewhere in the Zuni Mountains in the early part of this century.

## LAND MANAGEMENT PLANNING

The need for representation of this biotic community was identified in the Southwestern Regional Guide (August 1983). The Cibola National Forest Plan (USFS 1985: 79-80) recommends that approximately 882 acres (356.9 hectares) of the Little Water Canyon in Management Area 8 and approximately 28 acres (11.3 hectares) in Management Area 14 be designated for establishment as a Research Natural Area, with establishment to be completed in Period 1. 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

Little Water Canyon Research Natural Area was identified primarily as an outstanding example of a blue spruce streamside forest ecosystem. This is an important forest ecosystem in the Southwest. The need to include such an ecosystem within the RNA network of the Southwestern Region has been stated in the Regional Guide (USFS 1983). The already mentioned factors of isolation and topography will continue to aid the preservation of a virtually pristine, riparian blue spruce forest making the area fairly easy to maintain.

## PRINCIPAL DISTINGUISHING FEATURES

The upper slopes are relatively open. About 40 per cent of the open areas is rock outcrop. Ponderosa pine and gambel oak dominate on lithic, skeletal soils derived from sandstone. As the canyon narrows and the canopy begins to close, Douglas-fir (Pseudotsuga menziesii) is encountered. Gambel oak (Quercus gambelii) is still prominent, but diversity increases and both Rocky Mountain juniper (Juniperus scopulorum) and aspen (Populus tremuloides) are found. Surface water is intermittent

below about 8,400 ft (2,560 m) and most of the canyon is dry. The stream becomes perennial in the blue spruce community which starts near 8,250 ft (2,515 m). Little Water Canyon is the type locality for the Picea pungens/Cornus stolonifera (blue spruce/red-osier dogwood) plant association, SAF 216, a major riparian blue spruce association of the southwestern United States. Several trees in Little Water Canyon come close to record sizes for the species. The understory has an impressive diversity of shrubs and herbaceous plants; 108 taxa have been recorded on a single visit.

Another noteworthy community is located on the lower slopes of Oso Ridge to the northeast. Here there are large specimens of gambel oak thriving amid swards of bluegrass (Poa pratensis) and occasional aspen on apparently deep cumulic swale soils.

### LOCATION

Little Water Canyon lies approximately 22 miles (35.4 km) west of Grants, New Mexico, in the Zuni Mountains (Maps 1 and 2). The proposed RNA is located predominantly on the Post Office Flat USGS 7.5' quadrangle, and includes parts of Sections 4, 5, 6, and 7 of Township 10 N, Range 13 W, and parts of Sections 31, 32, and 33 of Township 11 N, Range 13 W (Map 3). The approximate center of the RNA, taken to be the end of the primitive road in the upper portion of the canyon, is at latitude 35° 7'40"N, longitude 108° 14'13"W.

Easiest access to the RNA is via Forest Road 178, which heads south from Interstate 40 at Thoreau (Map 2). This road is paved for nearly 9 miles (14.4 km) and then becomes an all-weather road which parallels the south side of Bluewater Lake. It continues for another 13 miles (20.8 km) and then intersects with Forest Road 490, a dirt road. Go right at the intersection and travel about 4 miles (6.4 km) to the intersection with another dirt road, Forest Road 50. Turn left and proceed approximately one mile (1.6 km) to a primitive road off to the right. This road, traversable only by four-wheel drive vehicle, climbs toward the Continental Divide and enters Little Water Canyon RNA at its northernmost tip, slightly over a mile (1.7 km) from Forest Road 50. After less than another mile (1.5 km), the primitive road ends. The Divide itself, and Little Water Canyon on the other side, can be reached by foot.

An alternate route involves traveling south and then west on State Route 53 from Grants for about 27 miles (43.2 km). Turn right on Forest Road 50 and continue for approximately 14 miles (22.4 km) to the primitive road mentioned above.

The RNA is only 5 air miles (8.0 km) from the town of El Morro, but the roads from there are primitive and on private land. The old logging road down the west side in the Little Water Canyon drainage (Map 3) cannot be traversed by vehicle.

A boundary description of the proposed Little Water Canyon RNA is as follows:

Beginning at the bench mark 8191 on section boundary between Sections 32 and 33, T. 11 N., R. 13 W., NMPM, as designated on the USGS Post Office Flat, New Mexico 7.5 minute quadrangle;

THENCE, South, along said section boundary a distance more or less of 2,230 ft to a slope and a point at lat, 35 deg. 08 min. 15 sec., long. 108 deg. 13 min. 20 sec.;

THENCE, S 23 E, ascending a distance more or less of 1,280 ft to top of slope to a point at lat. 35 deg. 08 min. 04 sec., long. 108 deg. 13 min. 16 sec.;

THENCE, S 75 E, along a ridge to the Continental Divide a distance more or less of 1,900 ft and a point at lat. 35 deg. 07 min. 58 sec., long. 108 deg. 12 min. 54 sec.;

THENCE, S 70 W, along the Continental Divide a distance more or less of 1,540 ft to a point at lat. 35 deg. 07 min. 54 sec., long. 108 deg. 13 min. 12 sec.;

THENCE, S 70 W, along the Continental Divide a distance more or less of 1,640 ft to a point at lat. 35 deg. 07 min. 49 sec., long. 108 deg. 13 min. 31 sec.;

THENCE, N 58 W, along the Continental Divide a distance more or less of 560 ft to a point at lat. 35 deg. 07 min. 52 sec., long. 108 deg. 13 min. 36 sec.;

THENCE, S 33 W, descending to a trail a distance more or less of 720 ft and a point at lat, 35 deg. 07 min. 46 sec., long. 108 deg. 13 min. 42 sec.;

THENCE, S 44 W, along said trail a distance more or less of 525 ft to a point at lat. 35 deg. 07 min. 43 sec., long. 108 deg. 13 min. 46 sec.;

THENCE, South, along said trail a distance more or less of 425 ft to a point at lat. 35 deg. 07 min. 38 sec., long. 108 deg. 13 min. 45 sec.;

THENCE, S 68 W, along said trail a distance more or less of 360 ft to a point at lat. 35 deg. 07 min. 36 sec., long. 108 deg. 13 min. 50 sec.;

THENCE, South, along said trail a distance more or less of 625 ft to a point at lat. 35 deg. 07 min. 30 sec., long. 108 deg. 13 min. 50 sec.;

THENCE, S 52 W, descending along the ridge a distance more or less of 2,460 ft to a point at lat. 35 deg. 07 min. 13 sec., long. 108 deg. 14 min. 09 sec.;

THENCE, West, descending along said ridge a distance more or less of 1,020 ft to bench mark designated 8426 on USGS Valle Largo 7.5 minute quadrangle, a point at lat, 35 deg. 07 min. 12 sec., long. 108 deg. 14 min. 21 sec.;

THENCE, S 47 W, descending along said ridge a distance more or less of 1,380 ft to a point at lat. 35 deg. 00 min. 12 sec., long. 108 deg. 14 min. 32 sec.;

THENCE, S 88 W descending along said ridge a distance more or less of 1,180 ft, across said trail, to a point at lat. 35 deg. 06 min. 58 sec., long. 108 deg. 14 min. 45 sec.;

THENCE, S 54 W, descending along said ridge a distance more or less of 625 ft to a point at lat, 35 deg. 06 min. 57 sec., long. 108 deg. 14 min. 52 sec.;

THENCE, S 49 W, along said trail to a fork in the trail a distance more or less of 460 ft and a point at lat, 35 deg. 06 min. 54 sec., long. 108 deg. 14 min. 55 sec.;

THENCE, S 73 W, along west fork of said trail a distance more or less of 395 ft to a point at lat. 35 deg. 06 min. 53 sec., long. 108 deg. 15 min. 00 sec.;

THENCE, S 52 W, descending along said ridge a distance more or less of 1,280 ft, across said trail, to a point at lat. 35 deg. 06 min. 46 sec., long. 108 deg. 15 min. 10 sec.;

THENCE, N 74 W, along the ridge a distance more or less of 920 ft to a point at lat. 35 deg. 06 min. 48 sec., long. 108 deg. 15 min. 20 sec.;

THENCE, S 65 W, descending along the ridge a distance more or less of 950 ft to

unimproved road and a point at lat, 35 deg. 06 min. 45 sec., long. 108 deg. 15 min. 31 sec.;

THENCE, N 80 W, across the canyon a distance more or less of 1,050 ft to the confluence of Little Water Canyon and Water Canyon and a point at lat, 35 deg. 06 min. 51 sec., long. 108 deg. 15 min. 40 sec.;

THENCE, N 40 E, ascending to the ridge between Water canyon and Little Water Canyon a distance more or less of 750 ft to a point at lat. 35 deg. 06 min. 56 sec., long. 108 deg. 15 min. 35 sec.;

THENCE, N 33 E, ascending a distance more or less of 360 ft to a point at lat. 35 deg. 06 min. 59 sec., long. 108 deg. 15 min. 33 sec.;

THENCE, N 62 E, ascending a distance more or less of 855 ft to a point at lat. 35 deg. 07 min. 09 sec., long. 108 deg. 15 min. 23 sec.;

THENCE, N 26 E, ascending to said road a distance more or less of 1,970 ft and a point at lat, 35 deg. 07 min. 19 sec., long. 108 deg. 15 min. 12 sec.;

THENCE, N 55 E, ascending to the ridge a distance more or less of 755 ft and a point at lat, 35 deg. 07 min. 25 sec., long. 108 deg. 15 min. 04 sec.;

THENCE, East, along said ridge a distance more or less of 400 ft to a point at lat. 35 deg. 07 min. 24 sec., long. 108 deg. 15 min. 00 sec.;

THENCE, S 80 E, along said ridge a distance more or less of 725 ft to a point at lat. 35 deg. 07 min. 23 sec., long. 108 deg. 14 min. 52 sec.;

THENCE, N 42 E, ascending to said road a distance more or less of 750 ft and a point at lat, 35 deg. 07 min. 28 sec., long. 108 deg. 14 min. 46 sec.;

THENCE, North, ascending a distance more or less of 2,495 ft to a point at lat. 35 deg. 07 min. 57 sec., long. 108 deg. 14 min. 43 sec.;

THENCE, N 27 E, ascending to said Continental Divide a distance more or less of 2,985 ft and a point at lat, 35 deg. 08 min. 15 sec., long. 108 deg. 14 min. 27 sec.;

THENCE, S 60 E, along said Continental Divide a distance more or less of 3,805 ft to bench mark 8728 as designated on the USGS Post Office Flat, New Mexico 7.5 minute quadrangle and a point at lat, 35 deg. 08 min. 00 sec., long. 108 deg. 13 min. 48 sec.;

THENCE, N 16 E, descending to the bottom of the slope a distance more or less of 3,640 ft and a point at lat, 35 deg. 08 min. 34 sec., long. 108 deg. 13 min. 35 sec.;

THENCE, N 74 E, a distance more or less of 1,180 ft to bench mark 8191 as designated on the USGS Post Office Flat, New Mexico 7.5 minute quadrangle, a point at lat, 35 deg. 08 min. 38 sec., long. 108 deg. 13 min. 22 sec., and point of beginning of said tract.

#### AREA BY COVER TYPES

The distribution of cover types was determined from field surveys conducted in the fall of 1985 and the summer of 1986, and from interpretation of 1981 aerial photography. Table 1 outlines the estimated total areas of vegetation types based on Alexander et al. (1987) for plant associations, the Society of American Foresters forest type system (Eyre 1980) and the Küchler Potential Natural Vegetation system (Küchler 1964). Map 4 depicts the distribution of vegetation under these classification systems on the candidate research natural area.

Table 1. Estimated Areas of Vegetation Types in the Little Water Canyon Research Natural Area.

<u>Plant Association</u> <sup>1</sup>	Society of American Foresters <u>Cover Type</u> <sup>2</sup>	<u>Küchler PNV Type</u> <sup>3</sup>	Surface Area	
			<u>Acres</u>	<u>Hectares</u>
<u>Picea pungens/</u> <u>Cornus stolonifera</u> (Blue spruce/ red-osier dogwood)	SAF 216 Blue spruce	K-17 Mixed conifer forest	20	8.1
<u>Pseudotsuga menziesii/</u> <u>Quercus gambelii</u> (Douglas-fir/ Gambel oak)	SAF 210 Interior Douglas-fir	K-17	90	36.4
<u>Populus tremuloides</u> (Quaking aspen)	SAF 217 Aspen	K-17	10	4.0
<u>Pinus ponderosa/</u> rockland (Ponderosa pine/ rockland)	SAF 237 Interior ponderosa pine	K-18 Ponderosa pine forest	685	277.2
<u>Pinus ponderosa/</u> <u>Quercus gambelii</u> (Ponderosa pine/ Gambel oak)	SAF 237	K-18	130	52.6
<u>Pinus ponderosa/</u> <u>Festuca arizonica</u> (Ponderosa pine/ Arizona fescue)	SAF 237	K-18	80	32.4
<u>Pinus ponderosa/</u> <u>Purshia tridentata</u> (Ponderosa pine/ bitterbrush breaks)	SAF 237	K-18	60	24.3
		Totals:	1075	435.0

<sup>1</sup>Alexander et al. 1987<sup>2</sup>Eyre 1980.<sup>3</sup>Küchler 1964.

## PHYSICAL AND CLIMATIC CONDITIONS

The Zuni Mountains are situated in the southeastern portion of the Colorado Plateau physiographic province (USDA Soil Conservation Service 1976). The mountains are crossed by the Continental Divide from northwest to southeast. The Divide forms part of the boundary of Little Water Canyon RNA. A prominent feature of the landscape is Oso Ridge, a very high escarpment that extends nearly unbroken for many miles, crossing the northeastern part of the RNA. Elevation in the RNA ranges from a high of over 8,800 ft (2,682 m) along the Continental Divide, to a low of 7,900 ft (2,408 m) in the steep southwestern part of the canyon.

The top of Oso Ridge is fairly open, with considerable rock surface and shallow soils. To the east of the ridge there is a bowl with a small seep; to the north the lower, gentle reaches increase to greater than 15 per cent slopes higher up. Heading down (southwest) from Oso Ridge, the drainage starts to form an actual canyon. Here the canyon is never more than 100 yards (91 m) wide, and the sides are steeper than 30°. In the lower third or so of the watered stretch the canyon is more open.

The Zuni Mountain range constitutes a pocket of semi-humid climate in a vast area of semi-arid climate in west-central New Mexico. The nearest long term weather station is at McGaffey, about 20 miles (32 km) to the northwest at an elevation of 7,800 ft (2,377 m). Climatic data from El Morro National Monument, 6 miles (10 km) to the southwest at 7,225 ft (2,202 m) elevation, also provide reference points for conditions at the RNA (NOAA 1982). Detailed projections for the actual area of the Little Water Canyon RNA come from the Terrestrial Ecosystem Handbook (USFS 1986). Average annual rainfall for Little Water Canyon is estimated as 18-22 in (45.7-55.9 cm) by the Soil Conservation Service (1967) (Map 5) or as 27 in (68.6 cm) by the Forest Service (USFS 1986), and average annual snowfall as 59 in (150.0 cm; USFS 1986). Cool season precipitation (falling between November and April) accounts for 40% of annual precipitation. Mean annual temperature is 39° F (3.9° C), with a July average of 61° F (16.1° C) and a January average of 20° F (-6.7° C). The frost free period lasts an average of 90 days.

## DESCRIPTION OF VALUES

### Flora

A broad survey of vegetation types was conducted during the 1985 and 1986 field work. A brief review follows. Alexander et al. (1987) or USDA Forest Service (1986a) should be consulted for a more detailed description of the vegetative make-up of these Habitat Types (HT).

The blue spruce forest is confined to a narrow riparian zone within the lower two-thirds of Little Water Canyon inside the RNA. The blue spruce forest begins to show up at the point where the stream becomes perennial at approximately 8,250 ft (2,515 m) elevation. In much of the canyon bottom, the spruce is found in almost pure stands, with aspen common wherever openings occur. The only other occasional--to



common tree in the wet riparian zone is Douglas-fir. The shrubby understory is dominated by red-osier dogwood with Oregon grape (Berberis repens), rose (Rosa woodsii), western thimbleberry (Rubus parvaflorus), and chokecherry (Prunus serotina) fairly common components. Forbs and grasses tend to be poorly represented here with the exception of horsetail (Equisetum sp.), hairy brome (Bromus ciliatus), and sedges (Carex sp.).

At the lower end of the RNA on south-facing slopes with a limestone substrate, the vegetation is characterized as a Pinus ponderosa/Purshia tridentata HT. Besides ponderosa pine, common tree components of this shrubby pine-woodland forest include pinyon pine (Pinus edulis), alligator juniper (Juniperus deppeana), Rocky Mountain juniper (J. scopulorum), and Douglas-fir. Gambel oak is the principal shrub other than Purshia. Grasses are well represented, and include mountain muhly (Muhlenbergia montana), little bluestem (Andropogon scoparius), pine dropseed (Blepharoneuron tricholepis) and muttongrass (Poa fendleriana). Forbs are scarce here.

Outside the riparian zone, most of the south-facing slopes west of the Continental Divide have a sandstone substrate and are dominated by ponderosa pine, much of it a Pinus ponderosa/rockland HT. But within the habitat type are mosaics of Pinus ponderosa/Muhlenbergia montana HT parklands, often containing islands of little bluestem. Gambel oak is the commonest shrub throughout the ponderosa communities.

The candidate RNA includes a noteworthy Pinus ponderosa/Quercus gambelii HT on the lower slope of Oso Ridge east of the Continental Divide. Huge Gambel oaks are found on open meadows and flats codominated by ponderosa pine. These stands may well be the best example of Gambel oak in large tree growth form on forest lands in New Mexico. Aspen is the only other tree of any abundance on these flats with some of the trees being very old. Ground cover here is made up principally of graminoids including bluegrass (Poa pratensis), Canada bluegrass (P. compressa), spike muhly (Muhlenbergia wrightii), Agrostis sp., Agropyron sp., and Juncus sp. Under forest canopy cover, shrubs, such as whitestem gooseberry (Ribes inerme) and Fendler rose (Rosa fendleri) tend to be poorly represented. In the wet meadows shrubby cinquefoil (Potentilla fruticosa) is occasionally found. Where the north-facing drainage steepens toward Oso Ridge, the habitat type shifts into a Pseudotsuga menziesii/Quercus gambelii type.

There are no known threatened, endangered, or unique plant species on the proposed RNA.

The following plant list was compiled from field observations by Reggie Fletcher (USFS Regional Botanist, Southwestern Region) on June 16, 1982, and on September 3, 1984. It should be noted that these observations were made on the southwest side of Oso Ridge and the Continental Divide, and do not cover plant taxa that are limited to the Pinus ponderosa/Quercus gambelii and Pseudotsuga menziesii Habitat Types northeast of the divide.

Abbreviated Plant List for Little Water RNA<sup>1</sup>

<u>Latin Name</u>	<u>Common Name<sup>2</sup></u>	<u>Frequency<sup>3</sup></u>			
		PIPO	PIPODR	MCDR	MCR
GRASSES AND GRASS-LIKE PLANTS:					
<u>Agrostis alba</u>	Redtop bentgrass			I	R
<u>Agrostis scabra</u>	Rough bentgrass		C	C	
<u>Andropogon scoparius</u>	Little bluestem	C			
<u>Aristida glauca</u>	Blue three-awn	R			
<u>Blepharoneuron tricholepis</u>	Pine dropseed	C		I	
<u>Bromus ciliatus</u>	Hairy brome		C	C	C
<u>Calamagrostis inexplansa</u>	Northern reedgrass			C	
<u>Carex bolunderi</u>	Sedge	R			
<u>Carex foena</u>	Sedge				C
<u>Carex geophila</u>	Dryland sedge	R			
<u>Carex occidentalis</u>	Rocky Mountain sedge	I		I	I
<u>Carex rossii</u>	Sedge				R
<u>Carex wootonii</u>	Sedge		R	C	
<u>Cyperus fendlerianus</u>	Tuber flat-sedge	R			
<u>Danthonia sp.</u>	Oatgrass			R	
<u>Festuca arizonica</u>	Arizona fescue	R/C <sup>4</sup>			
<u>Glyceria striata</u>	Fowl mannagrass				C
<u>Juncus interior</u>	Inland rush	C	C	C	
<u>Juncus saximontanus</u>	Rocky Mountain rush			I	R
<u>Koeleria cristata</u>	Junegrass	C			R
<u>Muhlenbergia montana</u>	Mountain muhly	C			
<u>Panicum bulbosum</u> var. <u>minus</u>	Bulb panicum	R	R	C	
<u>Panicum scribnerianum</u>	Panicum	R			
<u>Poa fendleriana</u>	Muttongrass	R			R
<u>Poa pratensis</u>	Kentucky bluegrass	R			R
<u>Scizachne purpurascens</u>	False-melic				R
<u>Sitanion hystrix</u>	Bottlebrush squirreltail	R		R	
<u>Trisetum montanum</u>	Rocky Mountain trisetum				R

## FORBS:

<u>Achillea lanulosa</u>	Western yarrow	I		C	
<u>Aconitum columbianum</u>	Columbia monkshood				R
<u>Actaea arguta</u>	Western baneberry				C
<u>Agastache pallidiflora</u>	Horsemint	R	R		
<u>Allium cernuum</u>	Nodding onion			R	
<u>Allium geoyeri</u>	Geyer onion	C	C	C	
<u>Androsace septentrionalis</u>	Rockjasmine	R		R	
<u>Antennaria marginata</u>	Pussytoes	R		C	

		PIPO	PIPODR	MCDR	MCR
<u>Antennaria parvifolia</u>	Rocky Mountain pussytoes	C		C	
<u>Aquilegia chrysantha</u>	Golden columbine				R
<u>Arenaria confusa</u>	Sandwort	R			
<u>Aster commutatus</u>	Aster	I		I	
<u>Aster laevis</u> var. <u>geyeri</u>	Smooth aster			I	
<u>Astragalus mollissimus</u>	Wooly locoweed	I <sup>6</sup>			
<u>Bahia dissecta</u>	Ragleaf bahia	I			
<u>Campanula rotundifolia</u>	Bluebells	R		R	R
<u>Castilleja austromontana</u>	Paintbrush			R	
<u>Castilleja integra</u>	Wholeleaf paintbrush	R			
<u>Cerastium arvense</u>	Starry mouse-ear	C			
<u>Chrysopsis villosa</u>	Hairy goldaster			C	
<u>Cirsium inornatum</u>	Thistle			C	
<u>Cirsium wheeleri</u>	Calves thistle	R			
<u>Claytonia megarrhiza</u>	Bigroot spring beauty	R			
<u>Cologania longifolia</u>	Cologania	R			
<u>Commelina dianthifolia</u>	Birdbill dayflower	R			
<u>Conioselinum scopulorum</u>	Hemlockparsley			R	C
<u>Conyza canadensis</u>	Horseweed	R			
<u>Corallorhiza maculata</u>	Spotted coralroot			R	R
<u>Corallorhiza striata</u>	Hooded coralroot				R
<u>Cystopteris fragilis</u>	Weak bladderfern				R
<u>Descurainia californica</u>	California tansymustard				R
<u>Draba aurea</u> var. <u>aurea</u>	Golden draba			R	R
<u>Draba helleriana</u> var. <u>blumeria</u> <u>Draba</u>	R		R		
<u>Equisetum arvense</u>	Field horsetail				R
<u>Equisetum hiemale</u> var. <u>affine</u>	Scouring-rush horsetail			C	
<u>Erigeron divergens</u>	Spreading fleabane	C		R	
<u>Erigeron formosissimus</u>	Itchy fleabane	C			
<u>Erigeron platyphyllus</u>	Fleabane	R		C	I
<u>Eriogonum alatum</u>	Winged buckwheat	R			
<u>Eriogonum racemosum</u>	Redroot buckwheat	R <sup>6</sup>			
<u>Erysimum capitatum</u>	Western dognods	R			
<u>Eupatorium herbaceum</u>	White joe-pye-weed	R		R	
<u>Fragaria americana</u>	Strawberry				I
<u>Fragaria ovalis</u>	Wild strawberry			C	C
<u>Galium boreale</u>	Northern bedstraw			I	
<u>Gentiana plebeia</u>	Gentian			C	
<u>Geranium caespitosum</u>	Purple geranium				R
<u>Geranium richardsonii</u>	Big Dick geranium	R			
<u>Gnaphalium pringlei</u>	Cudweed	C		C	
<u>Habenaria sparsiflora</u>	Bog-orchid				C
<u>Helianthella parryi</u>	Parry wood-sunflower	R			R
<u>Hieracium fendleri</u>	Redtail hawkweed	R			
<u>Hymenopappus flavescens</u>	White ragweed	R			
<u>Hymenoxys richardsonii</u>	Pingue	R/I <sup>5</sup>			

