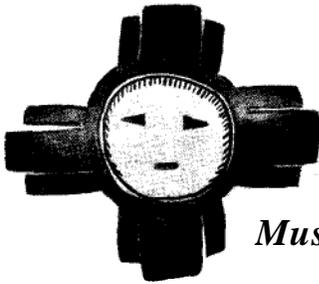


ECOLOGICAL DISTRIBUTION
Of some vertebrates in the
SAN JUAN BASIN, *New Mexico*

by Arthur H. Harris
with sections by William J. Koster
and David M. Niles

number 8

Museum of New Mexico
Papers in Anthropology
Santa Fe, 1963



Museum of New Mexico Press

A Salvage Archaeology program conducted by the Museum of New Mexico in co-operation with the National Park Service, Southwest Region, Department of the Interior, in the Navajo Reservoir District of the Upper Colorado Storage Project.

Edited by RICHARD WORMSER

Editor of Publications, Division of Anthropology

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NAVAJO PROJECT STUDIES VII

Library of Congress Catalog
Card Number: 63-63281

Price \$2.50

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FOREWORD

Initial surveys and excavations in the Navajo Reservoir District brought to light past events apparently caused by environmental changes (Dittert, et al, 1961, p.16). Available evidence suggested that the changes, though minor, had resulted in demographic shifts and certain cultural changes. Investigations of several types were devised to determine whether or not the suggested changes had a basis in fact and, if so, their magnitude and temporal placement.

James S. Findley of the Department of Biology, University of New Mexico, proposed that a systematic field study and collection of living vertebrate fauna be made to determine the meaning, in environmental terms, of the occurrence of a given species at an archaeological site. In addition, the collection provides comparative material so that archaeological bone specimen may be identified at the lowest possible taxonomic level.

In the following paper, Arthur H. Harris, of the Department of Biology, University of New Mexico, presents the results of the field

faunal study. The data describe present faunal assemblages, distributions, new records, and similar information without the interpretation of past events as represented in archaeological specimens. Thus, it is primarily a biological report, but indispensable for future interpretation of archaeological bone specimens. Studies of the latter material are now in progress.

In addition, the study area covered by the investigations is sufficiently large to serve the same purposes for archaeological work being carried out in the Irrigation District of the Navajo Project.

Also, a study of the fishes represented in the San Juan and Pine Rivers has been made by William J. Koster, and one of birds by David M. Niles. Like other vertebrate remains, the study of present fishes and birds becomes important for archaeological purposes because of their use by the previous inhabitants of the Navajo Reservoir District.

Alfred E. Dittert, Jr.

INTRODUCTION

Navajo Dam, part of the Colorado River Project complex, nearing completion on the San Juan River, some fifteen miles south of the New Mexico-Colorado state line, will hold back a reservoir extending five to six miles into Colorado along the San Juan and Piedra Rivers and almost to the state line along the Pine River, a major tributary of the San Juan. Irrigation lands to be fed from the Reservoir will extend sporadically west along and to the south of the San Juan, almost to the Arizona state line.

The School of American Research, until the summer of 1959, and the Museum of New Mexico, since then, have carried out salvage archaeology operations in the Dam and Reservoir areas under contract with Southwest Region of the National Park Service. Similar operations will be carried out in the lands to be irrigated. To provide data on present vertebrate distribution and ecology for later interpretation of archaeological data, the author spent two weeks of August, 1958, and the summers of 1959 and 1960 in the field for the above institutions.

Primary emphasis has been upon the mammals, with secondary attention to reptiles and amphibians. Well over 1200 specimens, collected by trapping and shooting, were preserved for study in the laboratory. Other specimens were collected, identified, and discarded in the field. Plant specimens, noted on environmental features, and comments of local inhabitants also were collected.

The area investigated during the periods of study includes most of those areas in which salvage archaeology will be carried out in the immediate future. The area has not been covered with equal attention to all parts, most work having been done in the

vicinity of the Dam and Reservoir. In addition to the main study area, a check point was set up to the north.

Minor place names within the Reservoir study area are carried on USGS topographic maps of 1954, Allison, Carracas, Burnt Mesa, Rosa, Pine River, and Gomez Ranch Quadrangles of the 7.5 minute series. Beyond these limits to the south and east, reference may be made to the Army Map Service, Aztec and Shiprock Quadrangles of 1954, 1:250,000 scale. North of the Reservoir area, coverage is given by Army Map Service, Durango Quadrangle. State highway maps should be consulted for all road and town locations.

The author wishes to thank the above mentioned institutions, members of the field parties during the study periods, and, particularly, Alfred E. Dittert, Jr., of the Museum of New Mexico, who has been in charge of the archaeological field program. Thanks also are due James S. Findley, who freely gave advice and aid during the field work and the preparation of the manuscript, and William C. Martin, who identified many of the plant specimens. Both are of the University of New Mexico. Stephen D. Durrant, field supervisor of the University of Utah Ecological Researches during the summer of 1960, kindly offered use of some data.

This manuscript was submitted during the summer of 1961 and remains, in January, 1963, essentially as at that time. However, the information on the ages of trees in the relict conifer stands, made available by F.W. Eddy, of the Museum of New Mexico, has been added since then, as have the definite records of mountain lion and pronghorn occurring within the Reservoir area.

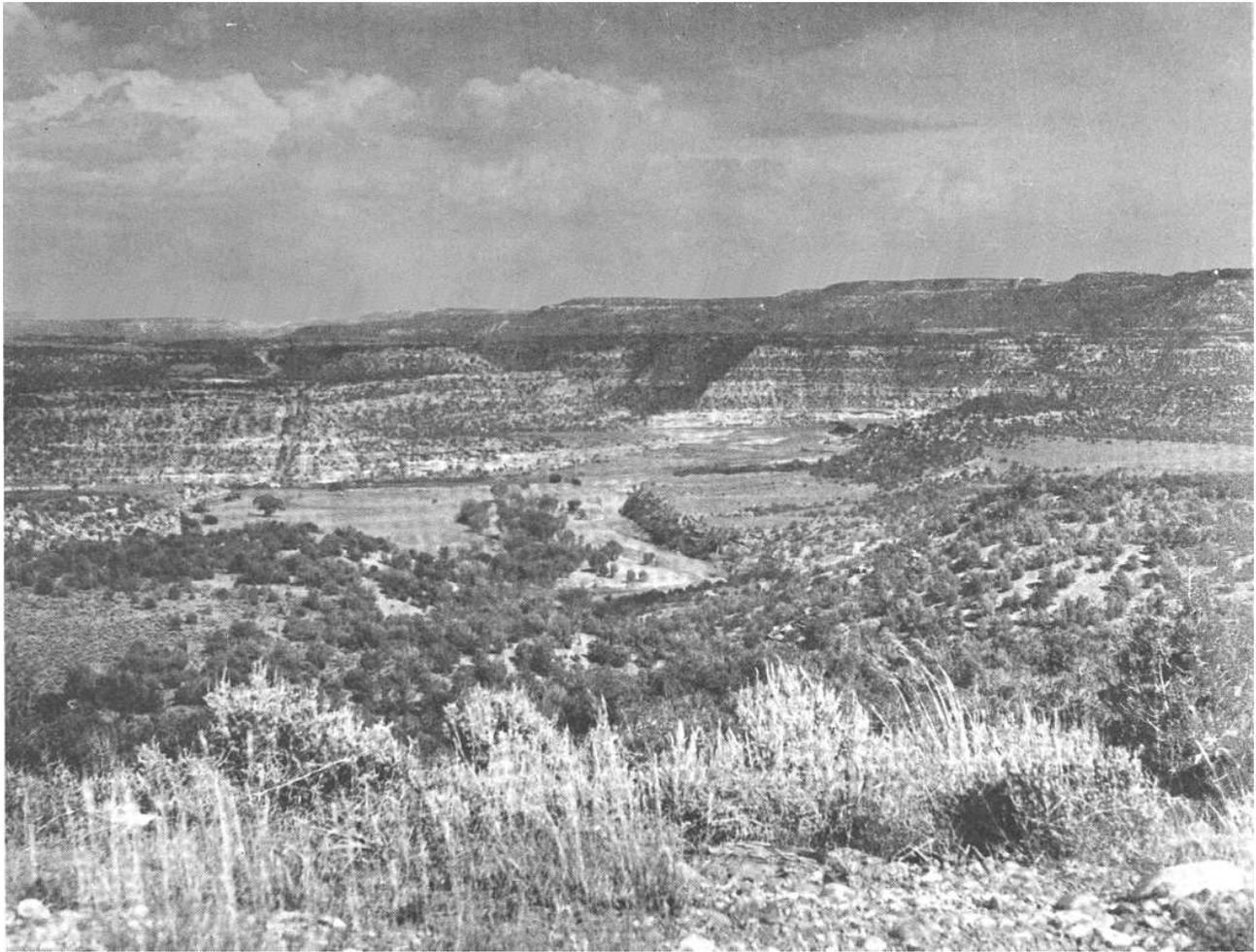


Fig. 1. Pinyon-juniper growth on canyon sides overlooking the Pine River just above its junction with the San Juan. The topography is typical of the Junction Land Form.

One important source of biological information has appeared since the summer of 1961. Ecological Studies of the Flora and Fauna of Navajo Reservoir Basin was pub-

lished as Number 55 of the University of Utah Anthropological Papers, in October, 1961. Records from this work are not included here.

TOPOGRAPHY

A land form consists of an area possessing a similar complex of physiographic features throughout its extent. Dittert, et al, (1961, pp. 18,20) have named three such land forms in and adjacent to the Reservoir area: the Arboles, Junction, and Blanco Land Forms. These terms are used here, but the Blanco Land Form has been expanded to cover somewhat more territory, as noted

below, and two new land forms, the Gallegos Mesa and the Waterflow defined.

The Arboles Land Form extends north from just below the state border into Colorado. Wide valleys with sloping walls and rounded highlands are characteristic, although more rugged and angular forms appear locally. The highest altitude within

this area is approximately 8,500 feet, atop the Piedra Peaks.

The Junction Land Form lies south of the Arboles Land Form and consists essentially of a high, dissected plateau. Alternating, almost horizontal, strata of sandstones and clays of early Tertiary age are incised by deep and narrow, steep-sided canyons (Fig. 1). Altitudes range from approximately 5,700 feet at the dam to some 6,800 feet in the higher portions of the plateau.

South of the Dam, the canyons broaden somewhat and relief lessens. This is the Blanco Land Form and, for the purposes of this paper, may be said to continue to the south of the San Juan River along the eastern border of the study area and westward along

and north of the river to the vicinity of Farmington.