		PIPO	PIPODR	MCDR	MCR
<u>Ipomopsis aggregata</u>	Skyrocket	I			
<u>Iris missouriensis</u>	Flag		R	I	
<u>Lathyrus arizonica</u>	Arizona peavine				R
<u>Linaaathastrum nuttallii</u>	Linaaathastrum	I			
<u>Lithospermum multiflorum</u>	Stoneseed			R	
<u>Lotus wrightii</u>	Red-and-yellow pea	C			
<u>Machaeranthera aquifolia</u>	Aster	R			
<u>Malaxis soulei</u>	Malaxis				
<u>Medicago lupulina</u>	Black medic				R
<u>Mertensia lanceolata</u>	Bluebells	R		R	R
<u>Monarda menthaefolia</u>	Mintleaf beebalm				R
<u>Monotropa latisquama</u>	Indian pipe			R	
<u>Oenothera villosa</u> ssp. <u>strigosa</u>	Primrose	R			
<u>Orobanche multiflora</u>	Broomrape	R			
<u>Osmorhiza chilensis</u>	Sweet cicely				C
<u>Osmorhiza depauperata</u>	Bluntseed sweet cicely				I
<u>Oxypolis fendleri</u>	Fendler cowbane				C
<u>Oxytropis lambertii</u>	Lambert crazyweed	R <sup>6</sup>			
<u>Pedicularis grayi</u>	Woodbetony				R
<u>Penstemon barbatus</u>	Beardlip			C	
<u>Penstemon linarioides</u>	Toadflax beardtongue	R			
<u>Penstemon whippleanus</u>	Whipple penstemon				R
<u>Petalostemon candidus</u>	Slender prairieclover	R			
<u>Phacelia heterophylla</u>	Caterpillar-weed			R	R
<u>Phlox longifolia</u>	Longleaf phlox	R		R	
<u>Plantago argyrea</u>	Silvery plantain	R			
<u>Potentilla concinna</u>	Elegant cinquefoil	R			
<u>Potentilla thurberi</u>	Sketch cinquefoil			R	
<u>Prunella vulgaris</u>	Selfheal			C	C
<u>Pteridium aquilinum</u>	Deadcow fern				C
<u>Pyrola asarifolia</u>	Pink wintergreen				
<u>Rudbeckia laciniata</u>	Cutleaf coneflower				I
<u>Rumex crispus</u>	Curly dock		R	R	R
<u>Saxifraga rhomboidea</u>	Saxifrage			R	
<u>Schistophragma intermedia</u>	Schistophragma	R			
<u>Sedum griffithsii</u>	Stonecrop	C			
<u>Senecio hartianus</u>	Groundsel			R	R
<u>Senecio neomexicanus</u>	Groundsel	C		C	
<u>Senecio wootonii</u>	Groundsel				R
<u>Silene laciniata</u>	Mexican silene	C			
<u>Silene scouleri</u> ssp. <u>pringlei</u>	Scours catchfly	R			
<u>Sisymbrium linearifolium</u>	Tumblemustard	R			
<u>Smilacina racemosa</u>	False Solomon's seal			R	I
<u>Smilacina stellata</u>	Starry smilac			R	I
<u>Solidago spathulata</u>	Goldenrod	R			

		PIPO	PIPODR	MCDR	MCR
<u>Solidago wrightii</u>	Goldenrod			I	
<u>Stellaria jamesii</u>	Tuber starwort				I
<u>Stellaria longipes</u>	Longstalk starwort	I			I
<u>Swertia radiata</u>	Deers-ears swertia				R
<u>Talinum parviflorum</u>	Flame flower	R			
<u>Taraxacum officinale</u>	Dandelion	R			R
<u>Thalictrum fendleri</u>	Fendler meadow rue	R		C	C
<u>Thelypodium micranthrum</u>	Thelypodium			R	
<u>Thermopsis pinetorum</u>	Piney goldenpea			I	R
<u>Tradescantia pinetorum</u>	Spiderwort	R			
<u>Tragopogon dubius</u>	Yellow salsify			R	
<u>Valeriana capitata</u> ssp.	Tobaccoroot				R
<u>Verbascum thapsus</u>	Flannel mullein	R			
<u>Vicia americana</u>	American vetch				I
<u>Viguiera multiflora</u>	Showy goldeneye	C		I	
PIPO PIPODR MCDR MCR					
<u>Viola adunca</u>	Hook violet				R
<u>Viola canadensis</u>	Canada violet	R			
<u>Viola nephrophylla</u>	Wanderer violet				R
<u>Viola pedatifida</u>	Larkspur violet				R
<u>Woodsia mexicana</u>	Rockfern	R		R	
<u>Zigadenas</u> sp.	Deathcamas			R	

#### HALF-SHRUBS, SHRUBS, AND TREES:

<u>Acer glabrum</u>	Rocky Mountain maple				R
<u>Alnus tenuifolia</u>	Thinleaf alder				
<u>Amelanchier goldmanii</u>	Serviceberry			I	I
<u>Artemisia campestris</u>	Western sagebrush				
<u>Artemisia carruthii</u>	Flat sage	C		I	
<u>Artemisia ludoviciana</u>	Mexican sage	C			
<u>Berberis repens</u>	Oregon grape	I		C	C
<u>Betula occidentalis</u>	Water birch				I
<u>Brickellia grandiflora</u>	Tassel brickellia			I	
<u>Ceanothus fendleri</u>	Buckbrush ceanothus	C			
<u>Cercocarpus montanus</u>	Mountain mahogany				
<u>Cornus stolonifera</u>	Red-osier dogwood			R	C
<u>Juniperus deppeana</u>	Alligator juniper	I/C <sup>7</sup>			
<u>Juniperus monosperma</u>	Oneseed juniper	C <sup>6</sup>			
<u>Juniperus scopulorum</u>	Rocky Mountain juniper	C <sup>6</sup>		C	
<u>Lonicera arizonica</u>	Arizona honeysuckle				R
<u>Opuntia phaeacantha</u>	New Mexico pricklypear	R			
<u>Pachystima myrsinites</u>	Mountain-lover			I	I
<u>Picea pungens</u>	Blue spruce			R	C
<u>Pinus edulis</u>	Pinyon pine	C	C		
<u>Pinus ponderosa</u>	Ponderosa pine	C	C	I	

		PIPO	PIPODR	MCDR	MCR
<u>Populus tremuloides</u>	Quaking aspen			R	C
<u>Potentilla fruticosa</u>	Shrubby cinquefoil			I	
<u>Prunus serotina</u> ssp. <u>virens</u>	Gila chokecherry			R	C
<u>Pseudotsuga menziesii</u>	Douglas-fir			C	C
<u>Purshia tridentata</u>	Antelopebrush		R/C <sup>4</sup>		
<u>Quercus gambelii</u>	Gambel oak	C	C	C	I
<u>Ribes pinetorum</u>	Orange gooseberry			R	I
<u>Rosa woodsii</u>	Rose		C	C	C
<u>Rubus parviflorus</u>	Western thimbleberry			R	C
<u>Rubus strigosus</u> var. <u>arizonicus</u>	Red raspberry			R	I
<u>Salix lasiandra</u>	Pacific willow				R
<u>Salix scouleriana</u>	Mountain willow			R	R
<u>Yucca baccata</u>	Datil yucca	R			
<u>Yucca baileyi</u>	Yucca	R <sup>6</sup>			

<sup>1</sup>Observed by Reggie Fletcher (USFS Regional Botanist, Southwestern Region) on June 16, 1982 and September 13, 1984.

<sup>2</sup>Common names follow USDA, Forest Service 1974.

<sup>3</sup>Relative abundance common (C), infrequent (I), or rare (R), by broad communities of Ponderosa pine (PIPO), Ponderosa pine dry riparian (PIPODR), Mixed conifer dry riparian (MCDR), and Mixed conifer riparian (MCR).

<sup>4</sup>Rare on Sandstone substrate, Common on Limestone substrate

<sup>5</sup>Rare of Sandstone, Infrequent on Limestone

<sup>6</sup>On Limestone

<sup>7</sup>Infrequent on Sandstone, Common on Limestone

## Fauna

No rare, endangered, or sensitive animal species are known to inhabit this area. The upper reaches of the RNA on the northeast side of the Continental Divide contain pockets of good occupied habitat for blue grouse (Dendragapus obscurus). The southern part of this portion of the RNA forms a bowl with dense mixed conifer and aspen. There is a small seep in the NW quarter of Section 4; this and the riparian blue spruce zone of Little Water Canyon provide good habitat for black bear (Ursus americanus). The western portion of the RNA is utilized by a small herd of elk (Cervus elepus). These numbered about a dozen animals in 1984.

The following animal list was derived from the RUN WILD III computer- stored data base (Lehmkuhl and Patton 1982; Patton 1979) from the following habitat types, for Cibola County, New Mexico:

1. Douglas-fir - White Fir series; Pseudotsuga menziesii - Mixed Conifer Association
2. Pine series

These habitat types currently in the data base most closely correspond to those occurring in the proposed RNA.

### Potential Animal List for Little Water Canyon RNA

#### Common Name

#### Latin Name

#### AMPHIBIANS:

Spadefoot, western

Scaphiopus hammondi

#### BIRDS:

Bluebird, mountain

Sialia currucoides

Bluebird, western

Sialia mexicana

Bushtit

Psaltriparus minimus

Chickadee, black-capped

Parus atricapillus

Chickadee, mountain

Parus gambeli

Cowbird, brown-headed

Molothrus ater

Creeper, brown

Certhia americana

Crossbill, red

Loxia curvirostra

Eagle, bald

Haliaeetus leucocephalus

Flicker, northern

Colaptes auratus

Flycatcher, olive-sided

Contopus borealis

Grosbeak, rose-breasted

Pheucticus ludovicianus

Grouse, blue

Dendragapus obscurus

Kingbird, Cassin's

Tyrannus vociferans

Kingbird, western

Tyrannus verticalis

Hawk, sharp-shinned	<u>Accipiter striatus</u>
Hummingbird, broad-tailed	<u>Selasphorus platycercus</u>
Junco, dark-eyed	<u>Junco hyemalis</u>
Kinglet, ruby-crowned	<u>Regulus calendula</u>
Martin, purple	<u>Progne subis</u>
Nighthawk, common	<u>Chordeiles minor</u>
Nutcracker, Clark's	<u>Nucifraga columbiana</u>
Nuthatch, pygmy	<u>Sitta pygmaea</u>
Nuthatch, red-breasted	<u>Sitta canadensis</u>
Owl, flammulated	<u>Otus flammeolus</u>
Owl, great horned	<u>Bubo virginianus</u>
Owl, long-eared	<u>Asio otus</u>
Owl, northern saw-whet	<u>Aegolius acadicus</u>
Phoebe, black	<u>Sayornis nigricans</u>
Pigeon, band-tailed	<u>Columba fasciata</u>
Robin, American	<u>Turdus migratorius</u>
Sapsucker, Williamson's	<u>Sphyrapicus thyroideus</u>
Sapsucker, yellow-bellied	<u>Sphyrapicus varius</u>
Siskin, pine	<u>Carduelis pinus</u>
Solitaire, Townsend's	<u>Myadestes townsendi</u>
Sparrow, chipping	<u>Spizella passerina</u>
Swallow, violet-green	<u>Tachycineta thalassina</u>
Swift, white-throated	<u>Aeronautes saxatalis</u>
Tanager, hepatic	<u>Piranga flava</u>
Tanager, western	<u>Piranga ludoviciana</u>
Thrush, hermit	<u>Catharus guttatus</u>
Towhee, rufous-sided	<u>Pipilo erythrophthalmus</u>
Turkey, wild	<u>Meleagris gallopavo</u>
Vireo, solitary	<u>Vireo solitarius</u>
Vireo, warbling	<u>Vireo gilvus</u>
Vulture, turkey	<u>Cathartes aura</u>
Warbler, Grace's	<u>Dendroica graciae</u>
Warbler, Virginia's	<u>Vermivora virginiae</u>
Waxwing, cedar	<u>Bombycilla cedrorum</u>
Woodpecker, acorn	<u>Melanerpes formicivorus</u>
Woodpecker, hairy	<u>Picoides villosus</u>
Woodpecker, Lewis'	<u>Melanerpes lewis</u>
Woodpecker, three-toed	<u>Picoides tridactylus</u>
Wood-pewee, western	<u>Contopus sordidulus</u>
Wren, canyon	<u>Catherpes mexicanus</u>
Wren, house	<u>Troglodytes aedon</u>

## MAMMALS:

Bat, pallid	<u>Antrozous pallidus</u>
Bat, silver-haired	<u>Lasiorycteris noctivagans</u>
Bear, black	<u>Ursus americanus</u>



Chipmonk, cliff	<u>Tamias dorsalis</u>
Chipmonk, Colorado	<u>Tamias quadrivittatus</u>
Coyote	<u>Canis latrans</u>
Deer, mule	<u>Odocoileus hemionus</u>
Elk	<u>Cervus elaphus</u>
Gopher, northern pocket	<u>Thomomys talpoides</u>
Lion, mountain	<u>Felis concolor</u>
Mouse, brush	<u>Peromyscus boylii</u>
Mouse, deer	<u>Peromyscus maniculatus</u>
Mouse, plains pocket	<u>Perognathus flavescens</u>
Mouse, western harvest	<u>Reithrodontomys megalotis</u>
Myotis, yuma	<u>Myotis yumanensis</u>
Porcupine	<u>Erethizon dorsatum</u>
Shrew, vagrant	<u>Sorex vagrans</u>
Squirrel, Abert's	<u>Sciurus aberti</u>
Squirrel, red	<u>Tamiasciurus hudsonicus</u>
Vole, long-tailed	<u>Microtus longicaudus</u>
Vole, Mexican	<u>Microtus mexicanus</u>
Woodrat, Mexican	<u>Neotoma mexicana</u>

#### REPTILES:

Lizard, short-horned	<u>Phrynosoma douglassi</u>
Lizard, tree	<u>Urosaurus ornatus</u>
Rattlesnake, western	<u>Crotalus viridis</u>
Snake, blackneck garter	<u>Thamnophis cyrtopsis</u>
Snake, gopher	<u>Pituophis melanoleucus</u>
Snake, ringneck	<u>Diadophis punctatus</u>
Whipsnake, striped	<u>Masticophis taeniatus</u>
Whiptail, Chihuahuan spotted	<u>Cnemidophorus exsanguis</u>
Whiptail, plateau striped	<u>Cnemidophorus velox</u>

#### Geology

Little Water Canyon lies within the Zuni uplift, which is the most faulted of the uplifts on the Colorado Plateau (Dane and Bachman 1965). The Zuni uplift is oval-shaped and runs northwest, covering an area some 75 by 30 miles (121 by 48 km). Precambrian rocks are exposed along the crest of the uplift north of Little Water Canyon. These are exposed by a wide band of Permian strata in which the Research Natural Area lies. Locally, these Permian outcrops are represented by the San Andres formation (limestone), and the Glorieta, Yeso, and Abo formations (all sandstones). The San Andres is the most recent of these formations. After it was deposited, the region was uplifted and eroded prior to deposition of Triassic strata (Gordon 1961, New Mexico Geological Society 1967).

The majority of the Research Natural Area consists of Glorieta sandstones, which are yellow or buff, well-bedded, and friable sandstones, with minor interbedded gypsum. These yield to San Andres limestone in lower Little Water Canyon for about one half mile (0.8 km) and to Yeso sandstones on the east side of Oso Ridge. Yeso sandstones are orange-red, with some white sandstone, and are found in this formation with orange-red siltstone and a few thin beds of limestone. The cross-section, reproduced below from USDA Soil Conservation Service (1967), helps to clarify the stratigraphic and surface relationships.

### Soils

Soils have not been specifically examined in the RNA. Generalizations which follow are made from regional data (USDA Forest Service 1986b).

Eutroboralfs are most extensive in this formation, and when forming on sedimentary parent material typically have fine sandy loam or loam surface layers and sandy clay or clay subsoils that rest on sandstone bedrock at a depth of 20-40 in (51-102 cm). Typic Eutroboralfs forming in materials of igneous origin are mainly on gently to strongly sloping and rolling uplands. These well-drained soils have a sandy loam or gravelly sandy loam surface layer about 12 in (30.5 cm) thick, neutral to slightly acid in reaction. A one to two inch (2.5-5.1 cm) layer of partially decomposed and undecomposed needles, twigs, and leaves commonly lies on the surface. Subsoils are reddish-brown or brown clay or heavy clay loam, about 15-20 in (38.1-50.8 cm) thick.

Argiborolls, the other extensive group of soils in this formation, are a minor component in the proposed RNA. When forming on fine-grained sandstone, and siltstones, these soils are characterized by their reddish-brown silt loam or stony silt loam surface layer, overlying a subsoil of reddish-brown silty clay loam. Soils may be frequently interrupted by rock outcrop on uplands. Where rock outcrop comprises about 50 - 90% of area, the Ponderosa pine/rockland habitat type occurs (pine is usually rooted in rock fissures).

### Lands

All the land in Little Water Canyon RNA was acquired from the George E. Breece Lumber Company on July 11, 1946 or from the State of New Mexico on February 2, 1954 (Map 6). In Township 10 N, Range 13 W, minerals are reserved to the State of New Mexico in Section 4, and in that portion of Section 6 acquired from the Breece Lumber Company. In Township 11 N, Range 13 W, Sections 31 and 33 have minerals reserved to Breece Lumber; in Section 32, land acquired from Breece Lumber has minerals reserved to the State of New Mexico. Sections 31, 32, and 33 have "right of way retained for any roads, trails, or easements not of record".

### Cultural

There are no known cultural resource sites within the RNA. No archeological projects have taken place within the proposed RNA. To the northeast of the RNA, a dump associated with the Serna homestead and an isolated chert flake have been recorded. No historic period sites (ranches, sawmills, homesteads, etc.) are shown on the 1910 Forest map of the Zuni Mountains, or on the 1922 Forest map (Manzano National Forest). Withdrawal of the RNA from archeological research should not greatly effect the potential data base as the area demonstrates very little surface evidence of former occupation or use.

## IMPACTS AND POSSIBLE CONFLICTS

### Mineral Resources

No mineral resources are known to exist within the boundaries of the RNA. Mineral rights in the area are reserved as follows:

1. approximately 960 acres (389 hectares) are reserved for all minerals by private interest.
2. approximately 115 acres (47 hectares) are reserved for fissionable minerals only (uranium and thorium) by the State of New Mexico.

### Grazing

The RNA is within both the Oso Ridge and Agua Fria allotments. Where these two allotments adjoin within the RNA, the boundary is the top of Oso Ridge. If the RNA is not fenced, the area would continue to receive minor grazing use. Less than 1% of the Agua Fria allotment would be excluded by fencing in the most logical location, along the RNA boundary. Withdrawal of this insignificant portion of the grazing allotment should not cause any conflict. Approximately 1.5 miles (2.4 km) of fence occurs along the boundary of the RNA; of this, approximately 1 mile (1.6 km) is in very poor condition and should be reconstructed to be effective, and the remainder, in fair condition, could be maintained. Total exclusion of livestock from the RNA would require approximately 6 miles (9.7 km) of new fence.

### Timber

The proposed RNA contains approximately 895 acres (362.2 hectares) of ponderosa pine which will be withdrawn from the timber base. This amounts to a loss of 3500 MBF of saleable timber.

Total forested area: 1075 acres (435.1 hectares)

Total commercial forest area: 895 acres (362.2 hectares)

### Watershed Values

The Continental Divide segments the RNA into two watersheds. The largest area of the RNA (approximately 845 acres or 342 hectares) is within the Zuni River watershed. The West Rio San Jose watershed comprises a smaller 230 acres (93 hectares). The stream in Little Water Canyon is a second order stream.

### Recreation Values

The proposed RNA is not a popular or heavily used recreation area due to its remoteness. The area is used for big game hunting. There should be no conflict between this recreation use (and other minor uses) and potential research.

### Wildlife and Plant Values

At this time, no threatened or endangered plant or animal species are known to occur within the boundaries of the RNA.

### Wilderness, Wild and Scenic River, National Recreation Area Values

None of the above congressionally designated areas have been proposed for the Little Water Canyon RNA or vicinity.

### Transportation Plans

The RNA is accessed by a spur road from Forest Road 50 to the north, and from off the Forest boundary to the west. No trails exist at present in the RNA, but the planned Continental Divide Trail may cross through the RNA along the top of Oso Ridge. This trail is not expected to have significant effects on either the eastern or western segments of the RNA. This corridor will be in the vicinity of the "seam" between the eastern and western segments of the RNA (see Location) and therefore will avoid any direct impacts on ecosystems within the segments.

### Utility Corridor Plans

No utility corridors currently exist within the RNA, and no future corridors will be permitted in accordance with the direction in the Cibola Land and Resources Management Plan.

## MANAGEMENT PLAN

The Cibola National Forest Plan prescribes that there will be no harvest of firewood and no assigned grazing capacity on Research Natural Areas. The prescriptions also prohibit road or trail construction, new utility corridors, off-road vehicle travel, open campfires, 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 flora, fauna, or other materials may be collected 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 Little Water Canyon RNA to maintain fire dependent ecosystems. Suppression action is limited to the use of hand tools, and fire retardant chemicals must not be used unless necessary to protect life and property outside the study area. Vegetation manipulation is allowed only when necessary to preserve the vegetation for which the area is being studied.

## ADMINISTRATIVE RECORDS AND PROTECTION

Administration and protection of the Little Water Canyon RNA will be the responsibility of the Cibola National Forest. The District Ranger, Mount Taylor Ranger District, Grants, 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.

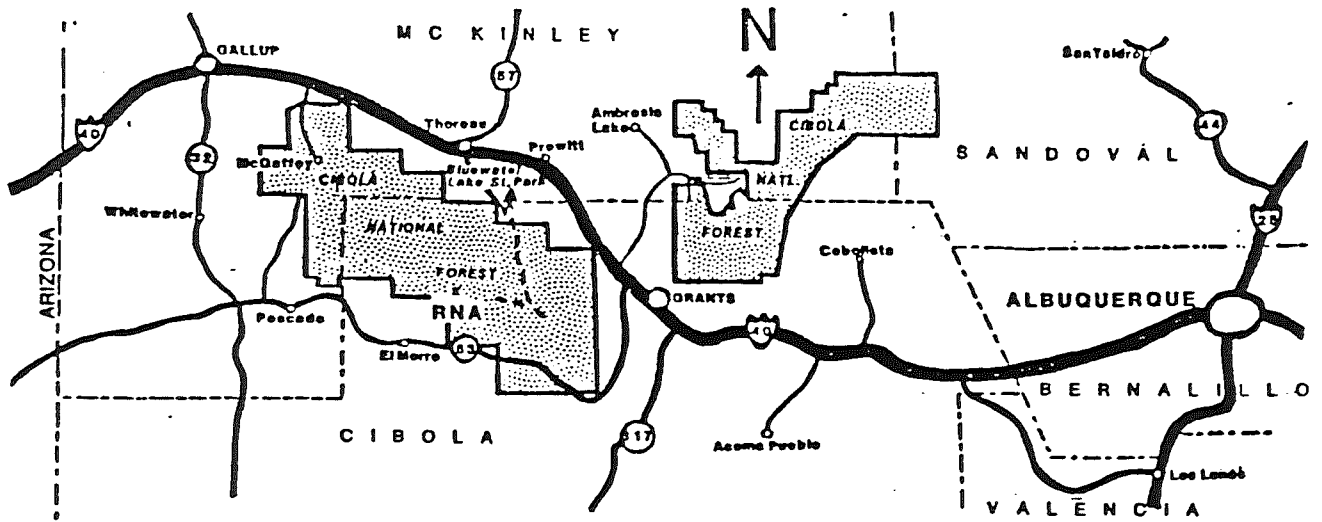
Records for the Little Water Canyon RNA will be maintained in the following offices:

Regional Forester, Southwestern Region, Albuquerque, NM  
 Rocky Mountain Station, Fort Collins, CO  
 Cibola National Forest, Albuquerque, NM  
 District Ranger, Mount Taylor Ranger District, Grants, NM

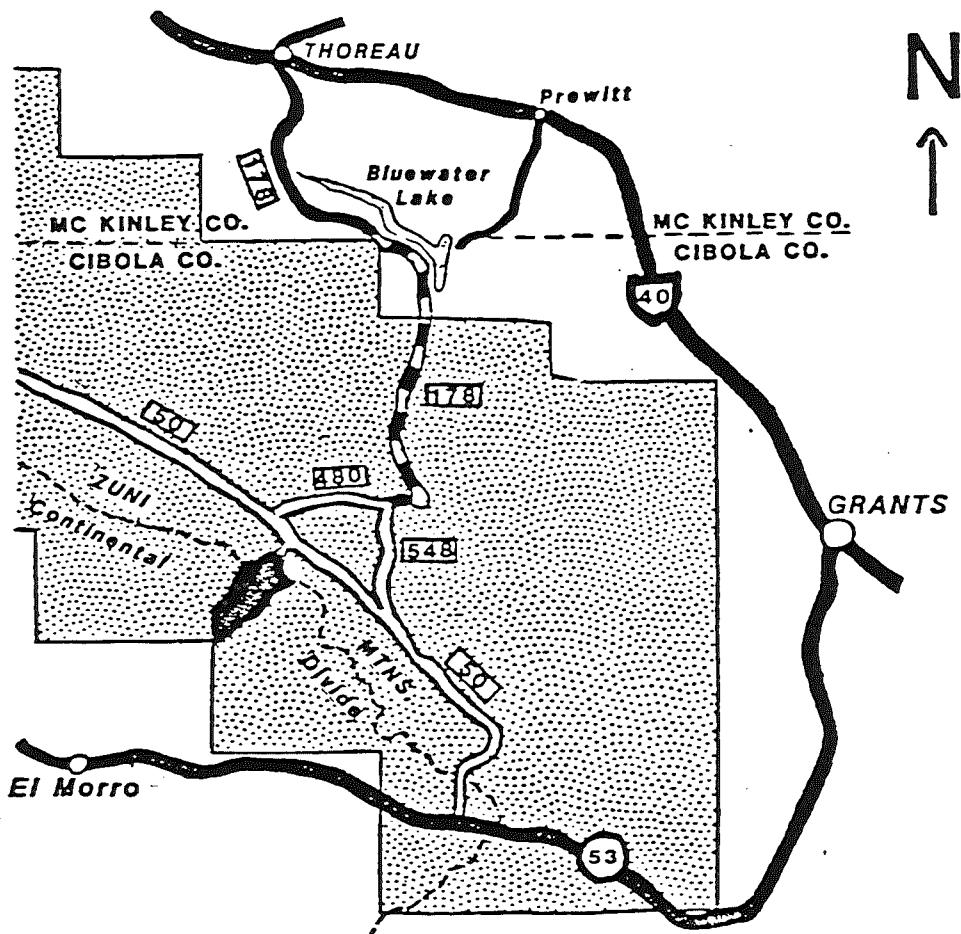
## REFERENCES

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Map 1 - Location of RNA (West Central New Mexico)



Map 2 - Access Routes to RNA




# LITTLE WATER CANYON RNA - 1075 ac.

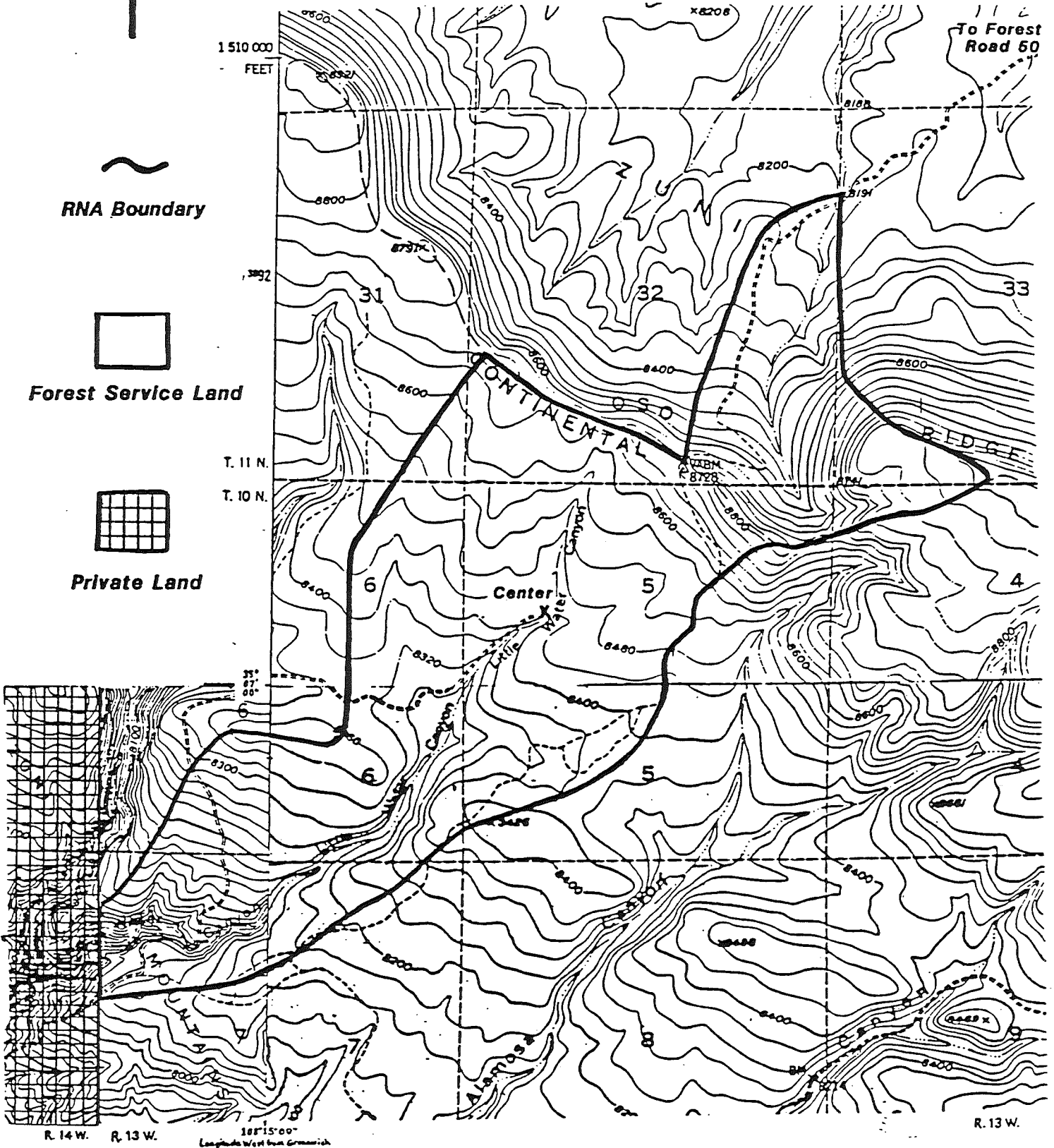
Post Office Flat Quadrangle (USGS 7.5')  
Valle Largo (USGS 7.5')  
El Morro (USGS 7.5')



  
RNA Boundary

  
Forest Service Land

  
Private Land



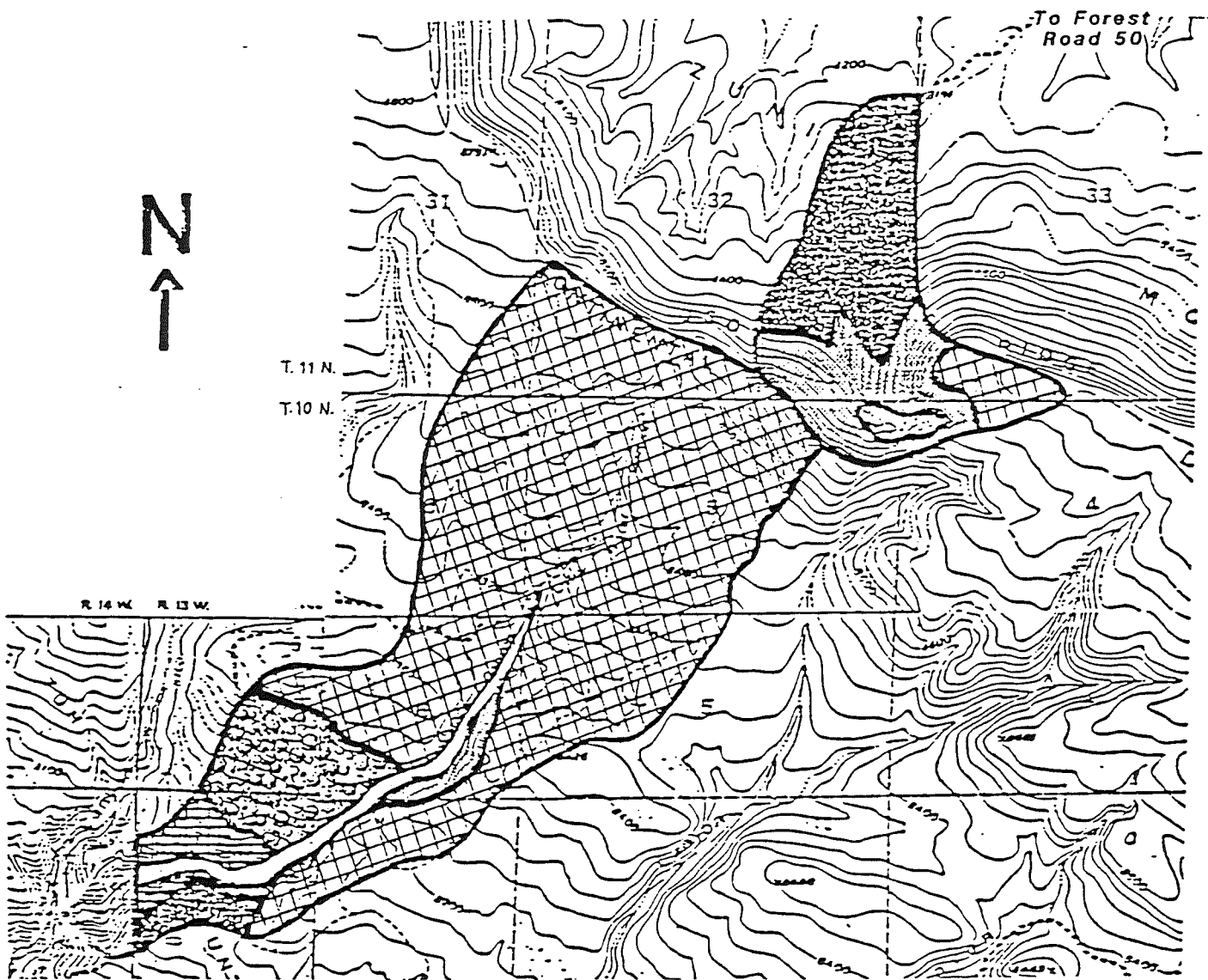
Map 3 - Boundary and Ownership Status of RNA

LITTLE WATER CANYON RNA - 1075 ac.

Post Office Flat Quadrangle (USGS 7.5')

Valle Largo (USGS 7.5')

El Morro (USGS 7.5')




**Küchler 17 - Mixed conifer forest**

**Küchler 18 - Ponderosa pine forests**

AF 16  *Picea pungens*/*Cornus stolonifera* plant association (p.a.) 20 acres

SAF 237  *Pinus ponderosa*/rockland p.a. 685 acres

AF 10  *Pseudotsuga menziesii*/*Quercus gambellii* p.a. 90 acres

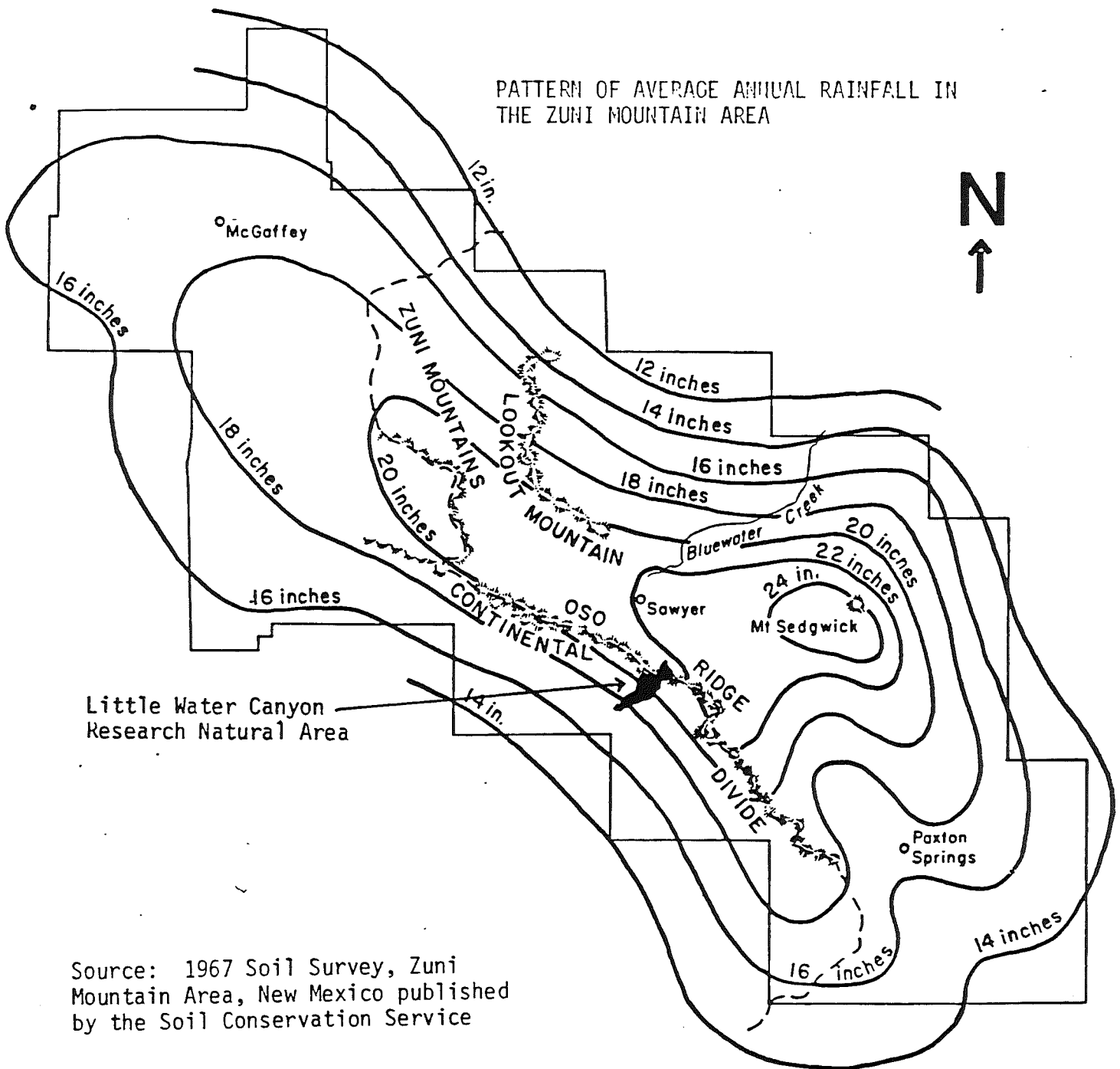
SAF 237  *Pinus ponderosa*/*Quercus gambellii* p.a. 130 acres

AF 17  *Populus tremuloides* plant community 10 acres

SAF 237  *Pinus ponderosa*/*Muhlenbergia montana* p.a. (limestone) 80 acres

SAF 237  *Pinus ponderosa*/*Purshia tridentata* breaks (limestone) 80 acres

PATTERN OF AVERAGE ANNUAL RAINFALL IN THE ZUNI MOUNTAIN AREA

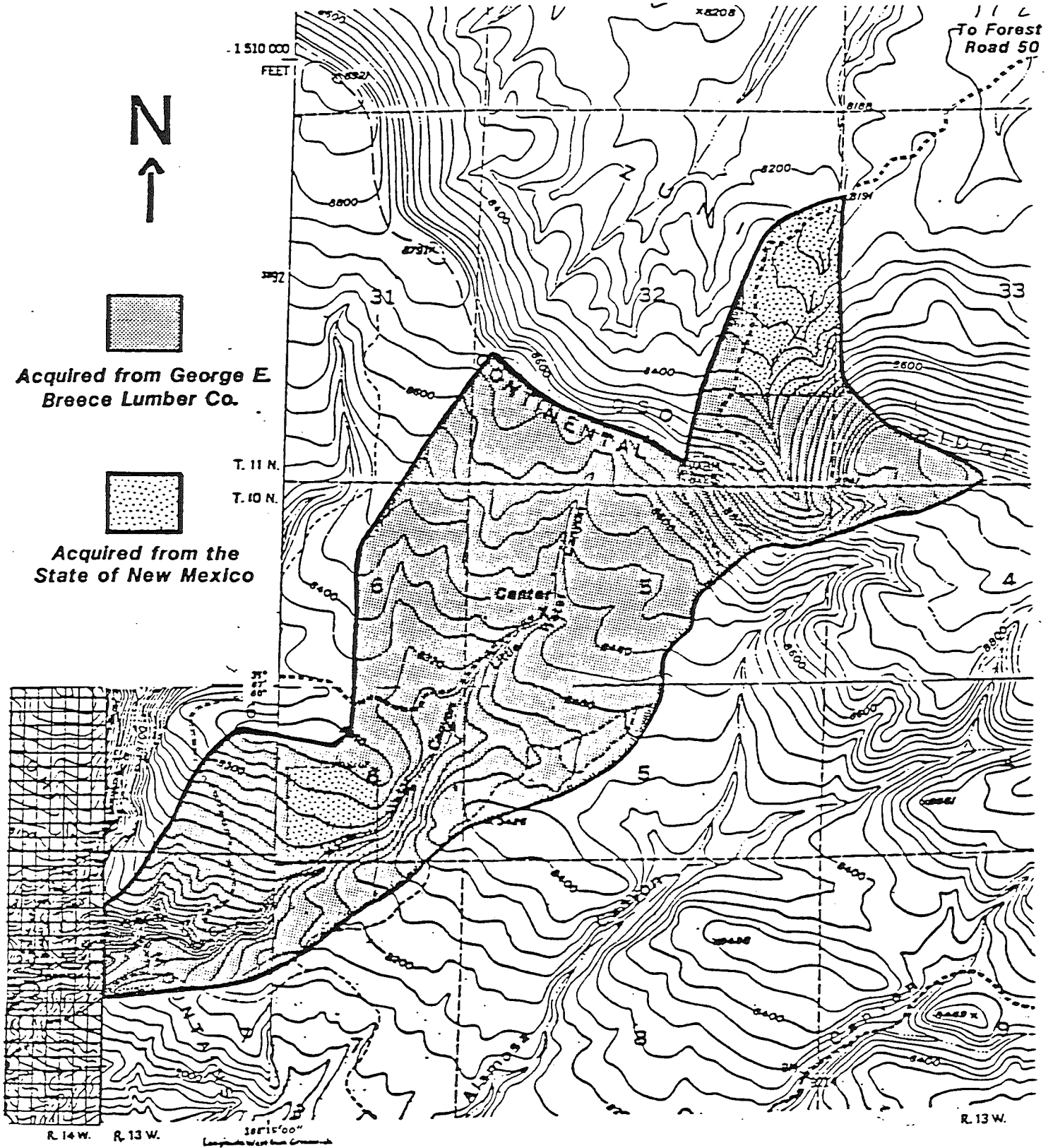


Source: 1967 Soil Survey, Zuni Mountain Area, New Mexico published by the Soil Conservation Service

Map 5 - Climate

LITTLE WATER CANYON RNA - 1075 ac.

Post Office Flat Quadrangle (USGS 7.5')  
Valle Largo (USGS 7.5')  
El Morro (USGS 7.5')



Map 6 - Land Status

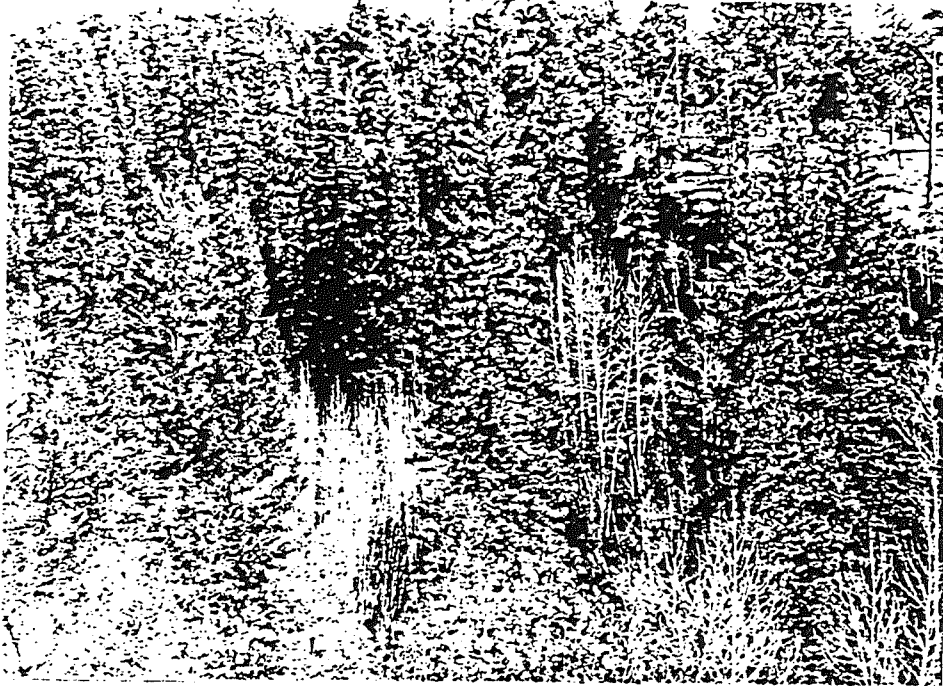


Photo 1. Blue spruce is confined to the canyon bottom of Little Water Canyon. Here they are associated with aspen in the riparian zone; Gambel oak on the slopes in the foreground.



Photo 2. Little Water Canyon is the type locality for the Picea pungens/Cornus stolonifera plant association. Both species are seen here.



Photo 3. Several blue spruces within the RNA are close to record size for the species. This one measured at 44.5 inches (107 cm) DBH.

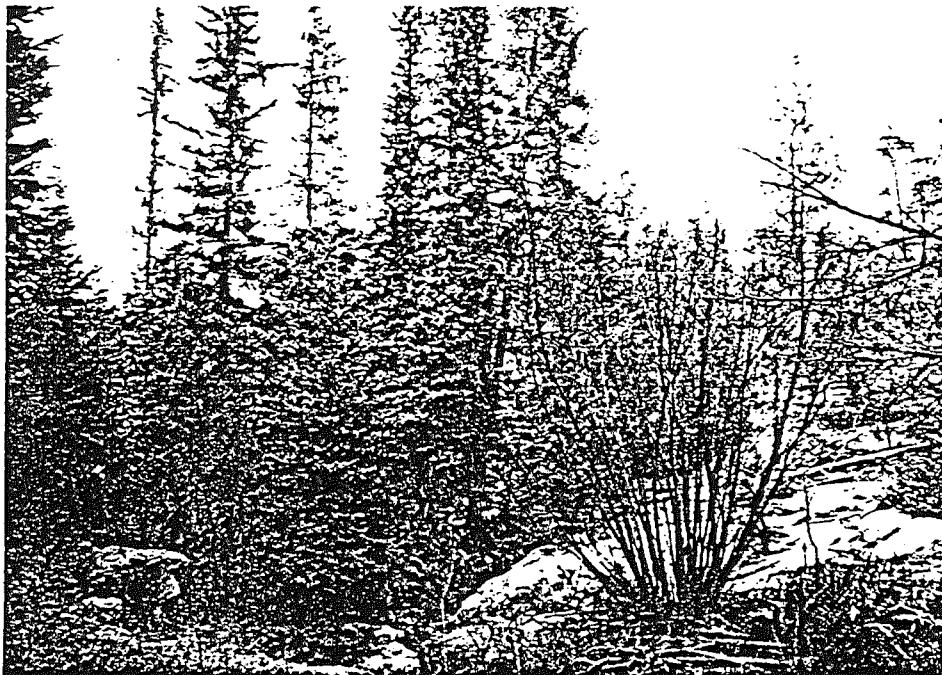


Photo 4. Alnus tenuifolia is occasionally found in association with Picea pungens within the riparian zone of Little Water Canyon.



Photo 5. A Pinus ponderosa/Purshia tridentata Habitat Type occurs on limestone outcrop soils at the west end of the RNA. Gambel oak and piñon pine are also visible here along with little bluestem and mountain muhly grasses.



Photo 6. Pseudotsuga menziesii/Quercus gambelii Habitat Type occurs on north-facing slopes at the lower end of the RNA. Ponderosa pine is also found here, and the grass is mountain muhly.





Photo 7. Pinus ponderosa/Rockland Habitat Type is common on the upper slopes of the RNA on sandstone substrates.



Photo 8. Ponderosa pine parkland with a dense groundcover of mountain muhly is characteristic of the PIPO/MUMO Habitat Type and occurs throughout the RNA as mosaics on the gentler slopes above Little Water Canyon.



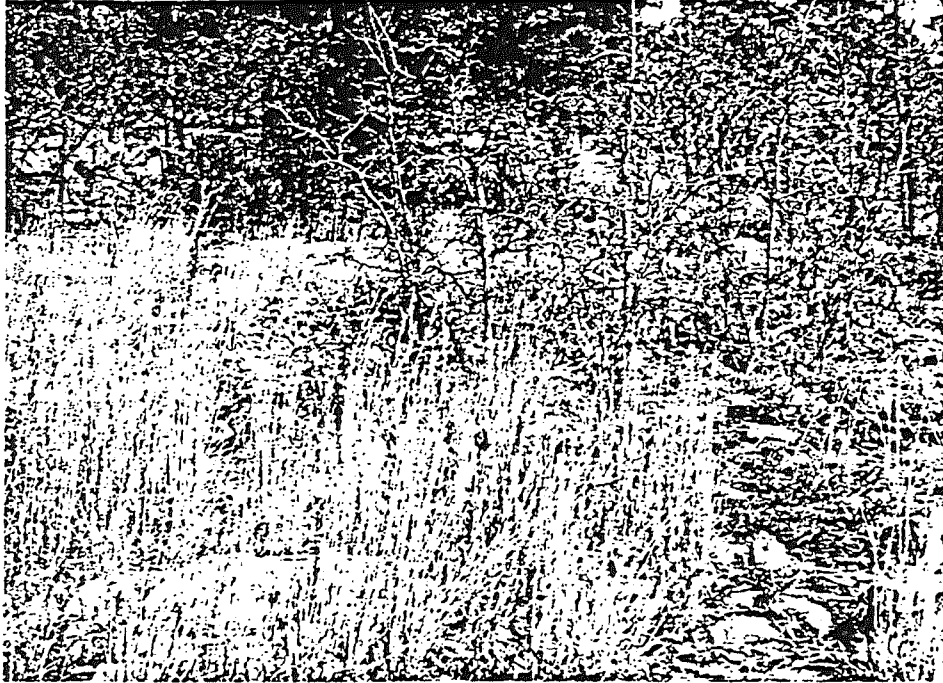


Photo 9. Islands of little bluestem frequently occur within the Pinus ponderosa/Muhlenbergia montana Habitat Type on south-facing slopes. Quercus gambelii growing in the background.



Photo 10. Few areas in New Mexico are known to exhibit Gambel oaks in such huge tree growth-form as found here at the north end of the RNA.

USDA-FOREST SERVICE

**PHOTOGRAPHIC RECORD**  
(See FSM 1643.52)

PHOTOGRAPHER  
William W. Dunmire

DATE SUBMITTED  
Nov. 16, 1987

HEADQUARTERS UNIT

LOCATION

INITIAL DISTRIBUTION OF PRINTS AND FORM 1600-11

WO  RO  DIV.  FOREST  DISTRICT  PHOTOGRAPHER Date \_\_\_\_\_

INSTRUCTIONS: Submit to Washington Office in quadruplicate. Permanent numbers will be assigned and the forms will be distributed as follows: (1) Washington Office, (2) RO or Station, (3) Forest or Center and (4) Photographer.

PHOTOGRAPH NUMBER		SELECTED FOR W.O. PHOTO LIBRARY	DATE OF EXPOSURE	LOCATION (State, Forest, District and County)	CONCISE DESCRIPTION OF VIEW	NEGATIVE (Show size and BW for black and white or C for color)
TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
				ALL: New Mexico Cibola NF Mt. Taylor Dist. Cibola Co.		ALL: 24x36mm color slides
1.			10-17-86		Little Water Canyon bottom at the lower end of the RNA.	
2.			10-17-86		Blue spruce and red-osier dogwood growing at the bottom of Little Water Canyon in the middle portion of the Research Natural Area.	
3.			10-17-86		44.5 DBH blue spruce in Little Water Canyon bottom, middle portion of RNA.	
4.			10-17-86		Blue spruce and thin-leaf alder at lower end of Little Water Canyon RNA.	
5.			10-17-86		Antelope brush under ponderosa pine overstory on south-facing slope just north of canyon, west end of Little Water Canyon RNA.	
6.			10-17-86		Douglas-fir reproduction on north-facing slope, south of canyon, west end of Little Water Canyon RNA.	
7.			10-17-86		Ponderosa pine on south-facing sandstone slopes near north boundary of middle portion of Little Water Canyon RNA.	
8.			10-17-86		Ponderosa pine parkland approximately 8,400 feet (2,560 M) on northwest side of Little Water Canyon RNA.	
9.			10-17-86		An island of little bluestem on a south-facing slope at approximately 8,400 feet (2,560 M) elevation in the northwest portion of Little Water Canyon RNA.	