The Blanco Land Form is replaced to the south by rolling terrain with, in general, little relief. It is broken only occasionally by remnants of the plateau-forming strata and by cliffs or bluffs along drainage ways. Sands and clays are prominent features. This may be known as the Gallegos Mesa Land Form.

North of the San Juan, northwest of Farmington, the terrain is somewhat similar to the Gallegos Mesa Land Form, but out-crops of rocks and clays are more common, the ground tends to be somewhat harder and rockier, and sand areas are less common. This may be known as the Waterflow Land Form.

VEGETATION

Several recognizable vegetational units occur within the study area. These units are by no means clear-cut, invariable entities. They vary in composition and development spatially and often merge with one another to greater or lesser degree. Nevertheless, they do give a general picture of the environment at any one place.

Pinyon-juniper

This unit is characterized by the presence of the Colorado pinyon (*Pinus edulis*) and one or more of several junipers (*Juniperus* spp.). Associates throughout the study area may include Gambel oak (*Quercus gambelii*), mountain mahogany (*Cercocarpus* spp.), Utah serviceberry (*Amelanchier utahensis*), and skunkbush (*Rhus trilobata*). Understory plants may include big sagebrush (*Artemisia tridentata*), yuccas (*Yucca* spp.), and cane and pad cacti (*Opuntia* spp.)

The unit changes to some degree from south to north. In the south, the one-seeded juniper (*J. monosperma*) appears to be the

sole representative of the genus. In more sheltered areas within an area extending from several miles south of the New Mexico-Colorado boundary, Rocky Mountain juniper (*J. scopulorum*) appears, becoming common north of the Colorado line. A few members of a third species of juniper (*J. osteosperma*) appear along the western edge of the study area.

The pinyon-juniper unit also varies greatly in thickness of growth and in proportions of associates to be found with the "marker" species. Thus, in some areas, the tree forms are widely spaced and understory plants, such as sagebrush, relatively abundant. Elsewhere, crowding may preclude almost all understory plants. In a different manifestation, junipers and pinyons occur very sparsely, with oak, mountain mahogany, *Fendlera*, and service-berry supplying most of the larger plants.

In general, the pinyon-juniper association is found on canyon walls and slopes throughout the Junction Land Form (Fig. 1)

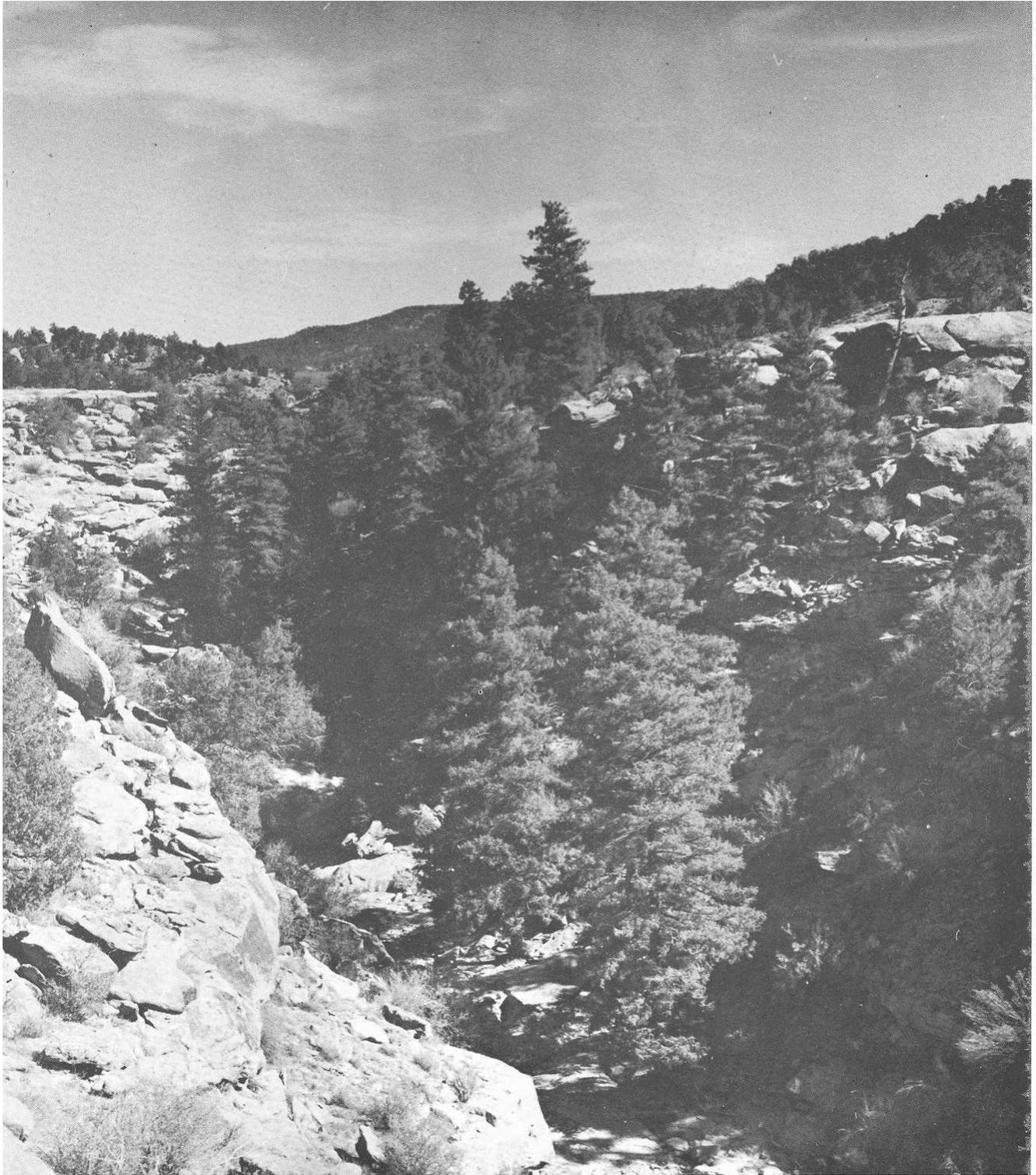


Fig. 2. Relict conifer stand in Benito Canyon near its junction with the Pine River.

and much of the Blanco Land Form of the New Mexican portions of the study area and on the lower slopes of high areas in Colorado, where it may merge with the ponderosa pine forests. Slight slopes on the plateau top south of the Colorado line, within the Junction Land Form, may be in pinyon-juniper, while immediately surrounding areas are in sagebrush. In several cases, where sagebrush occurs on gentle slopes in such situations, junipers and pinyons appear to be invading. South and west of the Junction Land Form, stands become rarer, usually depauperate in terms of associates, and almost entirely restricted to areas of relatively great relief.

Relict Conifer

Small (one to several dozen individuals) relictual populations of Douglas fir (*Pseudotsuga taxifolia*) and, to a somewhat lesser extent, ponderosa pine (*Pinus ponderosa*) appear sporadically throughout the New Mexican portion of the Junction Land Form (Fig. 2). Stands are associated, in most cases, with rather deep canyons and may appear near the head, within the length of the canyon, near the mouth, or, occasionally, in various combinations of these positions. In several cases, stands appear on northwesterly slopes along the San Juan and Pine Rivers proper, but most are in tributary canyons. A few scattered trees may occur unassociated with canyons.

Some such stands of Douglas fir may recently have been reproducing successfully, but most entirely lack young trees.

Associated plants may be only those typical of the pinyon-juniper unit or may include plants commonly associated with more mesic associations, such as wild currant (*Ribes aureum*), choke cherry (*Prunus virginiana*), gray barberry (*Berberis fendleri*), and narrow-leaf cottonwood (*Populus angustifolia*).

Corings of Douglas fir and ponderosa pine trees associated with Benito Canyon

were taken in 1959 by A. E. Dittert, Jr., F. W. Eddy, and J. J. Hester. The specimens were studied by Tom Lee, Laboratory of Tree-Ring Research, University of Arizona.

Dates for the inner rings from Douglas fir trees were 1723, 1751, 1752, 1763, 1772, 1795, 1822, and 1846; those for two ponderosa pine trees were 1820 and 1841. No evidence was seen at this site of reproduction after these dates. Thus there is indicated rather regular reproduction occurring until the middle of the nineteenth century, with no successful reproduction since.

Sagebrush

Big sagebrush (*Artemisia tridentata*) forms rather extensive, almost pure stands within the Junction Land Form on flats or on very gently sloping sites. To the south, within the eastern portions of the Gallegos Mesa Land Form, sagebrush may border the pinyon-juniper regions in a band that may be many miles wide (Fig. 3). The areas of individual stands decrease as one goes north of the Colorado line. In all cases, big sagebrush is the dominant plant; yucca and several species of grasses may appear in small numbers and, in the vicinity of arroyos or on river bottomland, greasewood (*Sarcobatus vermiculatus*), saltbush (*Atriplex canescens*), snakeweed (*Gutierrezia lucida*), and cocklebur (*Xanthium saccharatum*) may appear.

Riparian

In favorable areas along permanent water courses, in sloughs, and in moist, sheltered canyons may be found associations of cottonwoods (*Populus wislizenii* in the south and *P. angustifolia* within and north of the Reservoir), skunkbush, wild olive (*Forestiera neomexicana*), willows (*Salix exigua* and, less commonly, *S. lasiandra*), and box elder (*Acer negundo*) (Fig. 4). The latter is restricted mainly or entirely to the Junction and Arboles Land Forms, as is the occasional appear-



Fig. 3. Sagebrush country south of the San Juan River. Photograph is from near Estrella, south of the study area.

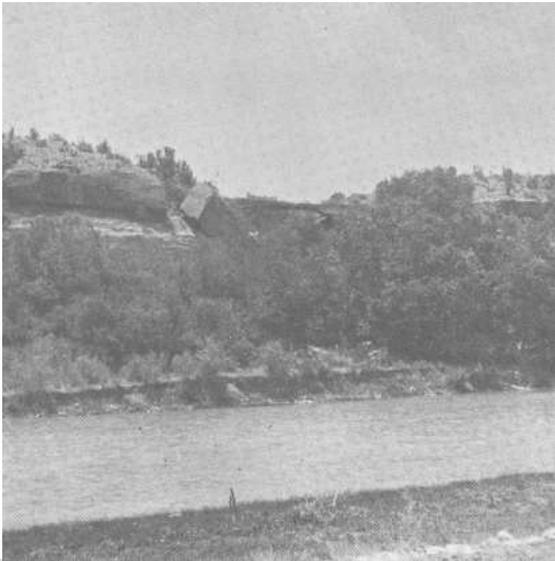


Fig. 4. Two views of riparian habitat along the Pine River.