USDA-FOREST SERVICE

PHOTOGRAPHER

DATE SUBMITTED

**PHOTOGRAPHIC RECORD**

William W. Dunmire

Nov. 16, 1987

(See FSM 1643.52)

HEADQUARTERS UNIT

LOCATION

INITIAL DISTRIBUTION OF PRINTS AND FORM 1600-1:

WO    RO    DIV.    FOREST    DISTRICT    PHOTOGRAPHER   Date \_\_\_\_\_

INSTRUCTIONS: Submit to Washington Office in quadruplicate. Permanent numbers will be assigned and the forms will be distributed as follows: (1) Washington Office, (2) RO or Station, (3) Forest or Center and (4) Photographer.

PHOTOGRAPH NUMBER		SELECTED FOR W.O. PHOTO LIBRARY	DATE OF EXPOSURE	LOCATION (State, Forest, District and County)	CONCISE DESCRIPTION OF VIEW	NEGATIVE (Show size and BW for black and white or C for color) (7)
TEMP.	PERMANENT (To be filled in by the WO)					
(1)	(2)	(3)	(4)	(5)	(6)	(7)
10.			10-17-86	ALL: New Mexico Cibola NF Mt. Taylor Dist. Cibola Co.	Large specimen of Gambel oak on lower slopes of Oso Ridge on the northern extension of Little Water Canyon.	ALL: 24x36mm color slides

**ENVIRONMENTAL ASSESSMENT**

**Proposed Little Water Canyon**

**Research Natural Area**

Cibola National Forest

U.S. Forest Service

Region 3

January 2, 1993

## ENVIRONMENTAL ASSESSMENT

Proposed Little Water Canyon Research Natural Area

January 2, 1993

### Alternatives and Environmental Consequences

#### Alternative A, Proposed Action

Alternative A would designate 910 acres (368.3 hectares) in the Zuni Mountains of west-central New Mexico as the "Little Water Canyon" Research Natural Area. Management of the area would limit recreation to dispersed, low intensity use, would prohibit grazing, harvesting of timber or fuelwood, allow no new road or trail construction, prohibit ORV travel, and prohibit new utility corridor construction. Planned and unplanned ignitions would be allowed to maintain fire dependent ecosystems unless persons or property outside of the RNA and the uniqueness of the RNA were threatened. Fire suppression would be limited in the RNA to the use of hand tools unless areas outside the RNA become threatened. No open campfires will be allowed in the RNA. All activities that would alter the educational and research values of the area would be prohibited (Cibola Forest Plan, pages 79-80).

The environmental consequences of Alternative A are described in the EIS for Cibola National Forest Plan (page 151). These consequences include short-term losses of opportunities to change vegetation conditions through management. Reductions in suitable timber, grazing lands, and mineral accessibility to protect the proposed Little Water Canyon RNA are not significant. There are no significant cumulative effects of the establishing of the RNA.

The direction in the Forest Plan for established RNA's also includes reasonably foreseeable actions such as withdrawal of the area from mineral entry and construction of protective fencing. The general consequences of mineral withdrawal are discussed in the Forest Plan EIS (page 147, 151). For the little Water Canyon area, these consequences are not considered to be significant since no mineral resources are known to exist within the RNA boundaries. Site-specific consequences will be disclosed in more detail if or when mineral entry is proposed for withdrawal.

#### Alternative B, No Action

This alternative continues management according to direction in the Forest Plan (pages 101-102) for a "proposed" RNA. This management includes prescriptions similar to those implemented for established RNAs so that the biotic diversity and values of the area are maintained until the establishment report is completed and acted on. These actions include limiting recreation to dispersed, low intensity use. Timber and fuelwood harvesting, grazing by livestock, and construction of new roads and trails will be prohibited. There are no significant cumulative effects of this alternative.

The environmental consequences of Alternative B, the "No Action" alternative, are as described in the Cibola National Forest Plan (page 25). These consequences include short-term losses of opportunities to change the vegetation conditions through management. Additionally, as future use of natural resources increases, the options for designating RNAs will diminish.

#### Agencies and Persons Consulted

In the process of updating information to determine whether or not conditions had changed since adoption of the Forest Plan (or as part of the Forest Plan monitoring process), the State Natural Heritage Program, Nature Conservancy, Livestockman's Association, range permittees, mineral exploration companies, etc. were contacted. The following comments were received and addressed as indicated (or no comments were received):

Natural Heritage Program -- supported establishment of the RNA.

Livestockman's Association -- no problem with establishment of the RNA because boundary changes were made at the time the Forest Plan was adopted by the Regional Forester.



Reply to: 4060 Research Facilities

Date: October 20, 1982

Subject: Proposed Little Water Canyon Blue Spruce Research Natural Area

To: Larry Schmidt, Soil and Water

The proposed blue spruce Research Natural Area on the Mt. Taylor Ranger District, Cibola National Forest, was visited by RNA Task Force members Earl Aldon, Larry Schmidt, Will Moir, and Reggie Fletcher together with Larry Sanson and George Garcia on June 16, 1982.

The area, as outlined by Stetson C. Edmunds, District Ranger, is a narrow strip running over a mile and one-half in Sections 5, 6, and 7, T. 10 N., R. 13 W., and Section 32, T. 11 N., R. 13 W. Elevation ranges from 7,900 to slightly above 8,800 feet.

Blue spruce is confined to the lower half between 7,900 and approximately 8,250 feet in the bottom of Little Water Canyon. A perennial stream runs from the elevation where blue spruce is encountered. The narrow rugged nature of Little Water Canyon is probably what prevented previous logging of the spruce. The upper portion of the canyon to the continental divide along Oso Ridge is included to maintain the integrity of the watershed.

That this small area has survived in such a pristine state is remarkable. Several blue spruce were measured that come close to the record measurements for this species. Species diversity and composition were impressive and accessibility favors research studies.

The upper slopes are relatively open with ponderosa pine and gambel oak dominating the overstory on lithic skeletal soils derived from sandstone. Rock fragments compose approximately 40 percent of the surface area here. As the canyon narrows and the canopy begins to close, Douglas-fir is encountered (8,400 feet). Gambel oak is still prominent, but diversity increases and both Rocky Mountain juniper and aspen are found. Water is spotty below the first Douglas-fir, and most of the canyon is dry. The canyon deepens abruptly, the canopy closes, and permanently flowing water begins coincidentally with blue spruce.

Enclosed is a list of plant species encountered on June 16, as well as vegetation plot data provided by Will Moir. The species list provides an example of the rich diversity of Little Water Canyon. It is expected numerous additional species would be encountered both in the fall and on a more thorough investigation.

I highly recommend this area be submitted for inclusion into the RNA System. A slight extension of the boundary across Oso Ridge to the northeast would include some of the largest gambel oaks I can recall.

*Reggie*



REGGIE A. FLETCHER  
Regional Botanist

Enclosures

ZUNI MTS. BLUE SPRUCE PROPOSED RNA SPECIES LIST

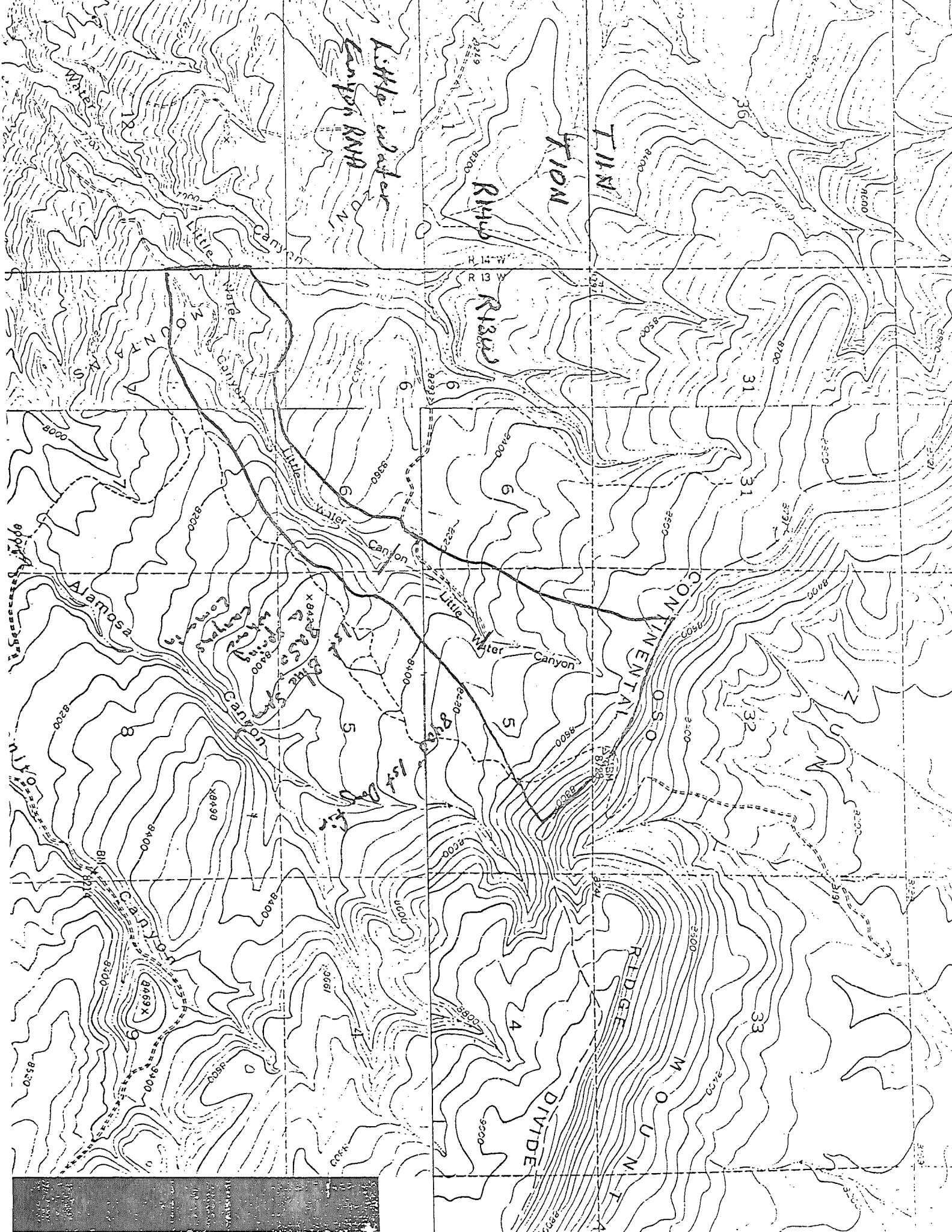
\*Member of the Blue Spruce Community

- \**Acer glabrum*
- Achillea lanulosa*
- \**Aconitum columbianum*
- \**Actaea arguta*
- Agastache* sp.
- Alnus* sp. (in Fitzhugh's 964)
- \**Amelanchier goldmanii*
- Andropogon scoparius*
- \**Androsace septentrionalis*
- Antennaria parvifolia*
- \**Aquilegia chrysantha*
- Arenaria confusa*
- Artemisia carruthii*
- \**Berberis repens*
- Blepharoneuron tricholepis*
- \**Bromus ciliatus*
- \**Campanula rotundifolia*
- \**Carex foena*
- Carex geophila*
- \**Carex occidentalis*
- \**Carex rossii*
- Ceanothus fendleri*
- Cerastium arvense*
- Chrysopsis canescens*
- Claytonia megarrhiza*
- \**Corallorhiza maculata*
- \**Cornus stolonifera*
- Delphinium nelsonii*
- \**Draba helleriana* var. *blumeri*
- \**Equisetum arvense*
- Erigeron divergens*
- Erigeron* sp.
- Eriogonum alatum*
- \**Fragaria americana*
- Fragaria ovalis*
- \**Galium* sp.
- \**Geranium richardsonii*
- Gnaphalium* sp.
- \**Haplopappus parryi*
- Hieracium fendleri*
- Hymenopappus flavescens* var. *cano-tomentosus*
- Ipomopsis aggregata*
- Iris missouriensis*
- Juniperus deppeana*
- Juniperus scopulorum*
- \**Koeleria cristata*
- \**Lathyrus arizonica*



\*Ligusticum porteri  
Linanthastrum nuttallii  
Lithospermum multiflorum  
\*Lonicera arizonica  
Lotus wrightii  
\*Melica nitens  
\*Mertensia lanceolata var. fendelri  
\*Monarda menthaefolia  
Muhlenbergia montana  
\*Osmorhiza obtusa  
\*Osmorhiza sp.  
\*Pachystima myrsinites  
\*Pedicularis grayi  
\*Penstemon whippleanus  
Penstemon sp.  
\*Phacelia heterophylla  
Phlox longifolia ssp. compacta  
\*Picea pungens  
Pinus ponderosa  
\*Platanthera sparsiflora var. sparsiflora (Habenaria)  
\*Poa fendleriana  
\*Poa pratensis  
\*Populus tremuloides  
Potentilla fruticosa  
Prunus serotina sp. virens  
\*Pseudotsuga menziesii  
\*Pteridium aquilinum  
\*Quercus gambellii  
\*Ribes pinetorum  
\*Rosa sp.  
\*Rubus parviflorus  
\*Rubus strigosus var. arizonicus  
\*Rudbeckia laciniata  
Rumex crispus  
Salix bebbiana var. perrostrata  
Saxifraga rhomboidea  
Schistophragma sp.  
\*Schizachne purpurascens  
Sedum sp.  
Senecio hartianus  
Senecio neomexicanus  
\*Senecio wootonii  
Sisymbrium linearifolium  
Sitanion hystrix  
\*Smilacina racemosum  
\*Smilacina stellata  
Solidago wrightii  
\*Stellaria jamesii  
\*Swertia radiata  
Talinum parviflorum

\**Taraxacum officinale*  
\**Thalictrum fendleri*  
\**Thermopsis pinetorum*  
  *Trifolium subacaulescens*  
\**Valeriana capitata* ssp. *acutiloba*  
\**Vicia americana*  
  *Viguiera multiflora*  
\**Viola adunca*  
\**Viola nephrophylla* var. *nephrophylla*  
\**Viola pedatifida*  
  *Zigadenus* sp.



Little Water Canyon Rd

Little Water Canyon Rd

CONTINENTAL RIDGE

MOJON DIVIDE

Alamosa

Little Water Canyon

Little Water Canyon

Little Water Canyon



Vegetation in understory Blue Spruce forest, Little Water Canyon, Zuni Mts.  
 (Data of plots 963A, 964, 965 from E. Lee Fitzhugh, July 1979).

PLOT AND ELEVATION			
963 A	964	965	758
7980	8040	8240	8200

Shrubs

	----- % cover -----			
<i>Cornus stolonifera</i>	53	2	.1	
<i>Ribes pinetorum</i>	8	1	1	.1
<i>Quercus gambelii</i>	2	.1		.5
<i>Amelanchier goldmani</i>		.4	.1	2
<i>Berberis repens</i>	27	2	4	40
<i>Rosa cf arizonica</i>	12	1	.9	
<i>Pachistima myrsinites</i>	3	1	t	.9
<i>Acer glabrum</i>	t		t	.1
<i>Rubus parviflora</i>				.1
<i>Rubus strigosus</i>	12			
<i>Lonicera arizonica</i>	.4			

Herbs

<i>Smilacina stellata</i>	17		.1	8
<i>S. racemosa</i>	1	.9		.1
<i>Carex cf. foenea</i>	36	.9	20	10
<i>C. occidentalis</i>	2			4
<i>Stellaria jamesii</i>		.1	12	8
<i>Lathyrus arizonica</i>	.1		1	7
<i>Vicia americana</i>	3	.9	1	.4
<i>Ligusticum porteri</i>	2	.1	1	.7
<i>Thalictrum fendleri</i>	2	1	1	5
<i>Fragaria americana</i>		1	3	3
<i>Haplopappus parryi</i>				.5
<i>Monarda menthaefolia</i>				.3
<i>Bromus cf ciliatus</i>	2	.9	1	
<i>Poa pratensis</i>				t
<i>P. fendleriana</i>	1			
<i>Koeleria cristata</i>	t			
<i>Osmorhiza obtusa</i>	.6	2	1	t
<i>Equisetum arvense</i>	4	3		.1
<i>Taraxacum officinale</i>	.1	.9		
<i>Campanula rotundifolia</i>		.1	2	.1
<i>Aquilegia chrysantha</i>				
<i>Thermopsis pinetorum</i>	.8	.1	.1	

Little Water Canyon, Zuni Mts, Tree population along canyon bottom <sup>2/</sup>

TREES	NUMBER BY DBH (INCH) CLASS											
	0 - 2		2 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16	16 - 18	18 - 20	> 20
	< 4.5'	> 4.5'										
PIPU	3	2			2	1	3	1	3	2	4	4
P												
PSME	7	2	1		1		1		2		1	
P												
POTR	4	11	1			1						
P												
P												
P												
P												

TREE	DBH	Ht.	Core	REMARKS: <sup>2/</sup> Stems per 750m <sup>2</sup> ( <u>two</u> plots)
PSME	27"	123'	122±6	
PIPU	13"	68'	118	
PIPU	44"	120'		

REMARKS:



## Little Water Canyon Blue Spruce Area

Background: The Zuni Mountains rise in elevation to a little more than 9,300 feet. The major vegetation types are woodland, ponderosa pine, mountain grassland, and small stands of mixed conifer here and there. Spruce (either Englemann or Colorado Blue) is not considered a species to be found in the Zunis.

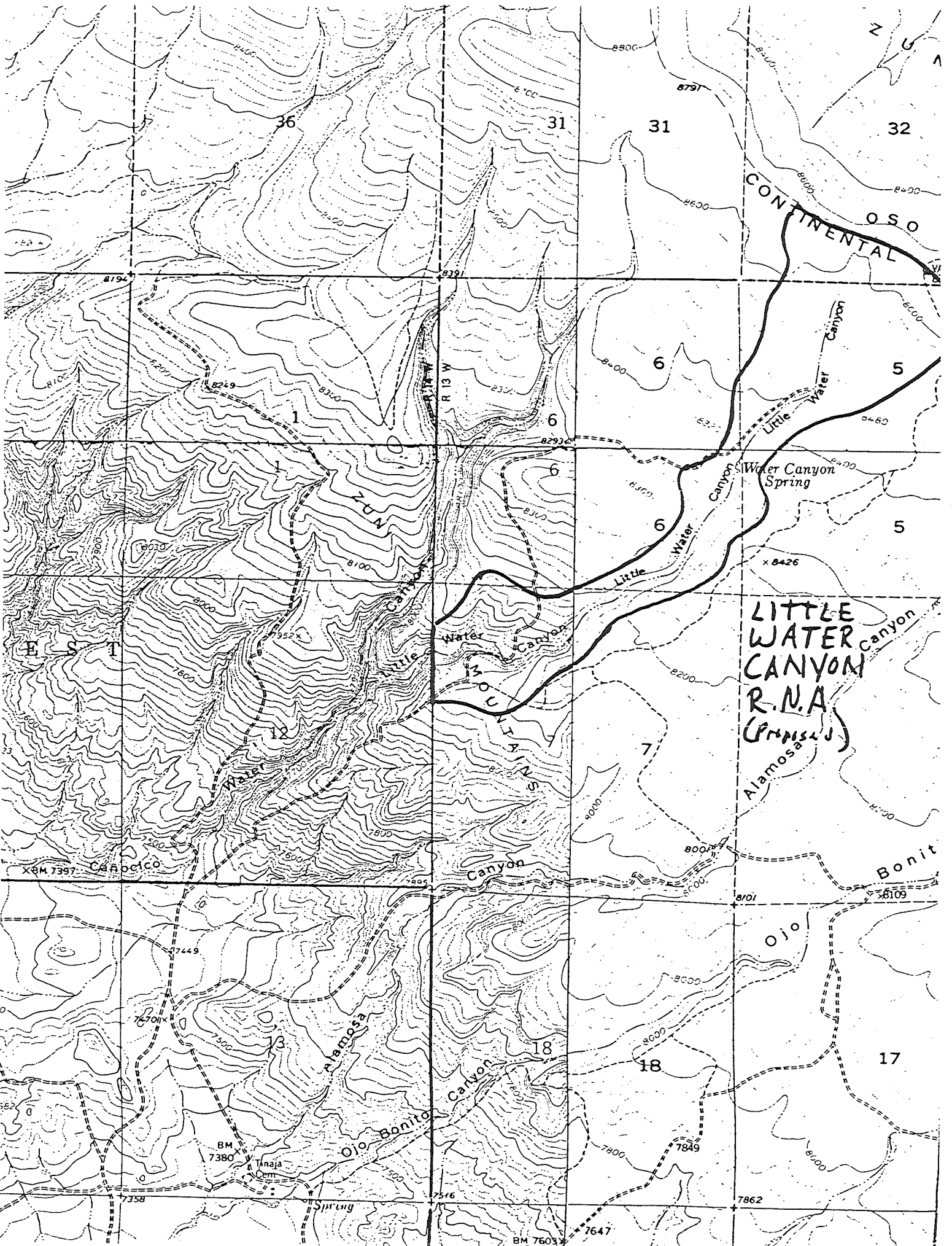
Description: The Little Water Canyon Blue Spruce Area is a unique ecosystem in that it is the only virgin blue spruce area within the Zunis and the largest of only three or four sites in this mountain range that supports this species of spruce. The stand is found in a deep canyon on the southwest side of Oso Ridge. The aspect of the surrounding country is southwest and the area is basically a transition zone with a mixture of ponderosa pine, pinyon, juniper and Gambel oak. However, little water canyon is a different world. The temperature drops dramatically and the vegetational change is abrupt. Blue spruce is the predominate species with some Douglas fir and aspen on the slopes and hardwood riparian vegetation on the bottom. A cool perennial stream runs through the canyon, with its origin Water Canyon Spring.

Rationale: This area is the only stand of old growth virgin blue spruce that is available for study on the Mt. Taylor District and perhaps on the Cibola National Forest. I feel it is extremely valuable to leave in its natural state as its potential for study is legion.

Recommendation: I recommend that the deep canyon itself (Little Water Canyon) plus the main drainages into the canyon (see enclosed map) be included in a Research Natural Area. This would take in approximately 300 acres (T. 10 N., R. 13 W., parts of Sections 5, 6, and 7 and T. 11 N., R. 13 W., part of Section 13).