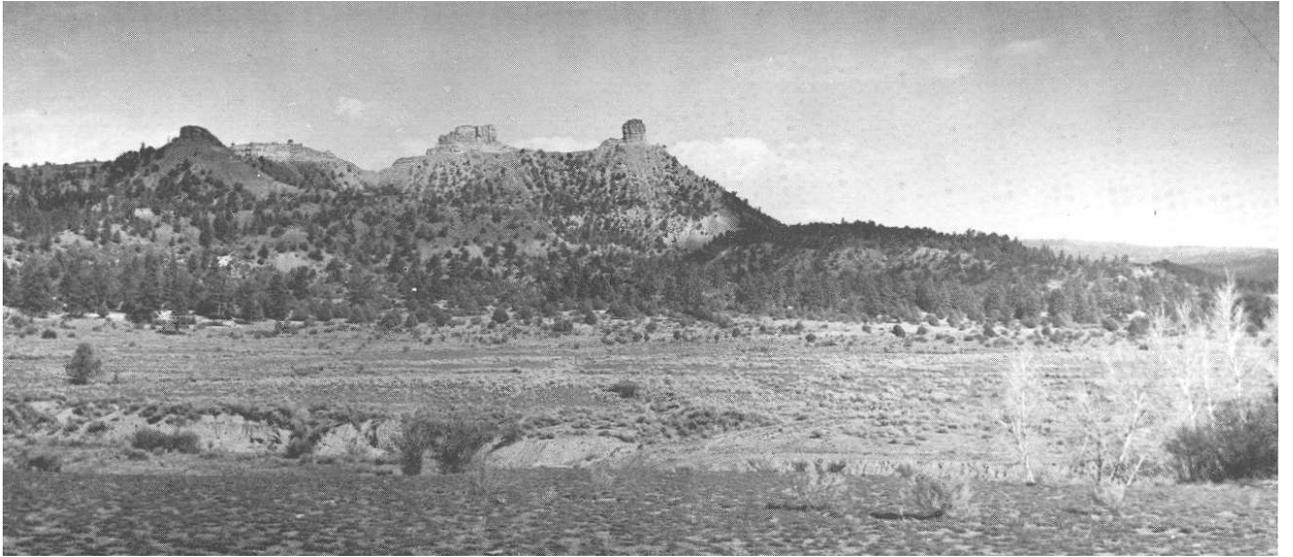


Fig. 5. Poorly developed ponderosa pine-Douglas fir habitat on flanks of Chimney Rock Mesa, west side of the Piedra River Valley.



Fig. 6. Cultivated land within the Arboles Land Form. View facing south across the Allison Valley toward Burnt Mesa.

ante of hawthorns (Crataegus spp.). In some areas, poison ivy (Rhus radicans) may appear and a few examples of salt cedar (Tamarix sp.) occur in more open areas south of the Colorado boundary.

Along irrigation ditches and smaller streams, damp valleys, occasionally on the flood plains of the larger streams, and in sloughs, another type of development occurs, with or separate from the above. Sedges (particularly Scirpus acutus), horse-tails (Equisetum spp.), cattails (Typha latifolia), and several grasses occur in various combinations.

Ponderosa Pine - Douglas fir

In the higher portions of the study area, in Colorado, poor to good stands of ponderosa pine and Douglas fir appear. In the better developed areas, Gambel oak, aspen (Populus tremuloides), gray barberry, narrow-leaf cottonwood, and alder (Alnus sp.) also occur. Rocky Mountain juniper is commonly present. In less well developed areas, plants more typical of the pinyon-juniper unit replace the above species to a greater or lesser degree (Fig. 5).

Large ponderosa pines around buildings in the valley of the San Juan River east of Arboles may be remnants of historically larger stands.

Grassland

Occurring at generally lower elevations than the sagebrush, the grassland seems to show two facies. South of the San

Juan River, grasses of several species form fairly dense, but low, stands with many associates in the form of yucca (Yucca glauca), snakeweed, Mormon tea (Ephedra trifurca), pad cactus (Opuntia sp.) and tumbleweed (Salsola kali). In sand dune areas and at lower altitudes, the grasses decrease in thickness of stand and the associates become more common. This section of the grassland may meet with the sage-brush to the east in a very sharp line. Within the Waterflow Land Form, the grassland appears poorer, both in thickness of stand and number of associates. Saltbush becomes more common, but Mormon tea, snakeweed, and cacti decrease in numbers. In part, this may be a reflection of the soil, which is harder and rockier than that to the south.

Cultivated Areas

The bottomlands of the San Juan, Pine, and Piedra Rivers are much utilized for the growing of such crops as alfalfa, clover, fruits, and corn. A few localities on the plateau top of the Junction Land Form and much of the area around Arboles, Allison, and westward are also in crops, although these localities are not in the river valleys proper (Fig. 6). In most situations, irrigation is necessary (small fields of corn and wheat have been grown without irrigation on the plateau top, however).

As a result of such cultivation, grassy vegetation and various crop plants supply animals a relatively recent habitat formerly absent or, at best, greatly restricted.

CLIMATE

Dittert, et al (1961) have brought together climatic data for the immediate vicinity of the Reservoir. Isohyetal lines run essentially northwest-southeast; the eighteen inch isohyet falls just north of the Reservoir limits, and the ten inch isohyet crosses the area in the vicinity of Blanco. The April to

September period receives 55-60 per cent of the total annual precipitation.

Temperature and precipitation data for stations in or near the study area are given in Table I and have been taken from data presented in Climate and Man (Gittings, 1941; Hardy, 1941).

TABLE I

Temperature and Precipitation Records from Seven Stations

Station	Temperature measured in degrees Fahrenheit				Annual Precipitation measured in inches
	January Average	July Average	Maximum	Minimum	
Aztec	26.8	73.7	104	-27	9.17
Bloomfield	26.8	74.7	106	-35	9.14
Fruitland	29.6	74.0	110	-21	6.76
Farmington	--	--	--	--	8.44
Rosa (near)	--	--	--	--	13.17
Shiprock	28.1	76.6	106	-18	7.59
Ignacio	21.8	67.5	101	-38	16.10

PRESENTATION OF DATA

To make clear the geographic distribution within the study area and, insofar as known, the preferred and limiting ecological features of the amphibians, reptiles, and mammals, the following form of presentation has been decided upon:

(1) Where little would be gained by comparisons and contrasts with other organisms, either because of an insufficiency of data or because of seemingly straightforward situations, comments are given in the form of species accounts stating the geographical ranges as known within the study area, and detailing the ecological conditions as far as possible. Some additional data are given for the bats because of the paucity of such information in the literature.

(2) Where comparisons are of particular interest, because of the presence of closely related species (belonging to the same genus), generic accounts may be given following the species accounts.

It is felt that by this manner of presentation, unmeaningful duplication in species accounts may be avoided and greater insight into the dynamics of distribution gained,

reptiles are given in the same order as in Schmidt's Check List of North American Amphibians and Reptiles (1953); Hall and Kelson's Mammals of North America (1959) is followed for the mammals.

For each species, record-stations of occurrence are given under the heading "Localities." Records from the literature are included when such fall within the study area or in the immediate vicinity (in general] this includes all of La Plata and Archuleta Counties in Colorado, but a less well defined area in New Mexico).

The record-stations are based on personal field work, on specimens in the University of New Mexico Collection of Vertebrates, and on records in the literature. In the absence of a literature citation, the records are from the first two sources mentioned (all specimens collected personally and preserved are now in the University of New Mexico Collection of Vertebrates). A figure in parentheses following a locality refers to the number of specimens from that station.

ACCOUNTS OF SPECIES

AMPHIBIANS

- Ambystoma tigrinum Green Tiger Salamander

Individuals were seen or collected in farmland, pinyon-juniper, sagebrush, and grassland habitats. Metamorphosed individuals have been seen in a rodent burrow excavated into the almost vertical side of an arroyo and in a deep crack formed by water in a clay-walled canyon side. Specimens were collected from a clay-bottomed tank on the bottom of a canyon and from an earthen cattle tank in irrigated farmland.

Where sufficient water for breeding occurs, members of this species probably are present throughout the study area.

Localities: COLORADO: La Plata Co.: Durango (Maslin, 1959, p.7); Allison (2). Archuleta Co. (Maslin, 1959, p.7). NEW MEXICO: San Juan Co.: Ulibarri Canyon, N 1/2 Sec. 25, T 32 N, R 7 W, (sight record); 16 mi. S and 1 mi. W of Farmington, Sec. 17, T 26 N, R 13 W (11). Rio Arriba Co.: Uell's Canyon, Sec. 26, T 32 N, R 6 W (sight record).

- Scaphiopus bombifrons Cope Central Plains Spadefoot

This toad was collected only in juniper and sagebrush, near greasewood growing along washes. One individual was found after dark, several hundred feet from a dirt cattle tank; the remainder were from mud at the edge of the tank or, in a very few cases, from the water.

J.S. Findley has identified members of this genus by call at Allison, La Plata Co., Colo.

Localities: COLORADO: La Plata Co.: Oxford (Maslin, 1959, p.9). NEW MEXICO: San Juan Co.: 2 mi. NW of Blanco (9).

- Bufo boreas Baird and Girard Boreal Toad

Members of this species are available only from the northern checkpoint. They were found in quiet water near the mouth of Gordon Creek. Riparian vegetation borders the stream, with spruce forest nearby.

The boreal toad probably exists somewhat further south, perhaps even to the northern portions of the main study area.

Localities: COLORADO: Archuleta Co.: jct. Gordon Creek and Piedra River (6).

- Bufo woodhousei Girard Woodhouse's Toad

Woodhouse's toad is widespread throughout the study area. One specimen was taken from a group of Bufo boreas in chorus in an area of spruce (Picea engelmannii) and riparian vegetation; other specimens were secured from all vegetational types represented in the study area, although only in the sparser areas of ponder-

osa pine-Douglas fir forest. The only limitation appears to be the lack of available water—the dryness of the summer of 1960, when most field work was done in the south, may account for apparent absence in some areas, since rain pools were unavailable for collecting purposes.

The few choruses located would seem to indicate a preference for water with little vegetation. At Allison, for example, though numerous irrigation ditches and heavily vegetated tanks were available, the breeding chorus and individuals in amplexus were found only in a tank which had no noticeable vegetation in 1959, and but little the following year. In general, individuals located in water at other sites were in dirt tanks or streams with little vegetation.

Localities: COLORADO: La Plata Co. Rio Florida near Durango (Maslin, 1959, p. 13); 11 mi. S of Durango (Maslin, 1959, p. 14); Allison (17). Archuleta Co.: jct. Gordon Creek and Piedra River (1); Piedra River, upper campground NW of Chimney Rock (Maslin, 1959, p. 14); Deep Canyon (6); Yellowjacket turnoff, Colo. 151 (1); vicinity Allison, Secs. 14 and 23, T 32 N, R 6 W (3). NEW MEXICO: San Juan Co.: near Pine River, Sec. 7, T 30 N, R 7 W (2); 2 mi. NW of Blanco (9); about 3 mi. E and 3 mi. S of Farmington (2); about 5 mi. W and 2 mi. S of Bloomfield (6); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (1). Rio Arriba Co.: 2 mi. S of Rosa (1).

• Pseudacris nigrita LeConte Chorus Frog

In the vicinity of Allison, the chorus frog was heard frequently along irrigation ditches and in those tanks which supported good growths of aquatic vegetation. The majority of specimens were collected at night. One specimen, however, was found during the daytime on a frequently watered lawn.

Tadpoles, almost ready for metamorphosis, were collected from meadows near the upper Piedra River in late June.

The call of this species was heard from marshes at Blanco, San Juan Co., New Mexico, several hours after dawn, but none was seen.

Localities: COLORADO: La Plata Co.: 10 mi. S of Durango (Maslin, 1959, p. 17); 1 1/2 mi. W Allison (1). Archuleta Co.: Gordon Creek near jct. with Piedra River (larvae); Pagosa Springs (Maslin, 1959, p. 16); vicinity Allison, Secs. 14 and 23, T 32 N, R 6 W (21).

• Rana catesbeiana Shaw Bullfrog

No evidence of the bullfrog, widely introduced in the Southwest, was found north of the Dam site. South of the Dam site, one specimen was found in a heavily vegetated backwater area of the San Juan River. Riparian vegetation and croplands are in the immediate vicinity, with pinyon-juniper on the canyon walls. An individual was seen several times in a large dirt cattle tank at the edge of Gallegos Canyon, some six miles south of the San Juan River°. The tank is fairly deep and with a fair amount of submergent vegetation.

Localities: NEW MEXICO: San Juan Co.: about 3 mi. N (by road) of Archuleta (1).

• Rana pipiens Schreber Leopard Frog

Leopard frogs are not uncommon in the irrigation areas, natural sloughs, and other areas of permanent water which support vegetation near the water's edge.

Localities: COLORADO: La Plata Co.: 20 mi. N of Hermosa (Maslin, 1959,

p. 19); 8 mi. NW of Hesperus (Maslin, 1959, p. 19); 10 mi. S of Durango (Maslin, 1959, p. 19); vicinity Columbine Ranger Station (5), Durango (Maslin, 1959, p. 19); Rio Florida, near Durango (Maslin, 1959, p. 19); Allison (2). Archuleta Co.; jct. Gordon Creek and Piedra River (1); Piedra River

upper campground NW of Chimney Rock (Maslin, 1959, p. 19); vicinity Allison, Secs. 14 and 23, T32 N, R 6 W (1). NEW MEXICO: San Juan Co.; Pine River, NW 1/4, Sec. 7, T 30 N, R 7 W (1); 4 mi. N and 1 mi. E of Waterflow (1).

REPTILES

- Chrysemys picta Schneider
Painted Turtle

The painted turtle may occur in permanent streams within the main study area. No specimens are available from within the Reservoir but there are apparently reliable reports of the presence of a turtle, presumable of this species, in the Piedra River north of Arboles and in the San Juan south of the Junction Land Form. One specimen was picked up from a road west of the study area by A.E. Dittert, Jr.; a small stream was nearby.

Localities: COLORADO: La Plata Co.; 5 mi. N of Durango, Animas River drainage (Maslin, 1959, p.23); 3 mi. E of Oxford, Colo. Rt. 172 (1).

- Crotaphytus collaris Say
Collared Lizard

The collared lizard was most often seen on or near rocks in pinyon-juniper or, occasionally, sagebrush habitat. On several occasions, young lizards were captured or seen at distances of up to several hundred feet from rocky areas usually in sagebrush, but in one instance in riparian habitat. Pinyon-juniper was nearby in these cases. One adult and one juvenile animal were taken in a clay-hill area of scattered pinyons and junipers. In this latter case, there were no rocks for a mile or more from the points of capture; the adult lizard was snap-trapped from a

rodent burrow opening and the immature animal was taken from beneath wood debris. In the Gallegos Canyon area, these lizards inhabit rock outcrops in a marginal pinyon-juniper area mixed with much grass and sagebrush.

Localities: COLORADO: La Plata Co.; near Bondad (Maslin, 1959, p.26). Archuleta Co.; Arboles (1). NEW MEXICO: San Juan Co.; Pine River, NE 1/4 Sec. 18, T 32 N, R 7 W (1); extreme SE corner Sec.29, T 31 N, R 7 W (1); Pine River, NE 1/4 Sec. 7, T 30 N, R 7 W (1); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (2); near jct. Sambrito Creek and San Juan River (1); Pine River Canyon, Sec. 20, T31 N, R7W(1); Sec. 29, T30N, R8W, 5,800' (1); jct. San Juan and Pine Rivers, NW 1/4 Sec. 17, T 30 N, R 7 W (2); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (1); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (1); 3 1/2 mi. E and 7 mi. S of Bloomfield, Sec. 32, T 28 N, R 10 W (2). Rio Arriba Co.; extreme SE corner Sec. 22, T 32 N, R 6 W (1).

- Holbrookia maculata Girard Lesser
Earless Lizard

The lesser earless lizard seems to be associated with sandy portions of the grassland south of the San Juan River. It is doubtful that its range extends north of the river within the river within the study area.

and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (4); 16 mi. S and 1 mi. W of Farmington, Sec. 17, T 26 N, R 13 W(1); 2 1/4 mi. N and 1 1/4 mi. E of Waterflow, Sec. 28, T 30 N, R 15 W (3); 5 1/2 mi. N and 1 1/2 mi. W of Waterflow, Sec. 12, T 30 N, R 16 W (3); 3 1/2 mi. E and 7 mi. S of Bloomfield, Sec. 32, T 28 N, R 10 W (3); 1 mi. E and 9 mi. S of Bloomfield, Sec. 11, T 27 N, R 11 W (1); about 4 mi. S of Gallegos Store, near Gallegos Canyon (I).

• *Urosaurus ornatus* Hallowell Tree Lizard

Cary (1911, p.26) reported observing this lizard at Arboles, Archuleta Co., Colo. No members of this species were seen or collected and it seems likely that this was a misidentification, perhaps based upon a young *Sceloporus undulatus*. If, however, the record is good, then it must be assumed that the animal is extremely rare or has vanished from the Arboles and Junction Land Forms. Although not seen immediately south of these areas, more work would be necessary to allow a definite statement as to its presence or absence.

• *Phrynosoma cornutum* (Harlan) Texas Horned Lizard

Maslin (1959, p.37) cites Cope as listing Pagosa, Archuleta Co., Colo., as a locality for this species. It seems reasonably safe to conclude on the grounds of known distribution and habitat that this record rests upon an escaped pet, a mislabeling, or a misidentification.

• *Phrynosoma douglassi* (Bell) Short Horned Lizard

Although seemingly not common, this lizard was found in the open ponderosa

pine areas in the north (there is a sight record from near the San Juan River, two miles west and one mile north of Juanita, Archuleta Co., Colo.) and throughout the flatter areas of pinyon-juniper and sagebrush in the more southerly portions of the Junction Land Form. No specimens were taken within those portions of the study area south of the Junction Land Form, but, as they are known to occur south of the study area in habitat similar to that of the Gallegos Mesa Land Form, they probably are present throughout the southern portions of the study area.

Nowhere were members of this species recorded from riparian situations or from cropland and they appeared absent from situations of strong topographic relief.

Small, apparently first-year individuals were first collected during the first week of August, 1959.

Localities: COLORADO: La Plata Co. (Maslin, 1959, p.40). Archuleta Co.: 2 mi. N of Chromo (Maslin, 1959, p.40); SW 1/4 of SE 1/4 Sec. 10, T 32 N, R 5 W (1). NEW MEXICO: San Juan Co.: SW 1/4 Sec. 8, T 32 N, R 7 W (1); E side NW 1/4 Sec. 10, T 32 N, R 6 W (1); NW 1/4 Sec. 22, T 32 N, R 6 W (1); near San Juan River, Sec. 3, T 31 N, R 6 W (1); near mouth Cottonwood Canyon, SE 1/4 Sec. 17, T 31 N, R 6 W (1); Pine River Rd., SE 1/4 Sec. 17, T 31 N, R 7 W (1); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (1). Rio Arriba Co.: San Juan River, Sec. 27, T 32 N, R 6 W (1).

• *Cnemidophorus tigris* Baird and Girard Western Whiptail

The western whiptail appears to be limited in distribution to the area south of the Junction Land Form, although perhaps overlapping to a slight degree into this region in a few places. It has been taken in the sparser portions of the lower pinyon-

juniper zone, in grassland, and in marginal riparian situations. Within the distributional area of C. inornatus, as now known, C. tigris appears to be limited to wash areas and the bordering areas of rock out-crops and bluffs. In the western portions of the study area, north of the San Juan River, where C. inornatus has not been found, C. tigris is found in both the types of areas described above and in areas of lesser relief and thus may fill the niche of C. inornatus in this region.

The western whiptail has been taken in regions of sandy and of rock substrata. When associated with the latter, it was seldom found among boulders, but rather in areas of exposed bedrock with small areas of soil and sand.

This lizard may be active during mid-day, after most other species have retired. In this respect, it approaches the schedule of C. inornatus, though usually appearing somewhat later in the morning and remaining active somewhat later in the afternoon.

Localities: NEW MEXICO: San Juan Co.: about 3 mi. E and 3 mi. S of Farmington (2); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (10); Kutz Canyon at jct. with US 44 (1); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (1); 2 1/4 mi. N and 1 1/4 mi. E of Waterflow, Sec. 28, T 30 N, R 15 W (3); 5 1/2 mi. N and 1 1/2 mi. W of Waterflow, Sec. 12, T 30 N, R 16 W (2).