STETSON C. EDMUNDS  
District Ranger

SCEdmunds:vs





A boundary description of the proposed Little Water Canyon RNA is as follows:

Beginning at the bench mark 8191 on section boundary between Sections 32 and 33, T. 11 N., R. 13 W., NMPM, as designated on the USGS Post Office Flat, New Mexico 7.5 minute quadrangle;

THENCE, South, along said section boundary a distance more or less of 2,230 ft to a slope and a point at lat, 35 deg. 08 min. 15 sec., long. 108 deg. 13 min. 20 sec.;

THENCE, S 23 E, ascending a distance more or less of 1,280 ft to top of slope to a point at lat. 35 deg. 08 min. 04 sec., long. 108 deg. 13 min. 16 sec.;

THENCE, S 75 E, along a ridge to the Continental Divide a distance more or less of 1,900 ft and a point at lat. 35 deg. 07 min. 58 sec., long. 108 deg. 12 min. 54 sec.;

THENCE, S 70 W, along the Continental Divide a distance more or less of 1,540 ft to a point at lat. 35 deg. 07 min. 54 sec., long. 108 deg. 13 min. 12 sec.;

THENCE, S 70 W, along the Continental Divide a distance more or less of 1,640 ft to a point at lat. 35 deg. 07 min. 49 sec., long. 108 deg. 13 min. 31 sec.;

THENCE, N 58 W, along the Continental Divide a distance more or less of 560 ft to a point at lat. 35 deg. 07 min. 52 sec., long. 108 deg. 13 min. 36 sec.;

THENCE, S 33 W, descending to a trail a distance more or less of 720 ft and a point at lat, 35 deg. 07 min. 46 sec., long. 108 deg. 13 min. 42 sec.;

THENCE, S 44 W, along said trail a distance more or less of 525 ft to a point at lat. 35 deg. 07 min. 43 sec., long. 108 deg. 13 min. 46 sec.;

THENCE, South, along said trail a distance more or less of 425 ft to a point at lat. 35 deg. 07 min. 38 sec., long. 108 deg. 13 min. 45 sec.;

THENCE, S 68 W, along said trail a distance more or less of 360 ft to a point at lat. 35 deg. 07 min. 36 sec., long. 108 deg. 13 min. 50 sec.;

THENCE, South, along said trail a distance more or less of 625 ft to a point at lat. 35 deg. 07 min. 30 sec., long. 108 deg. 13 min. 50 sec.;

THENCE, S 52 W, descending along the ridge a distance more or less of 2,460 ft to a point at lat. 35 deg. 07 min. 13 sec., long. 108 deg. 14 min. 09 sec.;

THENCE, West, descending along said ridge a distance more or less of 1,020 ft to bench mark designated 8426 on USGS Valle Largo 7.5 minute quadrangle, a point at lat, 35 deg. 07 min. 12 sec., long. 108 deg. 14 min. 21 sec.;

THENCE, S 47 W, descending along said ridge a distance more or less of 1,380 ft to a point at lat. 35 deg. 00 min. 12 sec., long. 108 deg. 14 min. 32 sec.;

THENCE, S 88 W descending along said ridge a distance more or less of 1,180 ft, across said trail, to a point at lat. 35 deg. 06 min. 58 sec., long. 108 deg. 14 min. 45 sec.;

THENCE, S 54 W, descending along said ridge a distance more or less of 625 ft to a point at lat, 35 deg. 06 min. 57 sec., long. 108 deg. 14 min. 52 sec.;

THENCE, S 49 W, along said trail to a fork in the trail a distance more or less of 460 ft and a point at lat, 35 deg. 06 min. 54 sec., long. 108 deg. 14 min. 55 sec.;

THENCE, S 73 W, along west fork of said trail a distance more or less of 395 ft to a point at lat. 35 deg. 06 min. 53 sec., long. 108 deg. 15 min. 00 sec.;

THENCE, S 52 W, descending along said ridge a distance more or less of 1,280 ft, across said trail, to a point at lat. 35 deg. 06 min. 46 sec., long. 108 deg. 15 min. 10 sec.;

THENCE, N 74 W, along the ridge a distance more or less of 920 ft to a point at lat. 35 deg. 06 min. 48 sec., long. 108 deg. 15 min. 20 sec.;

THENCE, S 65 W, descending along the ridge a distance more or less of 950 ft to unimproved road and a point at lat, 35 deg. 06 min. 45 sec., long. 108 deg. 15 min. 31 sec.;

THENCE, N 80 W, across the canyon a distance more or less of 1,050 ft to the confluence of Little Water Canyon and Water Canyon and a point at lat, 35 deg. 06 min. 51 sec., long. 108 deg. 15 min. 40 sec.;

THENCE, N 40 E, ascending to the ridge between Water canyon and Little Water Canyon a distance more or less of 750 ft to a point at lat. 35 deg. 06 min. 56 sec., long. 108 deg. 15 min. 35 sec.;

THENCE, N 33 E, ascending a distance more or less of 360 ft to a point at lat. 35 deg. 06 min. 59 sec., long. 108 deg. 15 min. 33 sec.;

THENCE, N 62 E, ascending a distance more or less of 855 ft to a point at lat. 35 deg. 07 min. 09 sec., long. 108 deg. 15 min. 23 sec.;

THENCE, N 26 E, ascending to said road a distance more or less of 1,970 ft and a point at lat, 35 deg. 07 min. 19 sec., long. 108 deg. 15 min. 12 sec.;

THENCE, N 55 E, ascending to the ridge a distance more or less of 755 ft and a point at lat, 35 deg. 07 min. 25 sec., long. 108 deg. 15 min. 04 sec.;

THENCE, East, along said ridge a distance more or less of 400 ft to a point at lat. 35 deg. 07 min. 24 sec., long. 108 deg. 15 min. 00 sec.;

THENCE, S 80 E, along said ridge a distance more or less of 725 ft to a point at lat. 35 deg. 07 min. 23 sec., long. 108 deg. 14 min. 52 sec.;

THENCE, N 42 E, ascending to said road a distance more or less of 750 ft and a point at lat, 35 deg. 07 min. 28 sec., long. 108 deg. 14 min. 46 sec.;

THENCE, North, ascending a distance more or less of 2,495 ft to a point at lat. 35 deg. 07 min. 57 sec., long. 108 deg. 14 min. 43 sec.;

THENCE, N 27 E, ascending to said Continental Divide a distance more or less of 2,985 ft and a point at lat, 35 deg. 08 min. 15 sec., long. 108 deg. 14 min. 27 sec.;

THENCE, S 60 E, along said Continental Divide a distance more or less of 3,805 ft to bench mark 8728 as designated on the USGS Post Office Flat, New Mexico 7.5 minute quadrangle and a point at lat, 35 deg. 08 min. 00 sec., long. 108 deg. 13 min. 48 sec.;

THENCE, N 16 E, descending to the bottom of the slope a distance more or less of 3,640 ft and a point at lat, 35 deg. 08 min. 34 sec., long. 108 deg. 13 min. 35 sec.;

THENCE, N 74 E, a distance more or less of 1,180 ft to bench mark 8191 as designated on the USGS Post Office Flat, New Mexico 7.5 minute quadrangle, a point at lat, 35 deg. 08 min. 38 sec., long. 108 deg. 13 min. 22 sec., and point of beginning of said tract.

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To	JIM Hibbets	From
Co.	Cibola N.F.	Co.
Dept.		Phone #
Fax #	761-4663	Fax #
		277-1997



United States  
Department of  
Agriculture

Forest  
Service

R-3

2017

Reply to: 4060 Research Facilities

Date: November 4, 1982

Subject: Botanical Information on Proposed Natural Areas

To: Forest Supervisor, Cibola NF

*information on rejected proposed RNA in Cibola NF file*

Enclosed is some followup work by Reggie Fletcher, Regional Botanist, on the botanical characteristics of natural areas that have been proposed. We believe you will find this information interesting and valuable.

If you have specific questions on the botanical feature, please contact Reggie at 766-2428.

DON RENTON  
RNA Committee Chairman

Enclosure

cc: Mount Taylor Ranger District





Reply to: 4060 Research Facilities

Date: October 20, 1982

Subject: Proposed Little Water Canyon Blue Spruce Research Natural Area

To: Larry Schmidt, Soil and Water

The proposed blue spruce Research Natural Area on the Mt. Taylor Ranger District, Cibola National Forest, was visited by RNA Task Force members Earl Aldon, Larry Schmidt, Will Moir, and Reggie Fletcher together with Larry Sanson and George Garcia on June 16, 1982.

The area, as outlined by Stetson C. Edmunds, District Ranger, is a narrow strip running over a mile and one-half in Sections 5, 6, and 7, T. 10 N., R. 13 W., and Section 32, T. 11 N., R. 13 W. Elevation ranges from 7,900 to slightly above 8,800 feet.

Blue spruce is confined to the lower half between 7,900 and approximately 8,250 feet in the bottom of Little Water Canyon. A perennial stream runs from the elevation where blue spruce is encountered. The narrow rugged nature of Little Water Canyon is probably what prevented previous logging of the spruce. The upper portion of the canyon to the continental divide along Oso Ridge is included to maintain the integrity of the watershed.

That this small area has survived in such a pristine state is remarkable. Several blue spruce were measured that come close to the record measurements for this species. Species diversity and composition were impressive and accessibility favors research studies.

The upper slopes are relatively open with ponderosa pine and gambel oak dominating the overstory on lithic skeletal soils derived from sandstone. Rock fragments compose approximately 40 percent of the surface area here. As the canyon narrows and the canopy begins to close, Douglas-fir is encountered (8,400 feet). Gambel oak is still prominent, but diversity increases and both Rocky Mountain juniper and aspen are found. Water is spotty below the first Douglas-fir, and most of the canyon is dry. The canyon deepens abruptly, the canopy closes, and permanently flowing water begins coincidentally with blue spruce.

Enclosed is a list of plant species encountered on June 16, as well as vegetation plot data provided by Will Moir. The species list provides an example of the rich diversity of Little Water Canyon. It is expected numerous additional species would be encountered both in the fall and on a more thorough investigation.

I highly recommend this area be submitted for inclusion into the RNA System. A slight extension of the boundary across Oso Ridge to the northeast would include some of the largest gambel oaks I can recall.

*Reggie*



REGGIE A. FLETCHER  
Regional Botanist

Enclosures

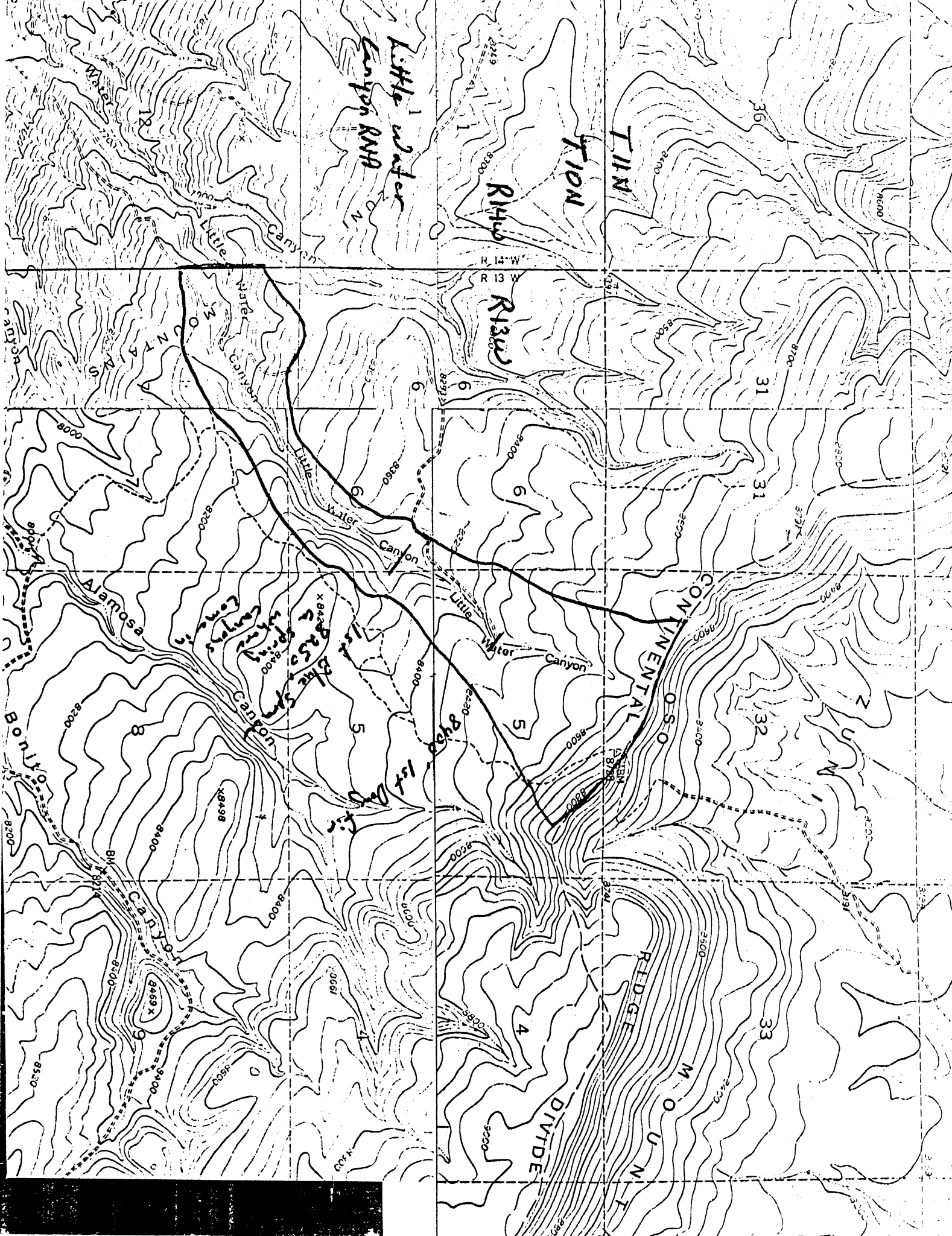
ZUNI MTS. BLUE SPRUCE PROPOSED RNA SPECIES LIST

\*Member of the Blue Spruce Community

- \**Acer glabrum*
- Achillea lanulosa*
- \**Aconitum columbianum*
- \**Actaea arguta*
- Agastache* sp.
- Alnus* sp. (in Fitzhugh's 964)
- \**Amelanchier goldmanii*
- Andropogon scoparius*
- \**Androsace septentrionalis*
- Antennaria parvifolia*
- \**Aquilegia chrysantha*
- Arenaria confusa*
- Artemisia carruthii*
- \**Berberis repens*
- Blepharoneuron tricholepis*
- \**Bromus ciliatus*
- \**Campanula rotundifolia*
- \**Carex foena*
- Carex geophila*
- \**Carex occidentalis*
- \**Carex rossii*
- Ceanothus fendleri*
- Cerastium arvense*
- Chrysopsis canescens*
- Claytonia megarrhiza*
- \**Corallorhiza maculata*
- \**Cornus stolonifera*
- Delphinium nelsonii*
- \**Draba helleriana* var. *blumeri*
- \**Equisetum arvense*
- Erigeron divergens*
- Erigeron* sp.
- Eriogonum alatum*
- \**Fragaria americana*
- Fragaria ovalis*
- \**Galium* sp.
- \**Geranium richardsonii*
- Gnaphalium* sp.
- \**Haplopappus parryi*
- Hieracium fendleri*
- Hymenopappus flavescens* var. *cano-tomentosus*
- Ipomopsis aggregata*
- Iris missouriensis*
- Juniperus deppeana*
- Juniperus scopulorum*
- \**Koeleria cristata*
- \**Lathyrus arizonica*

\**Ligusticum porteri*  
  *Linanthes nuttallii*  
  *Lithospermum multiflorum*  
\**Lonicera arizonica*  
  *Lotus wrightii*  
\**Melica nitens*  
\**Mertensia lanceolata* var. *fendleri*  
\**Monarda menthaefolia*  
  *Muhlenbergia montana*  
\**Osmorhiza obtusa*  
\**Osmorhiza* sp.  
\**Pachystima myrsinites*  
\**Pedicularis grayi*  
\**Penstemon whippleanus*  
  *Penstemon* sp.  
\**Phacelia heterophylla*  
  *Phlox longifolia* ssp. *compacta*  
\**Picea pungens*  
  *Pinus ponderosa*  
\**Platanthera sparsiflora* var. *sparsiflora* (*Habenaria*)  
\**Poa fendleriana*  
\**Poa pratensis*  
\**Populus tremuloides*  
  *Potentilla fruticosa*  
  *Prunus serotina* sp. *virens*  
\**Pendotsuga menziesii*  
\**Pteridium aquilinum*  
\**Quercus gembellii*  
\**Ribes pinetorum*  
\**Rosa* sp.  
\**Rubus parviflorus*  
\**Rubus strigosus* var. *arizonicus*  
\**Rudbeckia laciniata*  
  *Rumex crispus*  
  *Salix bebbiana* var. *perrostrata*  
  *Saxifraga rhomboidea*  
  *Schistophragma* sp.  
\**Schizachne purpurascens*  
  *Sedum* sp.  
  *Senecio hartianus*  
  *Senecio neomexicanus*  
\**Senecio wootonii*  
  *Sisymbrium linearifolium*  
  *Sitanion hystrix*  
\**Smilacina racemosum*  
\**Smilacina stellata*  
  *Solidago wrightii*  
\**Stellaria jamesii*  
\**Swertia radiata*  
  *Talinum parviflorum*

\**Taraxacum officinale*  
\**Thalictrum fendleri*  
\**Thermopsis pinetorum*  
  *Trifolium subacaulescens*  
\**Valeriana capitata* ssp. *acutiloba*  
\**Vicia americana*  
  *Viguiera multiflora*  
\**Viola adunca*  
\**Viola nephrophylla* var. *nephrophylla*  
\**Viola pedatifida*  
  *Zigadenus* sp.



*Little Water  
Canyon RWD*

**TION**

**TION**

**R14W**

R 14 W  
R 13 W

**R13W**

**CONTINENTAL**

**Alamosa**

**BONITO**

**CANYON**

*Blue Springs  
Canyon*

*1st Mt. K.*

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**CONTINENTAL**

**OSO**

**RIDGE**

**Moose**

**CONTINENTAL**

36

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31

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31

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**ZUM**

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Vegetation in understory Blue Spruce forest, Little Water Canyon, Zuni Mts.  
 (Data of plots 963A, 964, 965 from E. Lee Fitzhugh, July 1979).

	PLOT AND ELEVATION			
	963 A 7980	964 8040	965 8240	758 8200
	----- % cover -----			
<b>Shrubs</b>				
<i>Cornus stolonifera</i>	53	2	.1	
<i>Ribes pinetorum</i>	8	1	1	.1
<i>Quercus gambelii</i>	2	.1		.5
<i>Amelanchier goldmani</i>		.4	.1	2
<i>Berberis repens</i>	27	2	4	40
<i>Rosa cf. arizonica</i>	12	1	.9	
<i>Pachistima myrsinites</i>	3	1	t	.9
<i>Acer glabrum</i>	t		t	.1
<i>Rubus parviflora</i>		-		.1
<i>Rubus strigosus</i>	12			
<i>Lonicera arizonica</i>	.4			
<b>Herbs</b>				
<i>Smilacina stellata</i>	17		.1	8
<i>S. racemosa</i>	1	.9		.1
<i>Carex cf. foenea</i>	36	.9	20	10
<i>C. occidentalis</i>	2			4
<i>Stellaria jamesii</i>		.1	12	8
<i>Lathyrus arizonica</i>	.1		1	7
<i>Vicia americana</i>	3	.9	1	.4
<i>Ligusticum porteri</i>	2	.1	1	.7
<i>Thalictrum fendleri</i>	2	1	1	5
<i>Fragaria americana</i>		1	3	3
<i>Haplopappus parryi</i>				.5
<i>Monarda menthaefolia</i>				.3
<i>Bromus cf. ciliatus</i>	2	.9	1	
<i>Poa pratensis</i>				t
<i>P. fendleriana</i>	1			
<i>Koeleria cristata</i>	t			
<i>Osmorhiza obtusa</i>	.6	2	1	t
<i>Equisetum arvense</i>	4	3		.1
<i>Taraxacum officinale</i>	.1	.9		
<i>Campanula rotundifolia</i>		.1	2	.1
<i>Aquilegia chrysantha</i>				
<i>Thermopsis pinetorum</i>	.8	.1	.1	

Little Water Canyon, Zuni Mts, Tree population along canyon bottom <sup>2/</sup>

TREES	NUMBER BY DBH (INCH) CLASS											
	0 - 2		2 - 4	4 - 6	6 - 8	8 - 10	10 - 12	12 - 14	14 - 16	16 - 18	18 - 20	> 20
	< 4.5'	> 4.5'										
PIPU	3	2			2	1	3	1	3	2	4	4
P			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PSME	7	2	1		1		1		2		1	
P			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
POTR	4	11	1			1						
P			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
P			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

TREE	DBH	Ht.	Core
PSME	27"	123'	122t6
PIPU	13"	68'	118
PIPU	44"	120'	

REMARKS: <sup>2/</sup>Stems per 750m<sup>2</sup> (two plots)

REMARKS:

Used some of this & some of "Notes on  
Little Water Canyon" for Physical Conditions Issued July 1967

# SOIL SURVEY

## Zuni Mountain Area New Mexico



UNITED STATES DEPARTMENT OF AGRICULTURE  
Forest Service and Soil Conservation Service  
In cooperation with  
NEW MEXICO AGRICULTURAL EXPERIMENT STATION

# SOIL SURVEY OF ZUNI MOUNTAIN AREA, NEW MEXICO

BY JOHN A. WILLIAMS, FOREST SERVICE

SOILS SURVEYED BY JOHN A. WILLIAMS, TRUMAN C. ANDERSON, JR., AND DARWIN B. CREZEE, FOREST SERVICE, AND BASIL ABASKIN, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, FOREST SERVICE AND SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE NEW MEXICO AGRICULTURAL EXPERIMENT STATION.

## Part I: The Landscape

The Zuni Mountain Area, in the northwestern part of New Mexico (fig. 1), is part of the Cibola National Forest. It is 415,630 acres, or about 649 square

miles, in size. The Federal government owns 261,850 acres, and the rest is privately owned. About one-third of the Area is in McKinley County, and the rest is in Valencia County. Gallup, the county seat of McKinley County, is approximately 10 miles north of the northwestern corner of the Area.

Interstate Route 40 (U.S. 66) is a few miles outside the Area to the east and north (fig. 2). State Highways 53

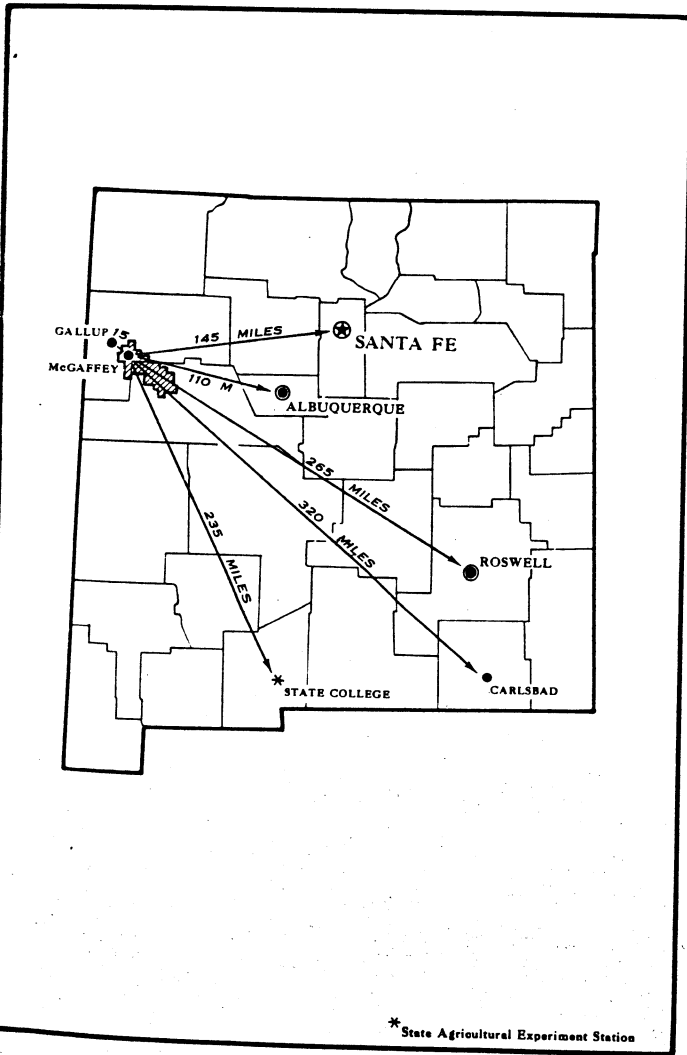


Figure 1.—Location of Zuni Mountain Area in New Mexico.

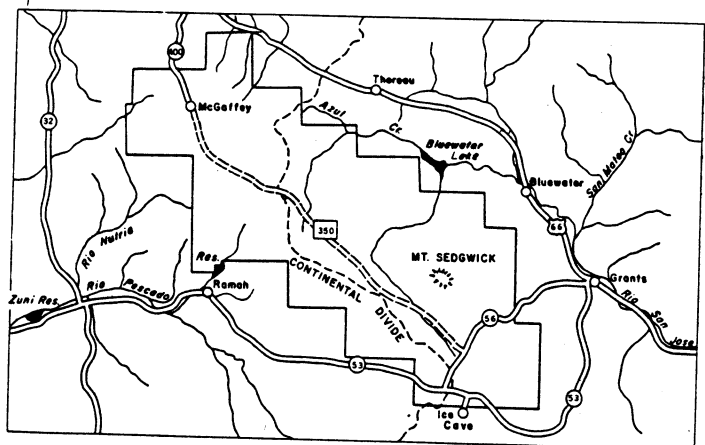


Figure 2.—Regional setting of the Zuni Mountain Area.

and 56 cross the southeastern part of the Area. State Highway 400 is a paved road that serves the northwestern part of the Area but terminates at McGaffey. Forest Road 350 is the main thoroughfare. It runs from McGaffey southeastward through the central part of the Area and terminates at State Highway 56 near the southeastern corner of the Area. Many minor roads and trails give access to the northern and southern flanks of the mountains.

## Topography and Drainage

The Zuni Mountains are in the southeastern part of the Colorado Plateau physiographic province. They are crossed by the Continental Divide in a general northwest-southeast direction. The altitude ranges from about 6,500 to more than 9,200 feet but is most commonly between 7,500 and 8,000 feet. Prominent features of the landscape are Mt. Sedgwick in the east, Oso Ridge in the south,

Lookout Mountain in the central part of the Area, and the Nutria Monocline (Hogback) along the western boundary.

The topographic features of the Area can be best described as four groups.

1.—A large area underlain by granite is located in the eastern part. The terrain is rough, very steep, rocky, and mountains. Outcrops of weathered granite are common, and the very steep slopes are cut by numerous little drainage ways created by erosion.

2.—A series of relatively broad interior valleys extends from McGaffey, in the northeastern part of the Area, to the southeastern corner. These valleys are divided by escarpments, rims, and low hills. Deep and extensive active gullies are common.

3.—Abrupt, steep rims and escarpments, rising several hundred feet above adjacent valley floors, stud the northern and southern parts of the survey Area. The northern rim is broken by a series of deep canyons that have nearly vertical walls. Oso Ridge, the southern rim, is a very high escarpment that extends nearly unbroken for many miles.

4.—Moderately steep, rocky, ridged topography extends from McGaffey westward to the boundary of the survey Area. The conspicuous Nutria Hogback is in this part, and there are many narrow, V-shaped draws and canyons. Because the Area is crossed by the Continental Divide, natural drainage is divided between two major river basins. West of the Divide, the drainage is tributary to the Colorado River; drainage east of the Divide is tributary to the Rio Grande. In the northwestern part of the Area, streams flow through a series of large canyons, notably Sixmile, Fournelle, Foster, and Smith Canyons. Drainage in the southwest is through canyons and draws turning into Rio Nutria and Rio Pescado. These two rivers join west of the boundary of the Cibola National Forest to form the Zuni River, which is a tributary of the Little Colorado River. East of the Divide are Cottonwood, Sawyer, and Binewater Creeks, which drain to the north, and Prop Canyon and its tributaries and Zuni Canyon, which provide channels to the east. Bonita Canyon and Agua Fria Creek flow southeastward.