- Cnemidophorus velox Springer
Plateau Whiptail

The plateau whiptail was found to inhabit the Junction Land Form, overlapping slightly into the Blanco and Arboles Land Forms. It is found mainly within open border areas, in sagebrush most commonly, but seldom further than several hundred yards from other, thicker vegetation or rocky outcrops. Its range also ex-

tends into the more open areas of pinyon-juniper, riparian, and low streamside vegetation. Although commonest on flat or gently sloping tracts, it occurs for short distances beyond such habitats into boulder fields at cliff bases, debris along slopes of small valleys, and, occasionally, onto steep canyon walls. Areas of heavy plant growth, including pinyon-juniper, and of finely dissected topography appeared uninhabited by this species.

Localities: COLORADO: La Plata Co.: Allison (1). Archuleta Co.: Carracas-Arboles Rd., NE 1/4 of SW 1/4 Sec. 17, T 32 N, R 4 W (1). NEW MEXICO: San Juan Co.: near jct. Sambrito Creek and San Juan River (2); Pine River Canyon, Sec. 20, T 31 N, R 7 W (3); E side NW 1/4 Sec. 10, T 32 N, R 6 W (1); SW 1/4 Sec. 11, T 32 N, R 6 W (2); Sambrito Creek, SW 1/4 Sec. 10, T 32 N, R 6 W (1); Sambrito Creek, S 1/2 Sec. 15, T 32 N, R 6 W (1); San Juan River, NW 1/4 Sec. 22, T 32 N, R 6 W (4); mouth of Benito Canyon, NW 1/4 of NW 1/4 Sec. 29, T 32 N, R 7 W (2); NW 1/4 of SW 1/4 Sec. 4, T 30 N, R 7 W (1); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W(2); jct. San Juan and Pine Rivers, NW 1/4 Sec. 17, T 30 N, R 7 W (1); 1/2 mi. S of Navajo Dam site (1); 2 mi. NW of Blanco (1); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (2). Rio Arriba Co.: Rosa (1); SE 1/4 Sec. 13, T 32 N, R 6 W (4); SW 1/4 Sec. 23, T 32 N, R 6 W (1).

- Cnemidophorus inornatus Baird
Little Whiptail

The little whiptail was found in grassland areas south of the San Juan River. At one collection station, in an area of sharp transition between grassland and sagebrush, a few individuals were taken from sagebrush, but always within a few hundred yards of grassland. The lizards were common on the higher, sandy ridges where shrubby vegetation (particularly Ephedra) was common; they were

- Pituophis catenifer (Blainville)
Gopher Snake

The gopher snake was the least restricted ecologically of any of the snakes found in the study area. Specimens were taken from the lower levels of the ponderosa pine-Douglas fir forest, from pinyon-juniper, sagebrush, farmland, and riparian habitats. Most specimens are from areas which are predominantly nonrocky and possess only gentle slopes.

Localities: COLORADO: Archuleta Co.: Pagosa (Maslin, 1959, p. 62); 0.4 mi. (by road) S of the jct. of Colo. 151 and US 160 (1). NEW MEXICO: San Juan Co.: boundary between Secs. 9 and 16, T 32 N, R 6 W (1); NW 1/4 Sec. 22, T 32 N, R 6 W (1); SE 1/4 of SE 1/4 Sec. 26, T 32 N, R 7 W (1); W side Pine River, opposite Wool Canyon (1); Ulibarri Canyon, N 1/2 Sec. 25, T 32 N, R 7 W (1); near mouth Cottonwood Canyon, SE 1/4 Sec. 17, T 31 N, R 6 W (1); Pine River, SW 1/4 Sec. 8, T 30 N, R 7 W (1); Pine River, NE 1/4 of NW 1/4 Sec. 7, T 30 N, R 7 W (1); San Juan River, just S of confluence with Pine River (1); Waterflow (1); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (1); 1 1/2 mi. W and 7 mi. S of Bloomfield, Sec. 4, T 27 N, R 11 W (1). Rio Arriba Co.: Sec. 22, T 32 N, R 6 W (1).

- Masticophis taeniatus (Hallowell)
Desert Striped Whipsnake

Only one specimen of the desert striped whipsnake was encountered within the study area. This individual was caught about midmorning among pinyons and junipers within the Junction Land Form. Sagebrush is nearby as an understory plant and, a few hundred feet away, a north slope supports heavy growths of mountain mahogany amidst the pinyons and junipers; smaller amounts of Utah serviceberry and Gambel oak appear. The locality shows moderate relief; although the substratum is predominantly of clay, sandstone outcrops appear nearby.

Localities: NEW MEXICO: San Juan Co.: NE 1/4 Sec. 24, T 32 N, R 7 W (1).

- Lampropeltis doliata (Linnaeus)
Milk Snake

A single specimen, which escaped before preservation, was taken near the mouth of Deep Canyon, Archuleta Co., Colo., on the morning of 6 July 1959. The snake was found beneath a decaying log in an area of ponderosa pine and Gambel oak. Rocky Mountain juniper and skunkbush also occur in the area; Douglas fir is present a short distance up-canyon.

The snake was examined carefully after capture and the identification to species is considered certain despite the later loss of the specimen.

- Crotalus viridis (Rafinesque)
Western Rattlesnake

This snake is relatively rare within the study area. The northernmost record is from the edge of a small stream with a growth of narrow-leaf cottonwood along its margins. Ponderosa pine and some Douglas fir cover the nearby slopes.

Two specimens are available from the pinyon-juniper unit, one from among the rocks of a canyon wall, the other from the relatively flat plateau top separating the San Juan and Pine Rivers. In the latter case, rather large amounts of shrubby growth (Gambel oak, mountain mahogany, etc.) are present.

The sole specimen from south of the Junction Land Form was found coiled beside a snap trap in the damper portion of a sedge bed on the east margin of Gallegos Canyon. Pinyon-juniper, sagebrush, and grassland intermingle to some degree in this region.

A very sparse growth of cottonwood and wild olive is found in the vicinity.

Local inhabitants seem to consider the rattlesnake rare. It seems probable that it reaches little further north in the vicinity. Maslin (1959) does not report records from the two Colorado counties into which the study area extends.

Localities: COLORADO: Archuleta Co.: 4 mi. S (by road) of the jct. of Colo. 151 and US 160 (1). NEW MEXICO: San Juan Co.: E wall of canyon of Pine River, opposite mouth of Wilmer Canyon, SE 1/4 of SE 1/4 Sec. 19, T 32 N, R 7 W (1); Pine River Rd., SE 1/4 of SE 1/4 Sec. 26, T 32 N, R 7 W (1); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (1).

MAMMALS

- Sorex vagrans Baird Vagrant
Shrew

One specimen was trapped on 6 July 1959, by Clyde J. Jones, in a Microtus montanus runway through thick sedges (Scirpus acutus) intermixed with some grasses. Ponderosa pine, pinyon, and junipers occur in the general area.

Warren (1942) reports that this shrew is found throughout practically the whole mountainous region of Colorado to an elevation as low as 7,000 feet.

Localities: COLORADO: Archuleta Co.: 2 mi. E and 1/2 mi. N of Chimney Rock (1)•

- Myotis yumanensis (H. Allen) Yuma
Myotis

Until completion of a recent study (Harris and Findley, 1962) based on the necessity for identification of two specimens from within the study area, bats of this type were assigned to the subspecies M. lucifugus phasma Miller and Allen. The study has resulted in their placement within the present species.

The two specimens were taken from over an earthen cattle tank, one on 11 June and the second on 16 June. The general area is one of croplands; those tracts not in crops are in sagebrush.

Both animals were pregnant females. In the earlier capture, a single embryo was just discernible, and the individual taken on 16 June had one embryo measuring 12 mm. (Crown X rump).

Localities: COLORADO: La Plata Co.: Allison (2).

- Myotis evotis (H. Allen) Long-eared Myotis

Specimens from the study area were taken over a small tank formed by the damming of an intermittent stream. The vegetation is that of the ponderosa pine-Douglas fir unit, with the former tree by far the more common. A small amount of aspen is near-by. Gambel oak and junipers are common.

The specimens were taken on 22 July 1960. All were females; one was immature.

Localities: COLORADO: Archuleta Co.: Deep Canyon (3).

- Myotis volans (H. Allen) Long-legged Myotis

The long-legged myotis is known from ponderosa pine-Douglas fir forest and from riparian growth in the canyon of the



Fig. 7. Roost of Tadarida molossa.

Localities: NEW MEXICO: San Juan Co.: cave near Pine River, SE 1/4 Sec. 6, T 30 N, R 7 W (2).

• Antrozous pallidus (Le Conte) Pallid Bat

The pallid bat may be presumed to be widespread throughout the southern portions of the study area, becoming rare to the north. One specimen was taken in ponderosa pine-Douglas fir forest; others came from well developed pinyon-juniper stands, marginal pinyon-juniper with much sage-brush, and from grassland. Lack of available roosting sites possibly could be a limiting factor, but relatively few areas are without potential sites within flying distance.

The one roost found in the study area was behind a thin slab of rock on a cliff face. Available space was about two inches at the widest.

A very young female was captured on 7 July. Lactating females were collected on 14 and 19 July; apparently nonlactating females on 14, 19, 22, and 27 July. Males were collected on 19 and 27 July.

Localities: COLORADO: Archuleta Co.: Deep Canyon (1). NEW MEXICO: San Juan Co.: Marcelo Lucero place, Pine River Canyon (2); W side of Todosio Canyon (1); Gale Wash, 4 mi. E and 2 mi. S of Bloomfield (3); about 3 mi. E and 3 mi. S of Farmington (5); 16 mi. S and 1 mi. W of Farmington, Sec. 17, T 26 N, R 13 W (1).

• Tadarida molossa (Pallas) Big Freetail Bat

One of the few known roosts of this large bat was in the Reservoir area (Fig. 7). Two large rock shelters, a short distance below the lip of the canyon wall of

the Pine River and within a few hundred yards of each other, supported a total of some thirty bats (estimated). Both shelters are approximately 100 feet above the Recent alluvium terrace of the Pine River. The canyon walls in this section are very steep. The shelters are difficult of access, ropes being required for safe entry to one. Both face approximately east.

The bats were in crevices in the ceilings of the shelters. The crevices are long (thirty feet or more for one; thirty to forty feet for the other), deep (six feet or more for one; an estimated eight to ten feet for the other), and at a height of about six to eight feet above the floors of the shelters. A slight angling in leaving the roost would provide the bats with thirty feet or more of free fall. In both cases, the crevices curved so as to block view of their full vertical extent.