## Rock Formations

The central core of the Zuni Mountains contains some of the oldest exposed rocks in northwestern New Mexico (2).<sup>1</sup> These rocks, largely granite, are believed to have formed between 500 million and 2,000 million years ago, during the Precambrian period. About 500 million years ago, the Area was composed of low, gently rolling granitic hills. Some 270 million years later, during the Permian period, a sea advanced slowly from the south to a line just north of the present Zuni Mountains, where it left deposits of shale, sandstone, and limestone about 1,000 feet thick. Later, another sea advanced and receded several times, leaving thick deposits of gray and black shale and thin layers of lighter colored sandstone. This sea retreated for the last time about 70 million years ago, near the end of the Cretaceous period. Then the uplift that formed the mountains began. The granite mass rose gradually, and as it rose the sedimentary rocks that had formed over it

<sup>1</sup> Italic numbers in parentheses refer to Literature Cited, p. 85.

were fractured and tilted upward. The Zuni Mountains are now a broad, elongated dome almost completely ringed with high, inward-facing cliffs of sandstone and shale. Figure 3 shows, in cross section, the position of some of the major rock formations in the Area.

Precambrian granite gneiss, biotite schist, granite, and quartzite are the rocks in the central upland of the Area. Except in the vicinity of Mt. Sedgwick, the Precambrian rocks are less rugged than the surrounding sedimentary rocks.

Within the upland valleys, around the Precambrian core, are Pennsylvanian rocks of the Magdalena group. These rocks range from calcareous, reddish-brown to medium-gray quartzite and feldspar conglomerate to gray, dense, massive limestone. The younger sedimentary rocks dip away in all directions from the central upland valleys, forming a chain of cuestas toward the lower Permian rocks overlie the Pennsylvanian rocks. They consist of Abo sandstone, Glorieta sandstone, San Andres limestone, and the Yeso member of the Chupadera formation. The Abo formation consists of layers of red to reddish-brown sandstone, siltstone, and shale. The Yeso formation is made up of interbedded, fine-grained or medium-grained sandstone, siltstone, and shale. The color ranges from reddish yellow to red to yellowish gray.

Glorieta sandstone is yellowish gray to light gray or white, medium grained, and noncalcareous. It forms the inner ledge and rim of high mesas around the central valleys above the Yeso formation. It is resistant to weathering. Steep cliffs and long, gentle dip slopes are common. The San Andres formation consists of gray limestone, of medium-grained, grayish-yellow to light-gray sandstone, and of silty and cherty, light-red limestone. It is massive, dense, and nonfossiliferous. It overlies Glorieta sandstone. Limestone makes up most of the formation.

The Chinle formation and Wingate sandstone are Triassic rocks. The Chinle formation is composed of shale, coarse-grained sandstone, and lenses of conglomerate. Petrified wood is abundant. Wingate sandstone, which forms the lower part of the escarpment in the southwestern corner of the Area, is composed of massive, conglomeratic, medium-grained to coarse-grained, yellowish-gray sandstone.

Jurassic and Cretaceous rocks outcrop in the western part of the Area and form the Nutria Monocline and that portion of the eastern flank of the Gallup Sag lying within the boundaries of the Cibola National Forest. Entrada sandstone of the Jurassic system is massive, medium grained or coarse grained, friable, and reddish yellow to medium red. Dakota sandstone, Mancos shale, and the Mesaverde rocks are part of the Cretaceous system.

Dakota sandstone is massive, resistant, yellowish-gray to light-brown, conglomeratic sandstone separated by gray shale. Mancos shale is dark gray and fossiliferous and contains lenses of siltstone and sandstone. It has some thin beds of bentonite. The Mesaverde group is composed of Gallup sandstone and the Crevasse Canyon member. The pink to yellowish-gray Gallup sandstone is massive and medium grained or coarse grained. The Crevasse Canyon member is gray to dark-gray shale that contains carbonaceous material, thin beds of coal, and lenses of gray to light-gray sand.

## Soils

Soils information is excerpted from the 1967 Soil Survey, Zuni Mountain Area, New Mexico published by the Soil Conservation Service. Refer to Map 6.

**Kiln rocky complex, 3 to 20 percent slopes (Kr).**—This complex consists of loam soils mixed with limestone rocks, stones, and cobblestones. It is on gently sloping or moderately sloping and rolling uplands in the ponderosa pine forest. About 30 percent of the surface is covered with stones and outcrops, and about 30 percent of the profile consists of stones and cobblestones. Included in the areas mapped are short breaks that have a slope of as much as 25 percent.

The surface layer is dark-brown, very friable, platy stony loam. It is 5 inches thick. The subsoil consists of reddish-brown, friable, blocky clay loam or clay and is about 5 inches thick. Directly under the subsoil is hard, dense, fissured limestone. A 1- or 2-inch layer of pine needles and oak leaves covers most of the surface. The depth to limestone ranges from 8 to 14 inches, but a depth of 10 inches is most common.

Infiltration is moderate, and permeability is moderately slow. The capacity to store water is low, as is the capacity for sustained yield. Runoff is slow, even though the soil is shallow. Apparently, most of the precipitation received passes through the soil and readily penetrates cracks and fissures in the underlying limestone. Some of the water is returned to springs and seep areas along the edges of the limestone exposures. The erosion hazard is moderate, but loss of soil through erosion does not appear to be significant. Roots penetrate easily as far as the limestone, and many enter the fissures in the limestone.

This complex is moderately well suited to timber and to herbage. In areas that have been heavily logged, there is little second-growth pine but an abundance of oak brush. The oak brush provides food for deer and wild turkey.

**Rock land (5 to 50 percent slopes) (Rk)** makes up about 10 percent of the survey Area. It includes two kinds of terrain.

About one-third of the unit consists of large escarpments, steep breaks, rock ledges, rock outcrops, short escarpments, talus slopes, and patches of shallow, moderately deep, and deep soil as a mantle over rock or as pockets among outcrops and ledges. The rock outcrops consist of granite, basalt, shale of the Chinle formation, San Andres limestone, Glorieta sandstone, and Abo and Yeso sandstone. The slope range is 25 to 50 percent. Much of the acreage is vegetated, some densely and some only sparsely. The vegetation consists of ponderosa pine, Douglas-fir, oak brush, pinyon pine, juniper, and such grasses as Arizona fescue, junegrass, blue grama, and squirreltail. These steep areas have scenic value (fig. 22). Their use for grazing is limited by the steep slopes, ledges, and escarpments. Logging is difficult and requires special equipment. Wildlife, particularly deer, find suitable food and avenues of escape and concealment. The surface yield of water is high.

Two-thirds of this unit consists of exposed Glorieta and Gallup sandstone and of pockets of loamy sand or sandy loam ranging from 10 to 40 square feet in area and from 6 to 10 inches in depth. This part is associated with Osoridge and Bond soils. It is sparsely vegetated with stunted ponderosa pine, pinyon pine, juniper, and grass. The slope range is 5 to 25 percent. These less sloping areas are suited to timber, range, and wildlife. Runoff is high, and stock ponds located downslope from these areas are seldom dry. The scenery is spectacular.

**Osoridge rocky complex, 5 to 20 percent slopes (Or).**—

This complex consists of very shallow and shallow, stony soils intermingled with sandstone rocks, boulders, stones, and gravel. It occupies high mesas, long dip slopes leading from escarpments, and the side slopes of canyons and draws. Included in the areas mapped are small areas of Rock outcrop, gently sloping, of Rock land, and of Kiln soils. Kiln soils adjoin some areas of the complex.

Large slabs, boulders, and fragments of sandstone cover 50 to 85 percent of the surface. The areas are difficult to cross, either on horseback or on foot.

Osoridge stony fine sandy loam makes up about 75 percent of the complex. Its surface layer is grayish brown, friable, platy, noncalcareous fine sandy loam about 4 inches thick. Beneath this is reddish-brown, firm, blocky, noncalcareous clay 10 to 12 inches thick. In most places this layer abruptly overlies Glorieta sandstone, but it may be separated from the sandstone by a thin layer of clay mixed with partly decomposed sandstone.

Other soils in the complex consist of grayish-brown and reddish-brown sandy loam from the surface to the underlying rock. Still others consist of grayish-brown or reddish-brown sandy loam about 12 inches thick over a 1- or 2-inch layer of blocky, reddish-brown clay over the sandstone bedrock.

In some areas these soils are only 3 to 5 inches deep, but in other places they are as much as 30 inches deep. Generally, the depth to bedrock is between 12 and 20 inches.

Infiltration is rapid, but permeability is impeded by the clayey subsoil. The capacity for water storage and the capacity for sustained yield to springs and seeps are low. Runoff is high because of the many stones, boulders, and slabs on the surface. Much of the water in irrigation lakes adjacent to the Zuni Mountains runs off the soils of this complex. The erosion hazard is high, and rill erosion is evident in many places.

These soils are poorly suited to timber and only moderately well suited to herbage. They are used for summer range, and they produce browse plants that provide food for deer. Ponderosa pines are stunted and of low quality. Natural regeneration of ponderosa pine is slow at best and in places is entirely ineffective. Distribution of grazing is difficult because of a lack of suitable sites for earthen stock tanks. If the herbage cover is reduced or depleted, recovery is very slow. The areas are valuable chiefly as a watershed.

**Osoridge rocky complex, 20 to 40 percent slopes (Ox).**—

This complex occupies the side slopes of canyons and draws. It contains a great deal of ledge rock, and generally the soils are not more than 12 inches deep. Included in the areas mapped are some areas where the slope is as much as 50 percent.

Runoff is rapid, and the surface yield of water is high. The erosion hazard is high.

These soils are poorly suited to timber and only moderately well suited to herbage. Their usefulness for grazing is limited because of the slope and the barriers of ledge rock. This complex is best managed for surface yield of water.

**Fortwingate loam, 2 to 8 percent slopes (Fo).**—In most areas of this soil (fig. 16), the slope gradient is between 3 and 5 percent. Small areas of Osoridge rocky complex, 5 to 20 percent slopes, and Kiln rocky complex, 3 to 20 percent slopes, are included in the areas mapped.

The surface layer is brown or grayish-brown, friable, noncalcareous loam or very fine sandy loam about 12 inches thick. Beneath this is reddish-brown, friable, noncalcareous, blocky sandy clay or clay, 24 to 30 inches thick, which overlies sandy soil material or sandstone bedrock. When dry, the surface layer is slightly hard in places, and the subsoil is extremely hard. The subsoil is well developed, and the color change from brown or grayish brown in the surface layer to reddish brown in the subsoil is distinct and abrupt. In most places the surface is covered by a 1- to 2-inch layer of litter. The depth to bedrock ranges from 32 to more than 48 inches. This range in depth is attributed to dipping and undulation of the underlying sandstone.

Infiltration is rapid, but permeability is impeded by the subsoil and is moderate or moderately slow. The capacity for water storage and sustained yield is high. Runoff is moderately slow, and the erosion hazard is moderate. Root penetration is moderately deep or deep. Fertility is high.

This soil is well suited to timber and herbage. It has good stands of young pine. Even though most of the area has been extensively logged, the stands restock through natural regeneration. Overgrazing has depleted much of the grass cover. Desirable browse, avenues of escape, and concealment areas make this soil an excellent habitat for deer.

**Savoia fine sandy loam, 5 to 20 percent slopes (Sf).**—This soil is on toe slopes and on higher fans and terraces than Savoia fine sandy loam, 2 to 5 percent slopes. It occurs in narrow strips that finger into the less sloping fans. The slope breaks sharply at the outer edges of the areas. Runoff is medium, and the erosion hazard is high.

This soil is well suited to timber and herbage. It provides excellent spring, summer, and fall range for cattle, and it produces good ponderosa pine. The clumps of oak brush provide forage for deer and turkey.

x2 in Cibola NF  
st 2 pgs in...

Mt. Taylor RD

4060 Research Facilities

May 24, 1982

Study of Two Proposed RNAs on the Mt. Taylor RD

Forest Supervisor

The Mt. Taylor District is fortunate to have two very unique areas that I feel should be in the RNA system. These are the Bluewater Old Growth Pine Area and the Little Water Canyon Blue Spruce Area.

Below is a short narrative describing both these stands and my rationale for nominating them.

Bluewater Old Growth Pine Area

Background: Dense stands of yellow pine once blanketed the Zuni Mountains. These stands reportedly had volumes up to 40 MBF per acre on good sites, with many trees in the 40-50" class. Railroad logging carried out by the American, Breece and McGaffey Lumber Companies between 1892 and the early 1930s completely changed, with some minor exception, the character of the Zunis. Large portions of this mountain range, notably Agua Fria and Bluewater Valleys and the west end of the mountains were clearcut. Scattered low quality and/or stubby yellow pine were left either as seed trees or by "cutter's choice." Some partial cuts were carried out later, and are continuing, and with the exception of some 16,000 acres (mostly again in the Agua Fria and Bluewater drainage) the Zunis are fairly well restocked with young growth.

Description: The Bluewater Old Growth Area epitomizes the original stands of virgin pine that once characterized the Zunis. It is an 80 acre block in Bluewater Valley that was not railroad harvested, as it was within a small area of original public domain that was never patented. An old railroad grade passes right next to the stand. It is essentially a virgin old growth stand of pure ponderosa pine with scattered reproduction and some natural openings. Individual trees in the 40"+ DBH and 100' height classes are fairly common. Grass cover is the pine bunchgrass association with sedges and bluegrass in the creek bottom itself.

Rationale: The area represents the only known stand of old growth virgin pine left east of the Continental Divide in the Zuni Mountains. I feel it is very valuable to leave in its natural state and useful to research in that most other sites like it in the eastern two thirds of this mountain range are now grasslands and/or are stocked with a minimal number of trees because of past cutting practices. This stand presents opportunities to show and measure what this kind of site is capable of producing and thus their worth and priority for reforestation.

Recommendation: I recommend this area (80 acres) plus 80 acres to the north (see map), which would include a 1/2 mile stretch of Bluewater Creek, become a Research Natural Area (T. 11 N., R. 13 W., NW $\frac{1}{4}$  Section 2).



Little Water Canyon Blue Spruce Area

Background: The Zuni Mountains rise in elevation to a little more than 9,300 feet. The major vegetation types are woodland, ponderosa pine, mountain grassland, and small stands of mixed conifer here and there. Spruce (either Englemann or Colorado Blue) is not considered a species to be found in the Zunis.

Description: The Little Water Canyon Blue Spruce Area is a unique ecosystem in that it is the only virgin blue spruce area within the Zunis and the largest of only three or four sites in this mountain range that supports this species of spruce. The stand is found in a deep canyon on the southwest side of Oso Ridge. The aspect of the surrounding country is southwest and the area is basically a transition zone with a mixture of ponderosa pine, pinyon, juniper and Gambel oak. However, little water canyon is a different world. The temperature drops dramatically and the vegetational change is abrupt. Blue spruce is the predominate species with some Douglas fir and aspen on the slopes and hardwood riparian vegetation on the bottom. A cool perennial stream runs through the canyon, with its origin Water Canyon Spring.

Rationale: This area is the only stand of old growth virgin blue spruce that is available for study on the Mt. Taylor District and perhaps on the Cibola National Forest. I feel it is extremely valuable to leave in its natural state as its potential for study is legion.

Recommendation: I recommend that the deep canyon itself (Little Water Canyon) plus the main drainages into the canyon (see enclosed map) be included in a Research Natural Area. This would take in approximately 300 acres (T. 10 N., R. 13 W., parts of Sections 5, 6, and 7 and T. 11 N., R. 13 W., part of Section 13).

STETSON C. EDMUNDS  
District Ranger

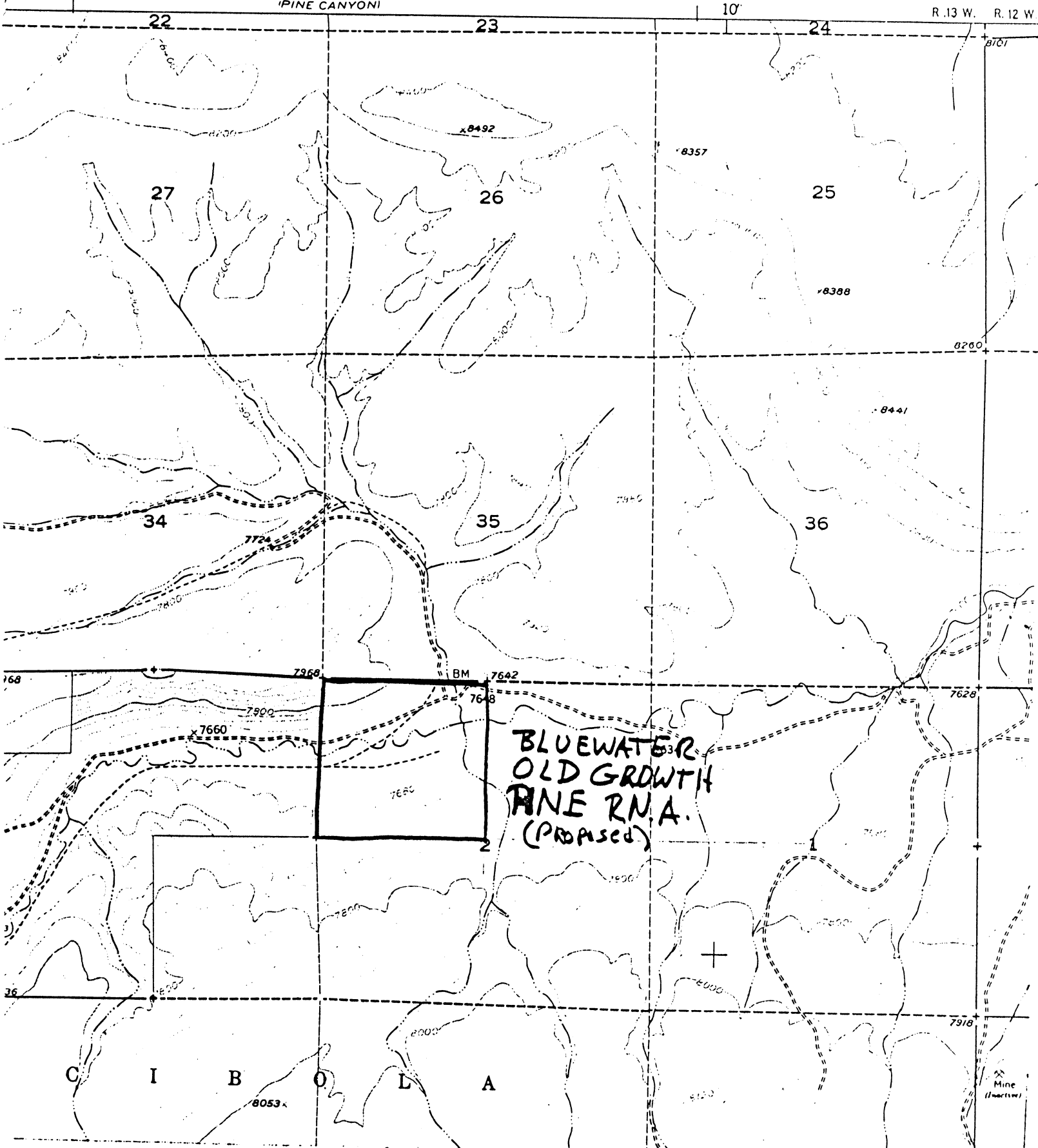
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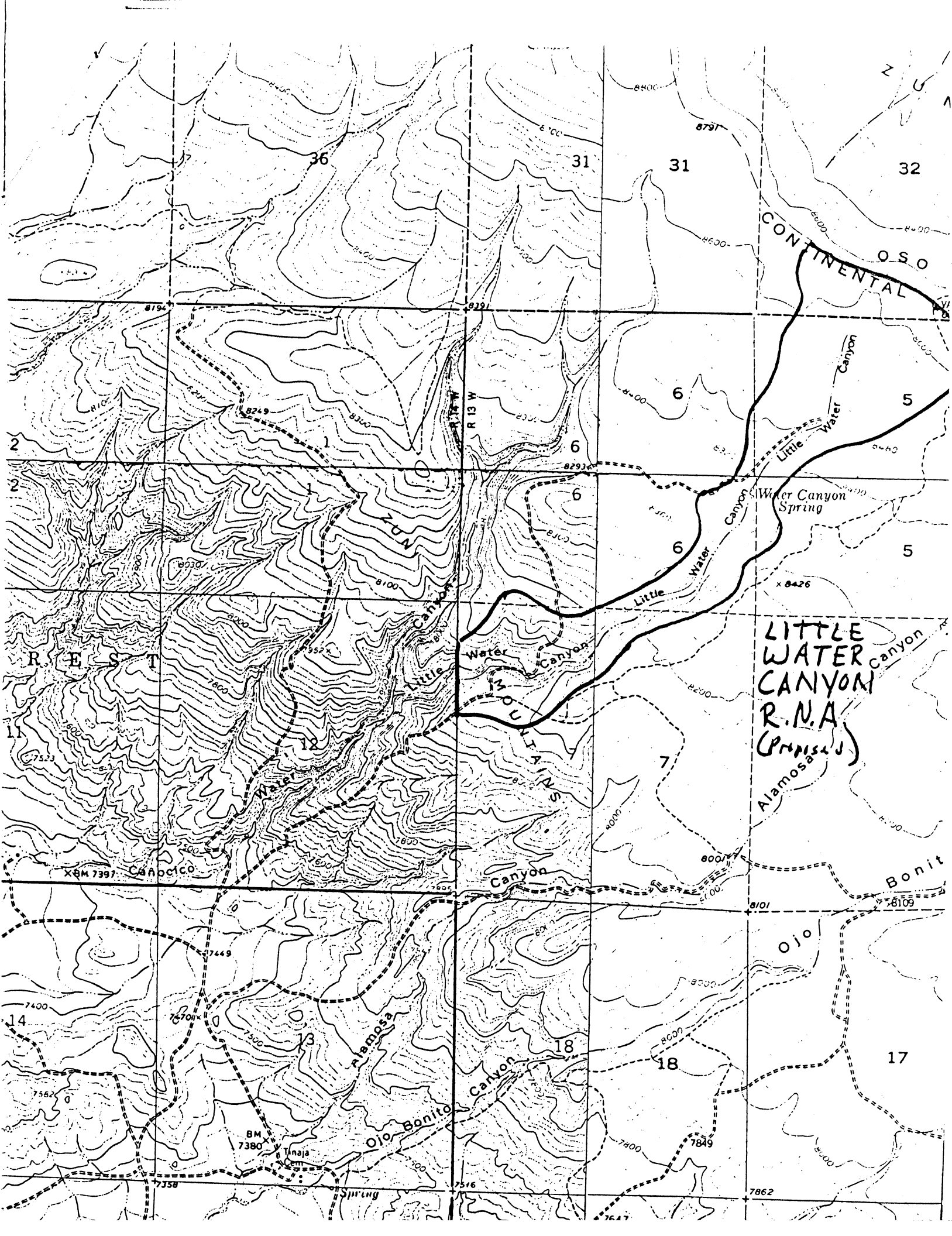
# IBOLA NATIONAL FOREST

## MT. TAYLOR RANGER DISTRICT

T 11 N  
R 13 W  
NW 1/4  
Sec. 2

(F.S. NO. 1485W)  
PINE CANYON





NOTES ON LITTLE WATER CANYON RNA

Handwritten notes in cursive script, partially obscured and illegible.

No white fir is found in the Zuni Mountains. On the northeast side of Oso Ridge the lower, more gentle reaches are dominated by ponderosa pine and gambel oak. Higher up slopes increase to above 15 percent and douglas-fir becomes common.

There is an old logging road up the canyon bottom of this northeast side. The steep west slope also has a logging trail zig zagging up but there are some old growth ponderosa pine left. The area was logged early this century at the same time the rest of the Zuni Mountains were cut.

The southern portion of this side forms a bowl with dense mixed conifer and aspen. There is a lot of downfall and a small seep in the NW 1/4, Section 4.

The road up the northeast side to the top of the ridge is now only traversable by 4 wheel drive. The old logging road down the west side in the Little Water Canyon drainage is not traversable by vehicle.

The top of Oso Ridge is fairly open ponderosa pine/gambel oak with lots (to 40 percent) of rock surface and shallow soils. Because of the shallow depth to sandstone bedrock over much of the west side, even the small draws will have normally riparian plants like Prunella vulgaris.

Where the drainage starts to form an actual canyon the bottom community is mixed conifer but the drainage is very narrow. The first douglas-fir is encountered at 8400' when heading down from Oso Ridge (center of NW 1/4, Section 5).

Permanent water and blue spruce community starts near 8250' at canyon forks between Sections 5 and 6 just inside Section 6. There is a May 1901 date on an aspen at the canyon forks. Most of the understory is thick red osier dogwood with an overstory dominated by blue spruce. The canyon is never much more than 100 yards wide.

The small stream appears not to have flooded for decades and the vegetation is almost impenetrable except for occasional bear trails too low for easy use by humans. Canyon sides are steep, 30° or more.

The canyon is more open the lower 1/3 or so of the watered stretch. Birch is found along sunny stretches mixed with spruce and aspen.

The lower 25 percent or so of the west side has a limestone substrate. Arizona fescue is abundant on the limestone but rare (except for one or two spots) on sandstone where little bluestem is common. Grass production on the ponderosa pine community on limestone is several times that on sandstone. The limestone soils are deeper and more productive except for one small sandstone area in the SE 1/4, Section 6. On limestone one-seed juniper and Purshia tridentata are relatively common but they drop out when you pass on to sandstone substrates.

On my two excursions, I did not notice any significant livestock uses for most of the watered stretch of the drainage the canyon sides are steep enough to preclude water availability to livestock. There was also scant evidence of use by humans.

The Little Water Canyon portion of the RNA ranges from 7900 to 8800' elevation.

2001 Mountain List for MIXED CONIFER Species  
 Common-name SCT-NM.

* CAT, BRAZILIAN FERR-TAILED	TAPAPIDA BRASILIENSIS
* BEAR, BLACK	URSUS AMERICANUS
* CHICKADEE, BLACK-CAPPED	PARUS ATRICAPILLUS
* COTTONTAIL, NUTTALL'S	SYLVILAGUS NUTTALLII
* CROW, AMERICAN	CORVUS BRACHYRHYNCHOS
* DOVE, MOURNING	ZENAIIDA MACROPSA
* EAGLE, GOLDEN	AQUILA CHRYSAETUS
* FALCON, PEREGRINE	FALCO PEREGRINUS
* FINCH, HOUSE	CARPODACUS MEXICANUS
* GOPHER, BOTTA'S POCKET	THOMOMYS BOTTAE
* GROSBEAK, BLACK-HEADED	PHEUCTICUS MELANOCEPHALUS
* GROSBEAK, EVENING	COCCOTHRAUSTES VESPERTINUS
* GROUSE, BLUE	DENDRAGAPUS OBSCURUS
* HAWK, RED-TAILED	BUTEO JAMAICENSIS
* JUNCO, DARK-EYED	JUNCO HYEMALIS
* KESTREL, AMERICAN	FALCO SPARVERIUS
* KINGLET, GOLDEN-CROWNED	REGULUS SATRAPA
* KINGLET, RUBY-CROWNED	REGULUS CALENDULA
* LIZARD, SHORT-HORNED	PHRYNOSOMA DOUGLASSI
* MAGPIE, BLACK-BILLED	PICA PICA
* MARTIN, PURPLE	PROGNE SUBIS
* MOUSE, PINYON	PEROMYSCUS TRUEI
* MYOTIS, CALIFORNIA	MYOTIS CALIFORNICUS
* MYOTIS, FRINGED	MYOTIS THYSANODES
* MYOTIS, LONG-EARED	MYOTIS EVOTIS
* MYOTIS, LONG-LEGGED	MYOTIS VOLANS
* MYOTIS, SMALL-FOOTED	MYOTIS LEIBII
* NIGHTHAWK, COMMON	CHORDEILES MINOR
* NUTHATCH, WHITE-BREASTED	SITTA CAROLINENSIS
* OWL, FLAMMULATED	OTUS FLAMMEOLUS
* OWL, SPOTTED	STRIX OCCIDENTALIS
* PHOENIX, BLACK	SAYORNIS NIGRICANS
* RACCOON	PROCYON LOTOR
* RATTLESNAKE, WESTERN	CROTALUS VIRIDIS
* SISKIN, PINE	CARDUELIS PINUS
* SKUNK, STRIPED	MEPHITIS MEPHITIS
* SNAKE, GOPHER	PITUDOPHIS MELANOLEUCUS
* SPARROW, WHITE-CROWNED	ZONOTRICHIA LEUCOPHRYS
* WARBLER, VIRGINIA'S	VERMIVORA VIRGINIAE
* WARBLER, WILSON'S	WILSONIA PUSILLA
* WOODPECKER, HAIKY	PICOIDES VILLOSUS
* WOODPECKER, LEWIS'	MELANERPES LEWIS
* BLUEBIRD, MOUNTAIN	SIALIA CURRUCCIDES
* BLUEBIRD, WESTERN	SIALIA MEXICANA
* BUSHTIT	PSALTRIPARUS MINIMUS
* CHICKADEE, MOUNTAIN	PARUS GAMBELI
* CHIPMUNK, COLORADO	TAMIAS QUADRIVITTATUS
* COYOTE	CANIS LATRANS
* CREEPER, BROWN	CERTHIA AMERICANA
* CROSSBILL, RED	LOXIA CURVIROSTRA
* DEER, MULE	ODOCOLEUS HEMIONUS
* ELK, ROCKY MOUNTAIN	ELAPHUS AMERICANA
* FLICKER, NORTHERN	COLAPTES AURATUS
* FLYCATCHER, OLIVE-SIDED	CONTOPUS BOREALIS
* FLYCATCHER, WESTERN	EMPIDONAX DIFFICILIS
* GOPHER, NORTHERN POCKET	THOMOMYS TALPOIDES
* HAWK, SHARP-SHINNED	ACCIPITER STRIATUS
* HUMMINGBIRD, BROAD-TAILED	SELASPHORUS PLATYCERCUS
* LION, MOUNTAIN	FELIS CONCOLOR
* MINK	MUSTELA VISON
* MOUNTAIN BEAR	PEROMYSCUS MANTICULATUS

MINK BEAR / mink western Hemet

\* NUTCRACKER, CLARK'S  
 NUTHATCH, RED-BREASTED  
 \* OAL, GREAT HORNED  
 \* OAL, LONG-EARED  
 \* OAL, NORTHERN SAW-WHET  
 \* PIGEON, BAND-TAILED  
 \* PORCUPINE  
 \* RABBIT, AMERICAN  
 \* SAPSUCKER, WILLIAMSON'S  
 \* SAPSUCKER, YELLOW-BELLIED  
 \* SHREW, VAGRANT  
 \* SOLITAIRE, TOWNSEND'S  
 \* SPARROW, CHIPPING  
 \* SQUIPHEL, RED  
 \* SWALLOW, VIOLET-GREEN  
 \* SHIFT, WHITE-THROATED  
 \* Tanager, WESTERN  
 \* THRUSH, HERMIT  
 \* TURKEY, WILD  
 \* VIREO, SOLITARY  
 \* VULTURE, TURKEY  
 \* WARBLER, GRACE'S  
 \* WAXWING, CEDAR  
 \* WOODPECKER, THREE-TOPED  
 \* WOOD-PEEKEE, WESTERN  
 \* WREN, HOUSE  
 \* BAT, PALLID  
 \* BAT, SILVER-HAIRED  
 \* CHIPMUNK, CLIFF  
 \* MOUSE, BRUSH  
 \* MYOTIS, YUMA  
 \* SQUIRREL, ABERT'S  
 \* VIREO, WARBLING  
 \* VOLE, LONG-TAILED  
 \* VOLE, MEXICAN  
 \* WOODRAT, MEXICAN

SITTIA CANADENSIS  
 RUPU VIRGINIANUS  
 ASIO OTUS  
 AEGOLIUS ACADICUS  
 COLUMBA FASCIATA  
 ERETHIZON DORSATUM  
 TURDUS MIGRATORIUS  
 SPHYRAPICUS THYROIIDEUS  
 SPHYRAPICUS VARIUS  
 SOREX VAGRANS  
 MYADESTES TOWNSENDI  
 SPIZELLA PASSERINA  
 TAMIASCIURUS HUDSONICUS  
 TACHYGINETA THALASSINA  
 AERONAUTES SAXATALIS  
 PIRANGA LUDUVICIANA  
 CATHARUS GUTTATUS  
 MELEAGRIS GALLOPAGO  
 VIREO SOLITARIUS  
 CATHARTES AURA  
 DENDRICA GRACIAE  
 POMBYCILLA CEDRORUM  
 PICOIDES TRIDACTYLUS  
 CONTOPUS SORDIDULUS  
 TROGLODYTES AEDON  
 ANTRROZOUS PALLIUS  
 LASIDNYCTERIS NOCTIVAGANS  
 TAMIAS DORSALIS  
 PEROMYSOCUS BOYLII  
 MYOTIS YUMANENSIS  
 SCIURUS ABERTI  
 VIREO GILVUS  
 MICROTUS LONGICAUDUS  
 MICROTUS MEXICANUS  
 NEOTOMA MEXICANA

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 ZUNI MOUNTAINS PUNDEROSA PINE SPECIES LIST  
 \* COMMON-NM SCI-NM

\*\*\*  
 \* RAT, BIG BROWN  
 \* RAT, BIG FREE-TAILED  
 \* RAT, BRAZILIAN FREE-TAILED  
 \* BAT, HOARY  
 \* BAT, PALLID  
 \* BAT, SILVER-HAIRED  
 \* BEAR, BLACK  
 \* BLUEBIRD, MOUNTAIN  
 \* BLUEBIRD, WESTERN  
 \* BUSHTIT  
 \* CHICKADEE, MOUNTAIN  
 \* CHIPMUNK, CLIFF  
 \* CHIPMUNK, COLORADO  
 \* COYOTE  
 \* CREEPER, BROWN  
 \* CROSSBILL, RED  
 \* DEER, MULE  
 \* ELK, ROCKY MOUNTAIN  
 \* FLICKER, NORTHERN  
 \* FLYCATCHER, BUFF-BREASTED  
 \* FLYCATCHER, OLIVE-SIDED  
 \* GOPHER, BOTTA'S POCKET  
 \* GOPHER, NORTHERN POCKET  
 \* GOOSE, BLACK-HEADED

EPTESICUS FUSCUS  
 TADAPIDA MACROTIS  
 TADAPIDA BRASILIENSIS  
 LASIURUS CINEREUS  
 ANTRROZOUS PALLIUS  
 LASIDNYCTERIS NOCTIVAGANS  
 URSUS AMERICANUS  
 SIALIA CURRUCCIDES  
 SIALIA MEXICANA  
 PSALTRIPARUS MINIMUS  
 PARUS GAMBELI  
 TAMIAS DORSALIS  
 TAMIAS QUADRIVITTATUS  
 CANIS LATRANS  
 CETHIA AMERICANA  
 LUXIA CURVIROSTRA  
 ODOCOLEUS HEMIONUS  
 ELAPHUS AMERICANA  
 COLAPTES AURATUS  
 EMPIDONAX FULVIFRONS  
 CONTOPUS BOREALIS  
 THOMOMYS BOTTAE  
 THOMOMYS TALPOIDES  
 PHEUCTICUS MELANOCEPHALUS

*Hammingsland, Broad tailed Hawk, Sharp-shinned*

- \* JAY, PINYON
- \* JUNCO, DARK-EYED
- \* KINGLET, RUBY-CROWNED
- \* LION, MOUNTAIN
- \* LIZARD, SIDE-BLOTCHED
- \* MAGPIE, BLACK-BILLED
- \* MINK
- \* MOUSE, BRUSH
- \* MOUSE, DEER
- \* MOUSE, NORTHERN GRASSHOPPER
- \* MOUSE, PINYON
- \* MOUSE, WESTERN HARVEST
- \* MYOTIS, CALIFORNIA
- \* MYOTIS, FRINGED
- \* MYOTIS, LONG-EARED
- \* MYOTIS, LONG-LEGGED
- \* MYOTIS, SMALL-FOOTED
- \* MYOTIS, YUMA
- \* NUTCRACKER, CLARK'S
- \* NUTHATCH, PYGMY
- \* NUTHATCH, RED-BREASTED
- \* NUTHATCH, WHITE-BREASTED
- \* OWL, FLAMMULATED
- \* OWL, GREAT HORNED
- \* OWL, LONG-EARED
- \* OWL, NORTHERN SAW-WHET
- \* PIGEON, BAND-TAILED
- \* PORQUILL, COMMON
- \* PORCUPINE
- \* RACCOON
- \* RINGTAIL
- \* ROADRUNNER, GREATER
- \* ROBIN, AMERICAN
- \* SAPSUCKER, WILLIAMSON'S
- \* SAPSUCKER, YELLOW-BELLIED
- \* SHREN, VAGRANT
- \* SHRIKE, LOGGERHEAD
- \* SISKIN, PINE
- \* SKUNK, STRIPED
- \* SOLITAIRE, TOWNSEND'S
- \* SPARROW, CHIPPING
- \* SQUIRREL, ABERT'S
- \* SQUIRREL, RED
- \* SQUIRREL, ROCK
- \* STARLING, EUROPEAN
- \* SWALLOW, VIOLET-GREEN
- \* SHIFT, WHITE-THROATED
- \* Tanager, WESTERN
- \* THRUSH, HERMIT
- \* TURKEY, WILD
- \* VIREO, SOLITARY
- \* VIREO, WARBLING
- \* VOLE, LONG-TAILED
- \* VOLE, MEXICAN
- \* VULTURE, TURKEY
- \* WARBLER, GRACE'S
- \* WAXWING, CEDAR
- \* WOODPECKER, THREE-TOED
- \* WOODRAT, MEXICAN
- \* WOODRAT, STEPHEN'S
- \* WOODRAT, WHITE-THROATED
- \* WOOD-PEWEE, WESTERN
- \* WREN, HOUSE

- GYMNOBRYNUS CYANOCERPHALUS
- JUNCO HYEMALIS
- REGULUS CALENDULA
- FELIS CONCOLOR
- UTA STANSBURIANA
- PICA PICA
- MUSTELA VISON
- PEROMYSCUS BOYLII
- PEROMYSCUS MANICULATUS
- ONYCHOMYS LEUCOGASTER
- PEROMYSCUS TRUEI
- REITHRODONTOMYS MEGALOTIS
- MYOTIS CALIFORNICUS
- MYOTIS THYSANODES
- MYOTIS EVOTIS
- MYOTIS VOLANS
- MYOTIS LEIRII
- MYOTIS YUMANENSIS
- NUCIFRAGA COLUMBIANA
- SITTA PYGMAEA
- SITTA CANADENSIS
- SITTA CAROLINENSIS
- OTUS FLAMMEOLUS
- BURBO VIRGINIANUS
- ASIO OTUS
- AGELIUS ACADICUS
- COLUMBA FASCIATA
- PHALACROPTILUS NUTTALLII
- ERETHIZON DOPSATUM
- PROCYON LOTOR
- BASSARICUS ASTUTUS
- GEOCOCCYX CALIFORNIANUS
- TURDUS MIGRATORIUS
- SPHYRAPICUS THYROIDES
- SPHYRAPICUS VARIUS
- SOREX VAGRANS
- LANIUS LUDOVICIANUS
- CARQUELIS PINUS
- MEPHITIS MEPHITIS
- MYALESTES TOWNSENDI
- SPIZELLA PASSERINA
- SCIOPUS ABERTI
- TAMIASCIURUS HUDSONICUS
- SPERMOPHILUS VARIEGATUS
- STURNUS VULGARIS
- TACHYDINETA THALASSINA
- AERONAUTES SAXATALIS
- PIRANGA LUDOVICIANA
- CATHARTES BUTTATUS
- MELEAGRIS GALLOPAVO
- VIREO SOLITARIUS
- VIREO SILVUS
- MICROTUS LONGICAUDUS
- MICROTUS MEXICANUS
- CATHARTES AURA
- DENDROICA GRACIAE
- BUMBYCILLA CEDRORUM
- PIGIDES TRIDACTYLUS
- NEOTOMA MEXICANA
- NEOTOMA STEPHENSI
- NEOTOMA ALBIGULA
- CONTOPUS SORDIDULUS
- TROGLODYTES AEDON



* RAT, BRAZILIAN PRE-TAILED	TADAPIDA BRASILIENSIS
* CHIPMUNK, COLORADO	TAMIAS QUADRIVITTATUS
* COTTONTAIL, DESERT	SYLVILAGUS AUDUBONII
* COTTONTAIL, NUTTALL'S	SYLVILAGUS NUTTALLII
* COYOTE	CANIS LATRANS
* DEER, MULE	ODCOILEUS HEMIONUS
* ELK, ROCKY MOUNTAIN	ELAPHUS AMERICANA
* EAGLE, GOLDEN	AQUILA CHRYSAETOS
* FLYCATCHER, GRAY	EMPIDONAX WRIGHTII
* FOX, KIT	VULPES MACROTIS
* GOPHER, BOTTA'S POCKET	THOMOMYS BOTTAE
* HAWK, SWAINSON'S	BUTEO SWAINSONI
* JACKRABBIT, BLACK-TAILED	LEPUS CALIFURNICUS
* LION, MOUNTAIN	FELIS CUMCOLOR
* LIZARD, COLLARED	CROTAPHYTUS COLLARIS
* LIZARD, LONGNOSE LEOPARD	GAMBELIA WISLIZENII
* LIZARD, SHORT-HORNED	PHRYNOSOMA DOUGLASSI
* LIZARD, SIDE-BLOTCHED	UTA STANSBURIANA
* MOCKINGBIRD, NORTHERN	MIMUS POLYGLOTTOS
* MOUSE, NORTHERN GRASSHOPPER	ONYCHOMYS LEUCOGASTER
* MOUSE, PLAINS POCKET	PEROGNATHUS FLAVESCENS
* MOUSE, WESTERN HARVEST	REITHRODONTOMYS MEGALOTIS
* PHOENIX, SAY'S	SAYORNIS SAYA
* PRAIRIE DOG, GUNNISON'S	CYNOMYS GUNNISONI
* PRONGHORN	ANTILDCAPRA AMERICANA
* RAT, OPD'S KANGAROO	DIPODOMYS ORDII
* SNAKE, DESERT	NOTIOSOREX CRAWFORDI
* SNAKE, GLOSSY	ARIZONA ELEGANS
* SPARKER, BLACK-THROATED	AMPHISPIZA BILINEATA
* SQUIRREL, SPOTTED GROUND	SPERMOPHILUS SPILSOMA
* SQUIRREL, WHITE-TAILED ANTELOPE	AMMOSPERMOPHILUS LEUCURUS
* THRASHER, SAGE	DRESCOPTES MONTANUS
* TOWHEE, GREEN-TAILED	PIPILO CHLORURUS

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 Little Water Canyon Research Natural Area the lands described in the following establishment record prepared by William W. Dunmire and Mollie S. Toll, dated November 12, 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

LITTLE WATER CANYON RESEARCH NATURAL AREA

USDA FOREST SERVICE  
SOUTHWESTERN REGION  
CIBOLA NATIONAL FOREST  
MOUNT TAYLOR RANGER DISTRICT  
CIBOLA COUNTY, NEW MEXICO

Prepared by: \_\_\_\_\_ Date \_\_\_\_\_  
William W. Dunmire, The Nature Conservancy  
Mollie S. Toll, Department of Biology,  
University of New Mexico

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
John Caffrey, District Ranger  
Mount Taylor Ranger District

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
C. Phil Smith, Forest Supervisor  
Cibola National Forest

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
John W. Russell, Chairman  
Southwestern Research Natural Area Committee

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
Sotero Muniz, Regional Forester  
Southwestern Region

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_  
Charles M. Loveless, Station Director  
Rocky Mountain Forest and Range Experiment  
Station

ESTABLISHMENT RECORD

for

LITTLE WATER CANYON RESEARCH NATURAL AREA

within

Cibola National Forest  
Cibola County, New Mexico

## INTRODUCTION

The Little Water Canyon Research Natural Area (RNA) comprises approximately 910 acres (368.3 hectares) in the Zuni Mountains of west-central New Mexico. The proposed RNA is located in the Mount Taylor Ranger District, Cibola National Forest, in Cibola County, and is all acquired National Forest land.

Blue spruce (Picea pungens) streamside forest has been noted as an important ecosystem for protection within the RNA program (USFS Regional Guide, 1983: Table 3-1). Little Water Canyon was selected as an ideal solution to the search for representation of this forest type with a minimal use history. Its isolation and steep canyon sides has minimized grazing and human disturbance. The present riparian environment shows little effect of the intensive logging experienced elsewhere in the Zuni Mountains in the early part of this century.

## LAND MANAGEMENT PLANNING

The need for representation of this biotic community was identified in the Southwestern Regional Guide (August 1983). The Cibola National Forest Plan (USFS 1985: 79-80) recommends that approximately 882 acres (356.9 hectares) of the Little Water Canyon in Management Area 8 and approximately 28 acres (11.3 hectares) in Management Area 14 be designated for establishment as a Research Natural Area, with establishment to be completed in Period 1. 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

Little Water Canyon Research Natural Area was identified primarily as an outstanding example of a blue spruce streamside forest ecosystem. This is an important forest ecosystem in the Southwest. The need to include such an ecosystem within the RNA network of the Southwestern Region has been stated in the Regional Guide (USFS 1983). Isolation of the area and its steep canyon sides are important factors in the preservation of a virtually pristine riparian blue spruce forest.

## PRINCIPAL DISTINGUISHING FEATURES

The upper slopes are relatively open with about 40 per cent rock outcrop, and ponderosa pine and gambel oak dominating on lithic, skeletal soils derived from sandstone. As the canyon narrows and the canopy begins to close, Douglas-fir (Pseudotsuga menziesii) is encountered. Gambel oak (Quercus gambelii) is still prominent, but diversity increases and both Rocky Mountain

juniper (Juniperus scopulorum) and aspen (Populus tremuloides) are found. Water is spotty below about 8400 feet (2560 m) and most of the canyon is dry. The stream becomes perennial in the blue spruce community which starts near 8250 feet (2515 m). Little Water Canyon is the type locality for the Picea pungens/Cornus stolonifera (blue spruce/red-osier dogwood) plant association, SAF 216, a major riparian blue spruce association of the southwestern United States. Several trees in Little Water Canyon come close to record sizes for the species. The understory has an impressive diversity of shrubs and herbaceous plants; 108 taxa have been recorded on a single visit.

Another noteworthy community is located on the lower slopes of Oso Ridge to the northeast. Here there are large specimens of gambel oak thriving amid swards of bluegrass (Poa pratensis) and occasional aspen on apparently deep cumulic swale soils.

#### LOCATION

Little Water Canyon lies approximately 22 miles (35.4 km) west of Grants, New Mexico, in the Zuni Mountains (Maps 1 and 2). The proposed RNA is located predominantly on the Post Office Flat USGS 7.5' quadrangle, and includes parts of Sections 4, 5, 6, and 7 of Township 10 N, Range 13 W, and parts of Sections 31, 32, and 33 of Township 11 N, Range 13 W (Map 3). The approximate center of the RNA, taken to be the end of the primitive road in the upper portion of the canyon, is at latitude 35° 7'40" N, longitude 108° 14'13" W. The proposed RNA comprises approximately 1075 acres (435 hectares).

Easiest access to the RNA is via Forest Road 178, which heads south from Interstate 40 at Thoreau (Map 2). This road is paved for nearly 9 miles (14.4 km) and then becomes an all-weather road which parallels the south side of Bluewater Lake. It continues for another 13 miles (20.8 km) and then intersects with Forest Road 490, a dirt road. Go right at the intersection and travel about 4 miles (6.4 km) to the intersection with another dirt road, Forest Road 50. Turn left and proceed approximately one mile (1.6 km) to a primitive road off to the right. This road, traversable only by four-wheel drive vehicle, climbs toward the Continental Divide and enters Little Water Canyon RNA at its northernmost tip, slightly over a mile (1.7 km) from Forest Road 50. After less than another mile (1.5 km), the primitive road ends. The Divide itself, and Little Water Canyon on the other side, can be reached by foot.

An alternate route involves traveling south and then west on State Route 53 from Grants for about 27 miles (43.2 km). Turn right on Forest Road 50 and continue for approximately 14 miles (22.4 km) to the primitive road mentioned above.

The RNA is only 5 air miles (8.0 km) from the town of El Morro, but the roads from there are primitive and on private land. The old logging road down the west side in the Little Water Canyon drainage (Map 3) cannot be traversed by vehicle.

## AREA BY COVER TYPES

The distribution of cover types was determined from field surveys conducted in the fall of 1985 and the summer of 1986, and from interpretation of 1981 aerial photography. Table 1 outlines the estimated total areas of vegetation types based on Alexander et al. (1987) for plant associations, the Society of American Foresters forest type system (Eyre 1980) and the Küchler Potential Natural Vegetation system (Küchler 1964). Map 4 depicts the distribution of vegetation under these classification systems on the candidate research natural area.

Table 1. Estimated Areas of Vegetation Types in the Little Water Canyon Research Natural Area.

<u>Plant Association</u> <sup>1</sup>	Society of American Foresters		Surface Area	
	<u>Cover Type</u> <sup>2</sup>	<u>Küchler PNV Type</u> <sup>3</sup>	<u>Acres</u>	<u>Hectares</u>
<u>Picea pungens/</u> <u>Cornus stolonifera</u> (Blue spruce/ red-osier dogwood)	SAF 216 Blue spruce	K-18 Mixed conifer forest	20	8.1
<u>Pseudotsuga menziesii/</u> <u>Quercus gambelii</u> (Douglas-fir/ Gambel oak)	SAF 210 Interior Douglas-fir	K-18	90	36.4
<u>Populus tremuloides</u> (Quaking aspen)	SAF 217 Aspen	K-18	10	4.0
<u>Pinus ponderosa/</u> rockland (Ponderosa pine/ rockland)	SAF 237 Interior ponderosa pine	K-19 Ponderosa pine forest	685	277.2
<u>Pinus ponderosa/</u> <u>Quercus gambelii</u> (Ponderosa pine/ Gambel oak)	SAF 237	K-19	130	52.6
<u>Pinus ponderosa/</u> <u>Festuca arizonica</u> (Ponderosa pine/ Arizona fescue)	SAF 237	K-19	80	32.4
<u>Pinus ponderosa/</u> <u>Purshia tridentata</u> (Ponderosa pine/ bitterbrush breaks)	SAF 237	K-19	60	24.3
Totals:			1075	435.0

<sup>1</sup>Alexander et al. 1987

<sup>2</sup>Eyre 1980.

<sup>3</sup>Küchler 1964.



## PHYSICAL AND CLIMATIC CONDITIONS

The Zuni Mountains are situated in the southeastern portion of the Colorado Plateau physiographic province (USDA Soil Conservation Service 1976). The mountains are crossed by the Continental Divide from northwest to southeast. The Divide forms part of the boundary of Little Water Canyon RNA. A prominent feature of the landscape is Oso Ridge, a very high escarpment that extends nearly unbroken for many miles, crossing the northeastern part of the RNA. Elevation in the RNA ranges from a high of over 8800 feet (2682 m) along the Continental Divide, to a low of 7900 feet (2408 m) in the steep southwestern part of the canyon.

The top of Oso Ridge is fairly open, with considerable rock surface and shallow soils. To the east of the ridge there is a bowl with a small seep; to the north the lower, gentle reaches increase to greater than 15 per cent slopes higher up. Heading down (southwest) from Oso Ridge, the drainage starts to form an actual canyon. Here the canyon is never more than 100 yards (91 m) wide, and the sides are steeper than 30°. In the lower third or so of the watered stretch the canyon is more open.

The Zuni Mountain range constitutes a pocket of semi-humid climate in a vast area of semi-arid climate in west-central New Mexico. The nearest long term weather station is at McGaffey, about 20 miles (32 km) to the northwest at an elevation of 7800 feet (2377 m). Climatic data from El Morro National Monument, 6 miles (10 km) to the southwest at 7225 feet (2202 m) elevation, also provide reference points for conditions at the RNA (NOAA 1982). Detailed projections for the actual area of the Little Water Canyon RNA come from the Terrestrial Ecosystem Handbook (USFS 1986). Average annual rainfall for Little Water Canyon is estimated as 18 - 22 inches (457 - 559 mm) by the Soil Conservation Service (1967) (Map 5) or as 27 inches (686 mm) by the Forest Service (USFS 1986), and average annual snowfall as 59 inches (150.0 cm; USFS 1986). Cool season precipitation (falling between November and April) accounts for 40% of annual precipitation. Mean annual temperature is 39° F (3.9° C), with a July average of 61° F (16.1° C) and a January average of 20° F (-6.7° C). The frost free period lasts an average of 90 days.