Vegetation in the vicinity is pinyon-juniper, well-developed only on the flats above the canyon walls; the walls themselves support fair numbers of juniper, a few pinyons, and much brush (mountain mahogany, etc.). Riparian growth and cultivated fields are on the bottomlands of the canyon. A few relict conifer stands exist in the general vicinity.

All collected individuals were females. A specimen taken on 30 June was carrying an embryo (crown X rump length, 33 mm.). Others collected the same date and on 18 July had no embryos.

Localities: NEW MEXICO: San Juan Co.: Pine River Canyon near Todosio Canyon (7).

- Sylvilagus nuttalli (Bachman)
Nuttall's Cottontail

Nuttall's cottontail is primarily an animal of the ponderosa pine-Douglas fir unit, but extends to lower elevations in riparian and the denser pinyon-juniper habitats.

Within the study area, this rabbit is concentrated north of the Colorado state line. It is common in ponderosa pine-Douglas fir, in those areas of pinyon-juniper which also support good stands of Gambel oak, and in riparian habitat in that region.

Two specimens have been taken in the New Mexican portion of the study area. One of these was collected from dense sagebrush in a small valley with permanent water; mixed with the sagebrush are good stands of grass, willows, narrow-leaf cottonwood, squawberry, and some juniper. Irrigated fields are nearby. The other specimen was collected in a very dense stand of pinyon-juniper. Both are from the Junction Land Form, not far south of the Colorado state line.

Localities: COLORADO: Archuleta Co.: NE 1/4 of SE 1/4 Sec. 18, T 32 N, R 4 W (1); Sec. 23, T 32 N, R 4 W (2); Sec. 18, T 32 N, R 4 W (1); N 1/2 Sec. 22, T 32 N, R 4 W (1); 2 1/2 mi. Sand 1 mi. W of Chimney Rock (1); Deep Canyon, 4 mi. S and 1/2 mi. W of Chimney Rock (5). NEW MEXICO: San Juan Co.: Sambrito Creek, SE 1/4 of SW 1/4 Sec. 15, T 32 N, R 6 W (1); Pine River Rd., W side Sec. 3, T 31 N, R 7 W (1).

- Sylvilagus auduboni (Baird)
Desert Cottontail

In keeping with its common name, this rabbit is most plentiful in the more xeric portions of the study area. It was observed in grassland, sagebrush, open pinyon-juniper, and brushy stream or wash vegetation. In the more open habitats, individuals were most common in or near rocky or dissected regions, seldom being observed in flat, open sagebrush or grassland.

Few specimens were collected in the southern portions of the area, but were

seen at most stations except those of little topographic relief.

Localities: COLORADO: La Plata

Co.: Allison, E side NW 1/4 Sec. 15, T 32 N, R 6 W (1, skull pickup). NEW MEXICO: San Juan Co.: NE 1/4 Sec. 12, T 32 N, R 7 W (1); SW 1/4 Sec. 34, T 32 N, R 7 W (1); NE 1/4 of SE 1/4 Sec. 5, T 30N, R 7 W (1); Ulibarri Canyon, N 1/2 Sec. 25, T 32 N, R 7 W (1); NW 1/4 Sec. 9, T 32 N, R 6 W (1); 2 mi. NW of Blanco (1); Fruitland (Nelson, 1909, p. 232); Aztec (Nelson, 1909, p.232); Blanco (Nelson, 1909, p.232); Canyon Blanco (Nelson, 1909, p.232). Rio Arriba Co.: Dulce (Nelson, 1909, p.232).

• Sylvilagus Gray
Cottontails

The distributions of Nuttall's cottontail and the desert cottontail overlap to some degree. Within this zone of sympatry, Nuttall's cottontail tends to inhabit the denser vegetation types and the desert cottontail mainly the more open areas. In the Sambrito Creek drainage south of the Colorado line, for example, Nuttall's cottontail was found in the dense vegetation along the stream, whereas the desert cottontail was taken from nearby sagebrush flats. The zone of overlap is narrow, probably little if any greater than ten miles in width, and appears centered a few miles south of the New Mexico-Colorado state line. The results of this study would seem to bear out the statement of Warren (1942, p.271) that "...sometimes (the) two species are found at practically the same locality."

• Lepus californicus Gray
Black-tailed Jack Rabbit

In the northern portions of the study area, the black-tailed jack rabbit was seen, with few exceptions, only in areas of sagebrush and was common there. Records of sightings from the study area reveal none

from the Piedra Valley north of approximately Arboles; in the San Juan Valley to the east of Arboles, however, there are records almost to Cato. It is probable that the range of these animals extends to a greater or lesser extent into pinyon-juniper and perhaps occasionally into lower ponderosa pine forest. To the south, it was observed in both sagebrush and grass-land, although more common in the former.

Localities: COLORADO: La Plata Co.: Ft. Lewis (Warren, 1942, p.262); Bayfield (Warren, 1942, p. 262). Archuleta Co.: NW 1/4 Sec. 23, T 32 N, R 6 W (1). NEW MEXICO: San Juan Co.: E 1/2 T 31 N, R 8 W (1); Sec. 12, T 30 N, R 8 W (1); Aztec (Nelson, 1909, p.145); Fruitland (Nelson, 1909, p. 145); Canyon Blanco (Nelson, 1909, p. 145).

• Eutamias minimus
(Bachman) Least
Chipmunk

The least chipmunk, absent from the study area proper, was common, along with the Colorado chipmunk, near the junction of Gordon Creek with the Piedra River. Warren (1942, p. 146) mentions that this animal ranges down to the pinyon and juniper zone and that it has been taken with the Colorado chipmunk. Thus it may be presumed that its lower limits are near the study area's boundaries.

Localities: COLORADO: La Plata Co.: Florida (Howell, 1929, p. 50). Archuleta Co.: Gordon Creek near jct. with Piedra River (4); Navajo River (Howell, 1929, p.50); Chromo (Howell, 1929, p.50).

• Eutamias quadrivittatus
(Say) Colorado Chipmunk

The Colorado chipmunk is common in the ponderosa pine-Douglas fir forest where thickets, fallen logs, and other debris provide ample cover, and in those

portions of the pinyon-juniper and relict conifer units where rock outcrops occur; it appears to be absent from all but the thickest growths of non-rocky pinyon-juniper areas. In the more southerly portions of the study area, this chipmunk lives a-long high cliffs and among rock debris even where the pinyon-juniper unit is extremely sparse, with sagebrush and grasses prevalent.

The major factor limiting its geographic distribution seems to be the availability of cover (though it seems to be absent from even the thickest riparian cover). The animals appear noticeably more wary in regions below ponderosa pine-Douglas fir vegetation than in the higher life-zones that provide better overhead cover; this may well be in response to the greater danger, particularly from birds, in the more open areas.

The Colorado chipmunk occurs with the least chipmunk in the spruce forest of the upper Piedra River. In the south there is equally close proximity to the antelope ground squirrel.

Localities: COLORADO: La Plata Co.: Bayfield (Howell, 1929, p. 83); Bondad (Howell, 1929, p.83); Florida (Howell, 1929, p. 83). Archuleta Co.: Gordon Creek near jct. with Piedra River (4); Pagosa Springs (Howell, 1929, p. 83); Deep Canyon (6); Stollsteimer Creek near mouth Deep Can-yon (1); N side San Juan River, about 1/2 mi. E of Gato (1); 2 mi. W and 1 mi. N of Juanita (2); Chromo (Howell, 1929, p. 83). NEW MEXICO: San Juan Co.: Benito Can-yon, NE 1/4 of NW 1/4 Sec. 29, T 32 N, R 7 W (1); NW 1/4 of SW 1/4 Sec. 4, T 30 N, R 7 W (2); 4 mi. S and 1/2 mi. E of Allison (1); Pine River Canyon, Sec. 20, T 31 N, R 7 W (3); jct. San Juan and Pine Rivers, NW 1/4 Sec. 17, T 30 N, R 7 W(1); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (8); Pine River, SW 1/4 Sec. 8, T 30 N, R 7 W (1); 1/2 mi. S of the Navajo Dam site (2); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800'(1); Largo Canyon (Bailey, 1931, p. 85); about

3 mi. E and 3 mi. S of Farmington (4). Rio Arriba Co.: SE 1/4 Sec. 13, T 32 N, R 6 W, 6400' (1); Uell's Canyon, SE 1/4 Sec. 26, T 32 N, R 6 W (1) ; Dulce (Howell, 1929, p.83); about 1 mi. N of Bancos Can-yon (1); near mouth of Bancos Canyon (1).

- Marmota flaviventris
(Audubon and Bachman)
Yellow-bellied Marmot

Yellow-bellied marmots have been seen by myself and other members of the field party near Sambrito Creek, Sec. 15, T 32 N, R 6 W, 5, 980', San Juan Co. , New Mex. Two specimens were collected from this general area by the University of Utah Ecological Researches party in the summer of 1960 (S.D. Durrant, personal communication). Vegetation at the locality where the animals were seen is largely scattered sagebrush, but excellent grass, willows, narrow-leaf cottonwoods and a few junipers are nearby and irrigated croplands lie on Miller Mesa immediately above the site.

Although the presence within the study area of an animal usually considered to be a high mountain form in southern Colorado and northern New Mexico was unexpected, a possible explanation lies in the nearby irrigated green crops, which provide an avenue to the higher country to the north via the Piedra Valley, with relatively few stretches entirely free of green fodder.

Presence at such an altitude under these conditions shows likelihood of marmots being limited in their southern distribution not by climatic conditions acting directly upon the animals themselves, but because of the absence of suitable green foods. Slight increases in moisture over present conditions might very well lead to a considerable expansion of range.

Localities: COLORADO: La Plata Co.: Florida, 7200' (Howell, 1915, p.55). Archuleta Co.: Gordon Creek near jct. with Piedra River (1).

- Citellus leucurus (Merriam)
White-tailed Antelope Squirrel

This small ground squirrel enters the Blanco Land Form, where it is found on the canyon bottoms among sagebrush, greasewood, and other canyon floor shrubs. Vegetation on the canyon walls and mesa tops is of the pinyon-juniper unit. The squirrel was not found in the Junction Land Form, but approaches the southern edges and may enter in years of high population numbers.

South and west of the Blanco Land Form the animal is ubiquitous except in the more developed riparian habitats. It is perhaps more common about washes and rocky outcrops, but also occurs in flat areas. In the latter places, bannertail kangaroo rat dens may be occupied, although probably any burrow system of suitable size may be utilized.