## DESCRIPTION OF VALUES

### Flora

A broad survey of vegetation types was conducted during the 1985 and 1986 field work. A brief review follows. Alexander et al. (1987) or USDA Forest Service (1986a) should be consulted for a more detailed description of the vegetative make-up of these types.

The blue spruce forest is confined to a narrow riparian zone within the lower two-thirds of Little Water Canyon inside the RNA. The blue spruce forest begins to show up at the point where the stream becomes perennial at approximately 8250 feet (2515 m) elevation. In much of the canyon bottom the spruce is found in

almost pure stands, with aspen common wherever openings occur. The only other occasional to common tree in the wet riparian zone is Douglas-fir. The shrubby understory is dominated by red-osier dogwood with Oregon grape (Berberis repens), rose (Rosa woodsii), western thimbleberry (Rubus parvaflorus), and chokecherry (Prunus serotina) fairly common components. Forbs and grasses tend to be poorly represented here with the exception of horsetail (Equisetum sp.), hairy brome (Bromus ciliatus), and sedges (Carex sp.).

At the lower end of the RNA on south-facing slopes with a limestone substrate, the vegetation is characterized as a Pinus ponderosa/Purshia tridentata Habitat Type. (The Purshia actually appears to be a Purshia-Cowania hybrid). Besides ponderosa pine, common tree components of this shrubby pine-woodland forest include pinyon pine (Pinus edulis), alligator juniper (Juniperus deppeana), Rocky Mountain juniper (J. scopulorum), and Douglas-fir. Gambel oak is the principal shrub other than Purshia. Grasses are well represented, and include mountain muhly (Muhlenbergia montana), little bluestem (Andropogon scoparius), pine dropseed (Blepharoneuron tricholepis) and muttongrass (Poa fendleriana). Forbs are scarce here.

Outside the riparian zone most of the south-facing slopes west of the Continental Divide have a sandstone substrate and are dominated by ponderosa pine, much of it a Pinus ponderosa/rockland Habitat Type. But within the habitat type are mosaics of Pinus ponderosa/Muhlenbergia montana HT parklands, often containing islands of little bluestem. Gambel oak is the commonest shrub throughout the ponderosa communities.

The candidate RNA includes a noteworthy Pinus ponderosa/Quercus gambelii Habitat Type on the lower slope of Oso Ridge east of the Continental Divide. Huge Gambel oaks are found on open meadows and flats codominated by ponderosa pine. These stands may well be the best example of Gambel oak in large tree growth form on forest lands in New Mexico. Aspen, often very old trees, is the only other tree of any abundance on these flats. Ground cover here is made up principally of graminoids including bluegrass (Poa pratensis), Canada bluegrass (P. compressa), spike muhly (Muhlenbergia wrightii), Agrostis sp., Agropyron sp., and Juncus sp. Under the forest cover shrubs such as whitestem gooseberry (Ribes inerme) and Fendler rose (Rosa fendleri) tend to be poorly represented, while in the wet meadows shrubby cinquefoil (Potentilla fruticosa) is occasionally found. Where the north-facing drainage steepens toward Oso Ridge, the habitat type shifts into a Pseudotsuga menziesii/Quercus gambelii type.

There are no known threatened, endangered, or unique plant species on the proposed RNA.

The following plant list was compiled from field observations by Reggie Fletcher (USFS Regional Botanist, Southwestern Region) on June 16, 1982, and on September 3, 1984. It should be noted that these observations were made on the southwest side of Oso Ridge and the Continental Divide, and do not cover plant taxa that are limited to the Pinus ponderosa/Quercus gambelii and Pseudotsuga menziesii Habitat Types northeast of the divide.

Abbreviated Plant List for Little Water RNA<sup>1</sup>

<u>Latin Name</u>	<u>Common Name<sup>2</sup></u>	<u>Frequency<sup>3</sup></u>			
PIPO PIPODR MCDR	MCR				
GRASSES AND GRASS-LIKE PLANTS:					
<u>Agrostis alba</u>	Redtop bentgrass			I	R
<u>Agrostis scabra</u>	Rough bentgrass		C	C	
<u>Andropogon scoparius</u>	Little bluestem	C			
<u>Aristida glauca</u>	Blue three-awn	R			
<u>Blepharoneuron tricholepis</u>	Pine dropseed	C		I	
<u>Bromus ciliatus</u>	Hairy brome		C	C	C
<u>Calamagrostis inexpansa</u>	Northern reedgrass			C	
<u>Carex bolunderi</u>	Sedge	R			
<u>Carex foena</u>	Sedge				C
<u>Carex geophila</u>	Dryland sedge	R			
<u>Carex occidentalis</u>	Rocky Mountain sedge	I		I	I
<u>Carex rossii</u>	Sedge				R
<u>Carex wootonii</u>	Sedge		R	C	
<u>Cyperus fendlerianus</u>	Tuber flat-sedge	R			
<u>Danthonia sp.</u>	Oatgrass			R	
<u>Festuca arizonica</u>	Arizona fescue	R/C <sup>4</sup>			
<u>Glyceria striata</u>	Fowl mannagrass				C
<u>Juncus interior</u>	Inland rush	C	C	C	
<u>Juncus saximontanus</u>	Rocky Mountain rush			I	R
<u>Koeleria cristata</u>	Junegrass	C			R
<u>Muhlenbergia montana</u>	Mountain muhly	C			
<u>Panicum bulbosum</u> var. <u>minus</u>	Bulb panicum	R	R	C	
<u>Panicum scribnerianum</u>	Panicum	R			
<u>Poa fendleriana</u>	Muttongrass	R			R
<u>Poa pratensis</u>	Kentucky bluegrass	R			R
<u>Scizachne purpurascens</u>	False-melic				R
<u>Sitanion hystrix</u>	Bottlebrush squirreltail		R		R
<u>Trisetum montanum</u>	Rocky Mountain trisetum				
R					

FORBS:

<u>Achillea lanulosa</u>	Western yarrow	I		C	
<u>Aconitum columbianum</u>	Columbia monkshood				R
<u>Actaea arguta</u>	Western baneberry				C
<u>Agastache pallidiflora</u>	Horsemint	R	R		
<u>Allium cernuum</u>	Nodding onion			R	
<u>Allium geveyi</u>	Geyer onion	C	C	C	
<u>Androsace septentrionalis</u>	Rockjasmine	R		R	
<u>Antennaria marginata</u>	Pussytoes	R		C	
<u>Antennaria parvifolia</u>	Rocky Mountain pussytoes		C		C
<u>Aquilegia chrysantha</u>	Golden columbine				R
<u>Arenaria confusa</u>	Sandwort	R			
<u>Aster commutatus</u>	Aster	I		I	
<u>Aster laevis</u> var. <u>geyeri</u>	Smooth aster			I	

<u>Astragalus mollissimus</u>	Woolly locoweed	I <sup>6</sup>		PIPO
PIPODR MCDR MCR				
<u>Bahia dissecta</u>	Ragleaf bahia	I		
<u>Campanula rotundifolia</u>	Bluebells	R	R	R
<u>Castilleja austromontana</u>	Paintbrush		R	
<u>Castilleja integra</u>	Wholeleaf paintbrush	R		
<u>Cerastium arvense</u>	Starry mouse-ear	C		
<u>Chrysopsis villosa</u>	Hairy goldaster		C	
<u>Cirsium inornatum</u>	Thistle		C	
<u>Cirsium wheeleri</u>	Calves thistle	R		
<u>Claytonia megarrhiza</u>	Bigroot spring beauty	R		
<u>Cologania longifolia</u>	Cologania	R		
<u>Commelina dianthifolia</u>	Birdbill dayflower	R		
<u>Conioselinum scopulorum</u>	Hemlockparsley		R	C
<u>Conyza canadensis</u>	Horseweed	R		
<u>Corallorhiza maculata</u>	Spotted coralroot		R	R
<u>Corallorhiza striata</u>	Hooded coralroot			R
<u>Cystopteris fragilis</u>	Weak bladderfern			R
<u>Descurainia californica</u>	California tansymustard			
R				
<u>Draba aurea</u> var. <u>aurea</u>	Golden draba		R	R
<u>Draba helleriana</u> var. <u>blumeria</u>	Draba	R	R	
<u>Equisetum arvense</u>	Field horsetail			R
<u>Equisetum hiemale</u> var. <u>affine</u>	Scouring-rush horsetail			C
<u>Erigeron divergens</u>	Spreading fleabane	C	R	
<u>Erigeron formosissimus</u>	Itchy fleabane	C		
<u>Erigeron platyphyllus</u>	Fleabane	R	C	I
<u>Eriogonum alatum</u>	Winged buckwheat	R		
<u>Eriogonum racemosum</u>	Redroot buckwheat	R <sup>6</sup>		
<u>Erysimum capitatum</u>	Western dognods	R		
<u>Eupatorium herbaceum</u>	White joe-pye-weed	R	R	
<u>Fragaria americana</u>	Strawberry			I
<u>Fragaria ovalis</u>	Wild strawberry		C	C
<u>Galium boreale</u>	Northern bedstraw		I	
<u>Gentiana plebeia</u>	Gentian		C	
<u>Geranium caespitosum</u>	Purple geranium			R
<u>Geranium richardsonii</u>	Big Dick geranium	R		
<u>Gnaphalium pringlei</u>	Cudweed	C	C	
<u>Habenaria sparsiflora</u>	Bog-orchid			C
<u>Helianthella parryi</u>	Parry wood-sunflower	R		R
<u>Hieracium fendleri</u>	Redtail hawkweed	R		
<u>Hymenopappus flavescens</u>	White ragweed	R		
<u>Hymenoxys richardsonii</u>	Pingue	R/I <sup>5</sup>		
<u>Ipomopsis aggregata</u>	Skyrocket	I		
<u>Iris missouriensis</u>	Flag		R	I
<u>Lathyrus arizonica</u>	Arizona peavine			R
<u>Linaathastrum nuttallii</u>	Linaathastrum	I		
<u>Lithospermum multiflorum</u>	Stoneseed		R	
<u>Lotus wrightii</u>	Red-and-yellow pea	C		
<u>Machaeranthera aquifolia</u>	Aster	R		
<u>Malaxis soulei</u>	Malaxis			
<u>Medicago lupulina</u>	Black medic			R

<u>Mertensia lanceolata</u>	Bluebells	R	R	R
PIPO PIPODR MCDR MCR				
<u>Monarda menthaefolia</u>	Mintleaf beebalm			R
<u>Monotropa latisquama</u>	Indian pipe		R	
<u>Oenothera villosa</u> ssp.				
<u>strigosa</u>	Primrose	R		
<u>Orobanche multiflora</u>	Broomrape	R		
<u>Osmorhiza chilensis</u>	Sweet cicely			C
<u>Osmorhiza depauperata</u>	Bluntseed sweet cicely			I
<u>Oxypolis fendleri</u>	Fendler cowbane			C
<u>Oxytropis lambertii</u>	Lambert crazyweed	R <sup>6</sup>		
<u>Pedicularis grayi</u>	Woodbetony			R
<u>Penstemon barbatus</u>	Beardlip		C	
<u>Penstemon linarioides</u>	Toadflax beardtongue	R		
<u>Penstemon whippleanus</u>	Whipple penstemon			R
<u>Petalostemon candidus</u>	Slender prairieclover	R		
<u>Phacelia heterophylla</u>	Caterpillar-weed		R	R
<u>Phlox longifolia</u>	Longleaf phlox	R	R	
<u>Plantago argyrea</u>	Silvery plantain	R		
<u>Potentilla concinna</u>	Elegant cinquefoil	R		
<u>Potentilla thurberi</u>	Sketch cinquefoil		R	
<u>Prunella vulgaris</u>	Selfheal		C	C
<u>Pteridium aquilinum</u>	Deadcow fern			C
<u>Pyrola asarifolia</u>	Pink wintergreen			
<u>Rudbeckia laciniata</u>	Cutleaf coneflower			I
<u>Rumex crispus</u>	Curly dock		R	R
<u>Saxifraga rhomboidea</u>	Saxifrage		R	
<u>Schistophragma intermedia</u>	Schistophragma	R		
<u>Sedum griffithsii</u>	Stonecrop	C		
<u>Senecio hartianus</u>	Groundsel		R	R
<u>Senecio neomexicanus</u>	Groundsel	C	C	
<u>Senecio wootonii</u>	Groundsel			R
<u>Silene laciniata</u>	Mexican silene	C		
<u>Silene scouleri</u> ssp. <u>pringlei</u>	Scours catchfly	R		
<u>Sisymbrium linearifolium</u>	Tumblemustard	R		
<u>Smilacina racemosa</u>	False Solomon's seal		R	I
<u>Smilacina stellata</u>	Starry smilac		R	I
<u>Solidago spathulata</u>	Goldenrod	R		
<u>Solidago wrightii</u>	Goldenrod		I	
<u>Stellaria jamesii</u>	Tuber starwort			I
<u>Stellaria longipes</u>	Longstalk starwort	I		I
<u>Swertia radiata</u>	Deers-ears swertia			R
<u>Talinum parviflorum</u>	Flame flower	R		
<u>Taraxacum officinale</u>	Dandelion	R		R
<u>Thalictrum fendleri</u>	Fendler meadow rue	R	C	C
<u>Thelypodium micranthrum</u>	Thelypodium		R	
<u>Thermopsis pinetorum</u>	Piney goldenpea		I	R
<u>Tradescantia pinetorium</u>	Spiderwort	R		
<u>Tragopogon dubius</u>	Yellow salsify		R	
<u>Valeriana capitata</u> ssp.	Tobaccoroot			R
<u>Verbascum thapsus</u>	Flannel mullein	R		
<u>Vicia americana</u>	American vetch			I
<u>Viguiera multiflora</u>	Showy goldeneye	C	I	

PIPO PIPODR MCDR MCR

<u>Viola adunca</u>	Hook violet				R
<u>Viola canadensis</u>	Canada violet	R			
<u>Viola nephrophylla</u>	Wanderer violet				R
<u>Viola pedatifida</u>	Larkspur violet				R
<u>Woodsia mexicana</u>	Rockfern	R		R	
<u>Zigadenas sp.</u>	Deathcamas			R	

HALF-SHRUBS, SHRUBS, AND TREES:

<u>Acer glabrum</u>	Rocky Mountain maple					R
<u>Alnus tenuifolia</u>	Thinleaf alder					
<u>Amelanchier goldmanii</u>	Serviceberry			I		I
<u>Artemisia campestris</u>	Western sagebrush					
<u>Artemisia carruthii</u>	Flat sage	C		I		
<u>Artemisia ludoviciana</u>	Mexican sage	C				
<u>Berberis repens</u>	Oregon grape	I		C		C
<u>Betula occidentalis</u>	Water birch					I
<u>Brickellia grandiflora</u>	Tassel brickellia			I		
<u>Ceanothus fendleri</u>	Buckbrush ceanothus	C				
<u>Cercocarpus montanus</u>	Mountain mahogany					
<u>Cornus stolonifera</u>	Red-osier dogwood				R	C
<u>Juniperus deppeana</u>	Alligator juniper		I/C <sup>7</sup>			
<u>Juniperus monosperma</u>	Oneseed juniper		C <sup>6</sup>			
<u>Juniperus scopulorum</u>	Rocky Mountain juniper		C <sup>6</sup>		C	
<u>Lonicera arizonica</u>	Arizona honeysuckle					R
<u>Opuntia phaeacantha</u>	New Mexico pricklypear	R				
<u>Pachystima myrsinites</u>	Mountain-lover				I	I
<u>Picea pungens</u>	Blue spruce				R	C
<u>Pinus edulis</u>	Pinyon pine	C	C			
<u>Pinus ponderosa</u>	Ponderosa pine	C	C		I	
<u>Populus tremuloides</u>	Quaking aspen				R	C
<u>Potentilla fruticosa</u>	Shrubby cinquefoil				I	
<u>Prunus serotina ssp. virens</u>	Gila chokecherry				R	C
<u>Pseudotsuga menziesii</u>	Douglas-fir				C	C
<u>Purshia tridentata</u>	Antelopebrush		R/C <sup>4</sup>			
<u>Quercus gambelii</u>	Gambel oak	C	C		C	I
<u>Ribes pinetorum</u>	Orange gooseberry				R	I
<u>Rosa woodsii</u>	Rose			C	C	C
<u>Rubus parviflorus</u>	Western thimbleberry				R	C
<u>Rubus strigosus var. arizonicus</u>	Red raspberry				R	I
<u>Salix lasiandra</u>	Pacific willow					R

Salix scouleriana  
Yucca baccata  
Yucca baileyi

Mountain willow  
Datil yucca  
Yucca

R  
R<sup>6</sup>

R R

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<sup>1</sup>Observed by Reggie Fletcher (USFS Regional Botanist, Southwestern Region) on June 16, 1982 and September 13, 1984.

<sup>2</sup>Common names follow USDA, Forest Service 1974.

<sup>3</sup>Relative abundance common (C), infrequent (I), or rare (R), by broad communities of Ponderosa pine (PIPO), Ponderosa pine dry riparian (PIPODR), Mixed conifer dry riparian (MCDR), and Mixed conifer riparian (MCR).

<sup>4</sup>Rare on Sandstone substrate, Common on Limestone substrate

<sup>5</sup>Rare of Sandstone, Infrequent on Limestone

<sup>6</sup>On Limestone

<sup>7</sup>Infrequent on Sandstone, Common on Limestone

### Fauna

No rare, endangered, or sensitive animal species are known to inhabit this area. The upper reaches of the RNA on the northeast side of the Continental Divide contain pockets of good occupied habitat for blue grouse (Dendragapus obscurus). The southern part of this portion of the RNA forms a bowl with dense mixed conifer and aspen. There is a small seep in the NW quarter of Section 4; this and the riparian blue spruce zone of Little Water Canyon provide good habitat for black bear (Ursus americanus). The western portion of the RNA is utilized by a small herd of elk (Cervus elepus). These numbered about a dozen animals in 1984.

The following animal list was derived from the RUN WILD III computer- stored data base (Lehmkuhl and Patton 1982; Patton 1979) from the following habitat types, for Cibola County, New Mexico:

1. Douglas-fir - White Fir series; Pseudotsuga menziesii - Mixed Conifer Association
2. Pine series

These habitat types currently in the data base most closely correspond to those occurring in the proposed RNA.



## Geology

Little Water Canyon lies within the Zuni uplift, which is the most faulted of the uplifts on the Colorado Plateau (Dane and Bachman 1965). The Zuni uplift is oval-shaped and runs northwest, covering an area some 75 by 30 miles (121 by 48 km). Precambrian rocks are exposed along the crest of the uplift north of Little Water Canyon. These are exposed by a wide band of Permian strata in which the Research Natural Area lies. Locally these Permian outcrops are represented by the San Andres formation (limestone), and the Glorieta, Yeso, and Abo formations (all sandstones). The San Andres is the most recent of these formations; after it was deposited, the region was uplifted and eroded prior to deposition of Triassic strata (Gordon 1961, New Mexico Geological Society 1967).

The majority of the Research Natural Area consists of Glorieta sandstones, which are yellow or buff, well-bedded, and friable sandstones, with minor interbedded gypsum. These yield to San Andres limestone in lower Little Water Canyon for about one half mile (0.8 km) and to Yeso sandstones on the east side of Oso Ridge. Yeso sandstones are orange-red, with some white sandstone, and are found in this formation with orange-red siltstone and a few thin beds of limestone. The cross-section, reproduced below from USDA Soil Conservation Service (1967), helps to clarify the stratigraphic and surface relationships.

## Soils

Soils have not been specifically examined in the RNA. Generalizations which follow are made from regional data (USDA Forest Service 1986b).

Eutroboralfs are most extensive in this formation, and when forming on sedimentary parent material typically have fine sandy loam or loam surface layers and sandy clay or clay subsoils that rest on sandstone bedrock at a depth of 20 to 40 inches (51 to 102 cm). Typic Eutroboralfs forming in materials of igneous origin are mainly on gently to strongly sloping and rolling uplands. These well-drained soils have a sandy loam or gravelly sandy loam surface layer about 12 inches (30.5 cm) thick, neutral to slightly acid in reaction. A one to two inch (2.5 to 5.1 cm) layer of partially decomposed and undecomposed needles, twigs, and leaves commonly lies on the surface. Subsoils are reddish-brown or brown clay or heavy clay loam, about 15 to 20 inches (38.1 to 50.8 cm) thick.

Argiborolls, the other extensive group of soils in this formation, are a minor component in the proposed RNA. When forming on fine-grained sandstone, and siltstones, these soils are characterized by their reddish-brown silt loam or stony silt loam surface layer, overlying a subsoil of reddish-brown silty clay loam. Soils may be frequently interrupted by rock outcrop on uplands. Where rock outcrop comprises about 50 - 90% of area, the Ponderosa pine/rockland habitat type occurs (pine is usually rooted in rock fissures).

### Lands

All the land in Little Water Canyon RNA was acquired from the George E. Breece Lumber Company on July 11, 1946 or from the State of New Mexico on February 2, 1954 (Map 6). In Township 10 N, Range 13 W, minerals are reserved to the State of New Mexico in Section 4, and in that portion of Section 6 acquired from the Breece Lumber Company. In Township 11 N, Range 13 W, Sections 31 and 33 have minerals reserved to Breece Lumber; in Section 32, land acquired from Breece Lumber has minerals reserved to the State of New Mexico. Sections 31, 32, and 33 have "right of way retained for any roads, trails, or easements not of record".

### Cultural

There are no known cultural resource sites within the RNA. No archeological projects have taken place within the proposed RNA. To the northeast of the RNA, a dump associated with the Serna homestead and an isolated chert flake have been recorded. No historic period sites (ranches, sawmills, homesteads, etc.) are shown on the 1910 Forest map of the Zuni Mountains, or on the 1922 Forest map (Manzano National Forest). Withdrawal of the RNA from archeological research should not greatly effect the potential data base as the area demonstrates very little surface evidence of former occupation or use.

## IMPACTS AND POSSIBLE CONFLICTS

### Mineral Resources

No mineral resources are known to exist within the boundaries of the RNA. Mineral rights in the area are reserved as follows:

1. approximately 960 acres (389 hectares) are reserved for all minerals by private interest.
2. approximately 115 acres (47 hectares) are reserved for fissionable minerals only (uranium and thorium) by the State of New Mexico.

### Grazing

The RNA is within both the Oso Ridge and Agua Fria allotments. Where these two allotments adjoin within the RNA, the boundary is the top of Oso Ridge. If the RNA is not fenced, the area would continue to receive minor grazing use. Less than 1% of the Agua Fria allotment would be excluded by fencing in the most logical location, along the RNA boundary. Withdrawal of this insignificant portion of the grazing allotment should not cause any conflict. Approximately 1.5 miles (2.4 km) of fence occurs along the boundary of the RNA; of this, approximately 1 mile (1.6 km) is in very poor condition and should be reconstructed to be effective, and the remainder, in fair condition, could be maintained. Total exclusion of livestock from the RNA would require approximately 6 miles (9.7 km) of new fence.

### Timber

The proposed RNA contains approximately 895 acres (362.2 hectares) of ponderosa pine which will be withdrawn from the timber base. This amounts to a loss of 3500 MBF of saleable timber.

Total forested area: 1075 acres (435.1 hectares)

Total commercial forest area: 895 acres (362.2 hectares)

### Watershed Values

The Continental Divide segments the RNA into two watersheds. The largest area of the RNA (approximately 845 acres or 342 hectares) is within the Zuni River watershed. The West Rio San Jose watershed comprises a smaller 230 acres (93 hectares). The stream in Little Water Canyon is a second order stream.

### Recreation Values

The proposed RNA is not a popular or heavily used recreation area due to its remoteness. The area is used for big game hunting. There should be no conflict between this recreation use (and other minor uses) and potential research.

### Wildlife and Plant Values

At this time, no threatened or endangered plant or animal species are known to occur within the boundaries of the RNA.

### Wilderness, Wild and Scenic River, National Recreation Area Values

None of the above congressionally designated areas have been proposed for the Little Water Canyon RNA or vicinity.

### Transportation Plans

The RNA is accessed by a spur road from Forest Road 50 to the north, and from off the Forest boundary to the west. No trails exist at present in the RNA, but the planned Continental Divide Trail may cross through the RNA along the top of Oso Ridge.

### Utility Corridor Plans

No utility corridors currently exist within the RNA, and no future corridors will be permitted in accordance with the direction in the Cibola Land and Resources Management Plan.

## MANAGEMENT PLAN

The Cibola National Forest Plan prescribes that there will be no harvest of firewood and no assigned grazing capacity on Research Natural Areas. The prescriptions also prohibit road or trail construction, new utility corridors, off-road vehicle travel, open campfires, 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 flora, fauna, or other materials may be collected 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 Little Water Canyon RNA to maintain fire dependent ecosystems. Suppression action is limited to the use of hand tools, and fire retardant chemicals must not be used unless necessary to protect life and property outside the study area. Vegetation manipulation is allowed only when necessary to preserve the vegetation for which the area is being studied.

### ADMINISTRATIVE RECORDS AND PROTECTION

Administration and protection of the Little Water Canyon RNA will be the responsibility of the Cibola National Forest. The District Ranger, Mount Taylor Ranger District, Grants, 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 Little Water Canyon RNA will be maintained in the following offices:

Regional Forester, Southwestern Region, Albuquerque, NM  
Rocky Mountain Station, Fort Collins, CO  
Cibola National Forest, Albuquerque, NM  
District Ranger, Mount Taylor Ranger District, Grants, NM

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