Localities: NEW MEXICO: San Juan Co.: 1/2 mi. S of Archuleta (1); Aztec (Bailey, 1931, p.95); between Aztec and La-plata (Howell, 1938, p. 176); Sec. 29, T 30 N, R 8 W, 5800' (1); Fruitland (Bailey, 1931, p.95); Blanco Canyon (Bailey, 1931, p.95); Gale Wash, 4 mi. E and 2 mi. S of Bloomfield (2); about 3 mi. E and 3 mi. S of Farmington (4); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (1); 5 mi. N and 1/2 mi. W of Waterflow (1); 2 1/4 mi. N and 1 1/4 mi. E of Waterflow, Sec. 28, T 30 N, R 15 W (1); 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (1); 11 mi. E and 13 mi. S of Farmington (1).

- Citellus spilosma (Bennett)
Spotted Ground Squirrel

This species was found only in relatively flat grasslands south of the San Juan River, where it occurs sympatrically with the white-tailed antelope squirrel. Grasses, Mormon tea, tumbleweed, and yuccas are common members of the vegetation. This animal, like the antelope squirrel, utilizes

the dens of the bannertail kangaroo rat upon occasion.

Localities: NEW MEXICO: San Juan Co.: 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (1); 14 mi. S and 2 mi. W of Farmington (1); 11 mi. E and 13 mi. S of Farmington (2).

- Citellus variegatus (Erxleben)
Rock Squirrel

The rock squirrel is widespread and common in pinyon-juniper areas in much of the Blanco Land Form and its range continues north well into the ponderosa pine - Douglas fir unit. It is most common in rocky areas but has been found in well developed riparian growth and about cultivated cropland near farm buildings.

This ground squirrel was neither seen nor collected south of the San Juan River, even in areas very similar to its habitat north of the river.

Warren (1942, p. 118) states: "In Colorado it is found from 8, 000 feet down."

Localities: COLORADO: La Plata Co.: Allison (1). Archuleta Co.: Deep Canyon, 4 mi. S and 1/2 mi. W of Chimney Rock (1); near mouth Deep Canyon (1). NEW MEXICO: San Juan Co.: extreme SW corner Sec. 14, T 32 N, R 6 W (1); Pine River Canyon, Sec. 20, T 31 N, R 7 W (3); Pine River, NE 1/4 Sec. 7, T 30 N, R 7 W (1); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (1); Pine River, NW 1/4 Sec. 8, T 30 N, R 7 W (2); jct. San Juan and Pine Rivers (1).

- Citellus lateralis (Say) Golden-mantled Ground Squirrel

This ground squirrel was not found in the main study area but a specimen was taken a short distance to the east, and others

in the meadows and edge of the spruce forest on the upper Piedra River. A relatively slight increase in moisture would probably allow invasion of the more mesic portions of the study area.

Localities: COLORADO: Archuleta Co.: Gordon Creek near jct. with Piedra River (6); Pagosa Springs (Howell, 1938, p. 194). NEW MEXICO: Rio Arriba Co.: about 5 mi. W and 4 mi. N of Dulce (1).

- Cynomys gunnisoni
(Baird) Gunnison's
Prairie Dog

Because of poisoning campaigns, the present distribution of the prairie dog is a questionable reflection of the past distribution, and may be somewhat restricted compared to earlier days.

The northernmost colonies located in Colorado were near Allison, near Sambrito Creek close to the state line, and on Miller Mesa. In New Mexico, there was a colony near Rosa. These towns were on or near cultivated or recently cultivated land. Sagebrush and/or pinyon-juniper is the common vegetational type in nearby uncultivated areas. No prairie dog towns are known from the unirrigated plateau top within the Junction Land Form.

South of this land form, towns were quite common in the grasslands. None was found in sagebrush.

Localities: COLORADO: Archuleta Co.: NW 1/4 Sec. 23, T 32 N, R 6 W (1); SE 1/4 Sec. 24, T 32 N, R W (1). NEW MEXICO: San Juan Co.: NE 1/4 Sec. 12, T 32 N, R 7 W;(4) Sec. 28, T 28 N, R 13 W (1); Laplata (Bailey, 1931, pp. 130-131); N side of valley at Fruitland (Bailey, 1931, p. 129); Liberty (Hollister, 1916, p. 34).

- Sciurus aberti
Woodhouse Abert's
Squirrel

Sciurus aberti was not found in the study area, but probably occurs, at least

sparsely, in the ponderosa pine forests of the higher elevations.

Localities: COLORADO: La Plata Co.: Florida (Warren, 1942, p. 152). Archuleta Co.: Pagosa Springs (Warren, 1942, p. 152).

- Thomomys bottae (Eydox and Gervais) Southern Pocket Gopher

In the northern portions of the study area, pocket gophers appear limited to the bottomlands and, occasionally, to the terraces of the San Juan River and its tributaries and to the cultivated lands in the vicinity of the state line. Vegetation varies from ponderosa pine-Douglas fir forest through domesticated crops such as alfalfa and hay to river bottomland vegetation (well developed and otherwise).

South of the San Juan River, the gopher is distributed in a spotty fashion through the grasslands. There is some concentration along major dry washes where vegetation is somewhat thicker than average, but sizeable areas of occupancy occur elsewhere.

Localities: COLORADO: La Plata Co.: Bayfield (Warren, 1942, p. 160); Los Pinos (Bailey, 1915, p. 75). Archuleta Co.: mouth of Archuleta Canyon (1); near mouth of Deep Canyon (1); Arboles (Warren, 1942, p. 160); NE 1/4 of SE 1/4 Sec. 18, T 32 N, R 4 W (1). NEW MEXICO: San Juan Co.: Pine River, NE 1/4 Sec. 7, T 30 N, R 7 W (1); jct. Pine and San Juan Rivers (1); Fruitland (Bailey, 1915, p. 75); about 3 mi. E and 3 mi. S of Farmington (1); 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (2).

- Thomomys talpoides
(Richardson) Northern Pocket
Gopher

The northern pocket gopher replaces the southern at higher altitudes. The south-

ern pocket gopher apparently is the only one found within the study area, but probably goes little further north before it is replaced by the northern species.

Localities: COLORADO: La Plata Co.: Florida, 7200° (Warren, 1942, p. 163). Archuleta Co.: Gordon Creek near jct. with Piedra River (3); Pagosa Peak (Bailey, 1915, p.112); Pagosa Springs (Bailey, 1915, p. 112).

- Perognathus flavus Baird
Silky Pocket Mouse

Although primarily an animal of the open grasslands, the silky pocket mouse enters extremely sparse pinyon-juniper in the vicinity of Blanco. It was not found farther north.

Localities: NEW MEXICO: San Juan Co.: Fruitland (Goldman, 1932a, p. 90); 2 mi. NW of Blanco (4); 3 mi. E and 3 mi. S of Farmington (2); 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (2).

- Perognathus apache Merriam
Apache Pocket Mouse

Within the Junction Land Form, the Apache pocket mouse occurs in well developed pinyon-juniper stands on the relatively flat interfluves (Fig. 8) and along canyon bottomlands amid sagebrush, greasewood, etc. It seems to be quite rare in all these regions, however.

To the south and west, it inhabits the grasslands, both along and between washes. Here it was taken, not infrequently, by night hunting.

Localities: NEW MEXICO: San Juan Co.: Pine River Rd., SE 1/4 of SW 1/4 Sec. 9, T 31 N, R 7 W (1); Lucero place, SE 1/4 of NE 1/4 Sec. 17, T 31 N, R 7 W (1); 5 1/2 mi. N and 1/2 mi. W of Water-



Fig. 8. Perognathus apache habitat in pinyon-juniper growth.

flow, Sec. 12, T 30 N, R 16 W (1); about 3 mi. E and 3 mi. S of Farmington (1); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (1); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (1); 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (2); 16 mi. S and 1 mi. W of Farmington, Sec. 17, T 26 N, R 13 W (2).

- Perognathus Wied-Neuwied
Pocket Mice

Within the study area, the Apache pocket mouse's range continues north for a considerable distance beyond that of the silky. Within the area of sympatry, however, no differences in habitat were noticed. Members of both species were captured by hand within ten minutes and a hundred yards or less of each other in seemingly uniform habitat.

- Dipodomys ordi Woodhouse
Ord's Kangaroo Rat

Ord's kangaroo rat occurs north to the edge of the Junction Land Form, but not into that region except, possibly, for short distances up the major river valleys. It was common nowhere within the study area during the summer of 1960.

The animal appears limited to the grasslands and those stands of sagebrush which include many associates, such as salt-bush and greasewood. In the latter type of habitat, the animals are concentrated mainly along washes.

The northernmost station for this animal, two miles NW of Blanco, is based upon a sight record.

Localities: NEW MEXICO: San Juan Co.: Blanco (Setzer, 1949, p.558); Fruitland (Setzer, 1949, p.558); Gale Wash, 4 mi. E and 2 mi. S of Bloomfield (4); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (2); 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (1).

- Dipodomys spectabilis Merriam
Bannertail Kangaroo Rat

The limits of distribution of this rodent within the study area are approximately the same as for Ord's kangaroo rat, and the bannertail is found in much the same type of vegetation.

Localities: NEW MEXICO: San Juan Co.: near Fruitland (Bailey, 1931, p.260); near Bloomfield, N side of San Juan River (Bailey, 1931, p.260); Blanco Canyon (Bailey, 1931, p.260); Largo Canyon (Bailey, 1931, p.260); 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (1); 1 mi. E and 9 mi. S of Bloomfield, Sec. 11, T 27 N, R 11 W (1); Gallegos Store, 10 mi. S and 7 mi. W of Bloomfield (1).

- Castor canadensis Kuhl
Beaver

At present the beaver occurs along the permanent water-courses within the study area and there is no reason to believe the situation was essentially different in the past, except that irrigation ditches are now utilized in addition to streams.

In most of the area under consideration, dams are not constructed, the animals constructing burrows. In some places, trees are not present along or near the banks of the inhabited section of river. Sagebrush, greasewood, and a few willows appear to be the only possible food in such cases.

Localities: NEW MEXICO: San Juan Co.: jct. of San Juan and Pine Rivers, NW 1/4 Sec. 17, T 30 N, R 7 W (1).

- Reithrodontomys megalotis (Baird)
Western Harvest Mouse

The western harvest mouse ranges widely through the study area in croplands, sloughs, marshes, and wash edges. In cultivated areas, the animal is common in alfalfa, hay, and weeds; away from areas of cultivation, its habitat is in the growth of grasses and bushes along the courses of washes. Such situations often are relatively barren, with individual plants widely spaced (though less so than away from the washes).

In the Pine River Canyon, one specimen was collected from among rocks of the canyon wall, some twenty to thirty feet above the upper river terrace. Vegetation here is of scattered pinyons and junipers with their associated shrubs and forbs. This is the only case where a harvest mouse was taken among such surroundings.

The species probably extends well to the north of the study area in the river valleys.

Localities: COLORADO: La Plata Co.: Allison (4). Archuleta Co.: 6 mi. S and 4 1/2 mi. W of Chimney Rock (2); NE 1/4 of SE 1/4 Sec. 18, T 32 N, R 4 W (6); NW 1/4 Sec. 23, T 32 N, R 6 W (1); 1 mi. E and 0.2 mi. N of Arboles (1); Arboles (Warren, 1942, p.196). NEW MEXICO:

San Juan Co.: Laplata (Howell, 1914, p.30); Aztec (Howell, 1914, p.30); extreme NW 1/4 of NW 1/4 Sec. 9, T 32 N, R 6 W (1); Ulibarri Canyon, N 1/2 Sec. 25, T 32 N R 7 W (1); Pine River Canyon, Sec. 20, T 31 N, R 7 W (7); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (5); Pine River, NE 1/4 Sec. 7, T 30 N, R 7 W (2); Pine River, SW 1/4 Sec. 8, T 30 N, R 7 W (3); about 3 mi. N (by road) of Archuleta (2); Fruitland (Howell, 1914, p.30); 1 1/2 mi. W of Farmington (1); Farmington (Howell, 1914, p.30); 1 1/2 mi. W of Bloomfield (1); Bloomfield (1); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (4); 16 mi. S and 1 mi. W of Farmington, Sec. 17, T 26 N, R 13 W (2).

- Peromyscus crinitus (Merriam)
Canyon Mouse

In the area under consideration, Peromyscus crinitus appears to reach the northern limits of its range at about the New Mexico-Colorado state line.

Warren (1942, p.204) states that "...it appears to live exclusively among rocks, ..." The present author finds no reason for disagreement here, and, in fact, it seems that the presence of rocks alone is not always sufficient and that somewhat jumbled blocks are usually present. Thus, the mouse most often is found where debris from a cliff face has accumulated at the base.

As yet, these mice have not been taken within the study area in other than pinyon-juniper vegetation, though this unit has not always been well developed.

Localities: NEW MEXICO: San Juan Co.: Pine River, NW 1/4 Sec. 7, T 30 N,

R 7 W (2); 5 1/2 mi. N and 1 1/2 mi. W of Waterflow, Sec. 12, T 30 N, R 16 W (3); about 3 mi. E and 3 mi. S of Farmington (3); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (5).

- Peromyscus maniculatus (Wagner)
Deer Mouse

The deer mouse is extremely widespread throughout the study area. Nearly any line of traps of reasonable number produced at least one specimen, almost regardless of habitat.

Highest population numbers appear to have been in the spruce and ponderosa pine-Douglas fir forests of the upper Piedra River, in areas of contemporary or recent cultivation, and, at least during the summer of 1960, in the almost pure sage-brush flats of the Junction Land Form. Even in conditions seemingly optimal for other species of Peromyscus, a few specimens of this species were almost invariably taken. The deer mouse was rarest in open, unbroken grassland and was not taken in several stations located in this vegetational unit. Here, other species of the genus were also absent.

Localities: COLORADO: La Plata Co.: Durango (Warren, 1942, p. 200); Bayfield (Warren, 1942, p. 200); Allison (6). Archuleta Co.: Pagosa Springs (Warren, 1942, p. 200); Gordon Creek near jct. with Piedra River (11); 0.4 mi. S (by road) of the jct. of Colo. 151 and US 160 (2); mouth of Archuleta Canyon (5); Archuleta Canyon (5); Stollsteimer Creek near mouth of Deep Canyon (6); Deep Canyon, 4 mi. S and 1/2 mi. W of Chimney Rock (18); 6 mi. S and 4 1/2 mi. W of Chimney Rock (1); 6 1/2 mi. S and 5 mi. W of Chimney Rock (2); 1 1/4 mi. E and 1 mi. S of Chimney Rock (5); Piedra River, NW 1/4 Sec. 4, T 32 N, R 5 W (10); Arboles (Warren, 1942, p. 202); 1 mi. E and 0.2 mi. N of Arboles (3); Carracas-Arboles Rd., NE 1/4 of SW 1/4

Sec. 17, T 32 N, R 4 W (8); Sandoval Canyon, SE 1/4 of SE 1/4 Sec. 12, T 32 N, R 5 W (2); NE 1/4 of SE 1/4 Sec. 18, T 32 N, R 4 W (9); 2 mi. W and 1 mi. N of Juanita (9); NW 1/4 Sec. 23, T 32 N, R 6 W (3); E side of San Juan River, NW 1/4 Sec. 21, T 32 N, R 5 W (5). NEW MEXICO: San Juan Co.: Laplata (J. A. Allen, 1893, p. 74); Aztec (J.A.Allen, 1893, p.74); 5 1/2 mi. N and 1 1/2 mi. W of Waterflow, Sec. 12, T 30 N, R 16 W (2); 2 1/4 mi. N and 1 1/4 mi. E of Waterflow, Sec. 28, T 30 N, R 15 W (3); 2 1/2 mi. W and 1/2 mi. S of Rosa, NE 1/4 Sec. 16, T 32 N, R 6 W (13); Sambrito Creek, SW 1/4 of SE 1/4 Sec. 15, T 32 N, R 6 W (2); Pine River Canyon, Sec. 20, T 31 N, R 7 W (10); Lucero place, SE 1/4 of NE 1/4 Sec. 17, T 31 N, R 7 W (6); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (6); Pine River, NE 1/4 Sec. 7, T 30 N, R 7 W (3); Pine River Rd., SE 1/4 of SW 1/4 Sec. 9, T 31 N, R 7 W (2); extreme NW 1/4 of NW 1/4 Sec. 9, T 32 N, R 6 W (1); NW 1/4 Sec. 11, T 32 N, R 6 W (2); E 1/2 of NW 1/4 Sec. 10, T 32 N, R 6 W (2); NW 1/4 of SW 1/4 Sec. 4, T 30 N, R 7 W (2); SW 1/4 of NE 1/4 Sec. 24, T 32 N, R 7 W (1); 9 mi. S and 6 1/2 mi. W of Bloomfield (5); 9 mi. S of Bloomfield, Sec. 10, T 27 N, R 11 W (2); 3 1/2 mi. E and 7 mi. S of Bloomfield, Sec. 32, T 28 N, R 10 W (2); Ulibarri Canyon, N 1/2 Sec. 25, T 32 N, R 7 W (24); 2 mi. NW of Blanco (3); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (3); about 3 mi. E and 3 mi. S of Farmington (4); Sec. 29, T 30 N, R 8 W, 5800' (2); Gale Wash, 4 mi. E and 2 mi. S of Bloomfield (2); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (5); 16 mi. S and 1 mi. W of Farmington, Sec. 17, T 26 N, R 13 W (5). Rio Arriba Co.: SW 1/4 Sec. 23, T 32 N, R 6 W (2); extreme SE corner Sec. 22, T 32 N, R 6 W (1).

- Peromyscus boylii (Baird)
Brush Mouse

The brush mouse is predominately a rock dweller of the pinyon-juniper unit,

but in very well developed pinyon-juniper within the Junction Land Form, the mouse may be taken far from any major rock outcrops, in quite level areas. In several cases, the brush mouse was found where pinyon was absent and junipers very sparse, in heavy tree and shrub growth of riparian character. The creature enters the lower parts of the ponderosa pine-Douglas fir forest.

Localities: COLORADO: Archuleta Co.: 6 1/2 mi. S and 5 mi. W of Chimney Rock (1); Piedra River, NW 1/4 Sec.4, T 32 N, R 5 W (2); Sandoval Canyon, SE 1/4 of SE 1/4 Sec. 12, T 32 N, R 5 W (1); 2 mi. W and 1 mi. N of Juanita (20); 1 mi. E and 0.2 mi. N of Arboles (2). NEW MEXICO: San Juan Co.: Laplata (Osgood, 1909, p.147); Aztec (Osgood, 1909,p.147); Sec. 29, T 30 N, R 8 W, 5800' (3); 5 1/2 mi. N and 1 1/2 mi. W of Waterflow, Sec. 12, T 30 N, R 16 W (6); 2 mi. NW of Blanco (1); Pine River Canyon, Sec. 20, T 31 N, R 7 W (13); NW 1/4 of SW 1/4 Sec. 4, T 30 N, R 7 W (7); Lucero Place, SE 1/4 of NE 1/4 Sec. 17, T 31 N, R 7 W (1); jct. San Juan and Pine Rivers, NW 1/4 Sec. 17, T 30 N, R 7 W (5); Benito Canyon, NE 1/4 of NW 1/4 Sec. 29, T 32 N, R 7 W (9); Sambrito Creek, SW 1/4 of SE 1/4 Sec. 15, T 32 N, R 6 W (5); Pine River Rd., SE 1/4 of SW 1/4 Sec. 9, T 31 N, R 7 W (2); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (21).

- Peromyscus truei (Schufeldt)
Pinyon Mouse

Like the brush mouse, the pinyon mouse is most concentrated in the pinyon-juniper unit. However, some individuals occur in cultivated lands and about farm buildings, in riparian growth, and in the sagebrush wash types of habitat. In the latter two cases, pinyon-juniper usually is present within a few hundred yards, although often only sparsely so. In sparse, very open pinyon-juniper with few or no

rock outcroppings, the animal may occur in fairly large numbers.

Rarely, the pinyon mouse may be found at considerable distances from any pinyon-juniper. North of Waterflow, it was trapped among Sarcobatus and Artemisia growing on flats bordering entrenched arroyos, on rocky hillsides, and on sand dunes. The nearest pinyons or junipers are several miles distant.

Localities: COLORADO: Archuleta Co.: Piedra River, NW 1/4 Sec. 4, T 32 N, R 5 W (1). NEW MEXICO: San Juan Co.: Laplata (Osgood, 1909, p. 169); Aztec (Hoffmeister, 1951, p. 39); Pine River Rd., N 1/2 of SW 1/4 Sec. 25, T 32 N, R 7 W (1); SW 1/4 of NE 1/4 Sec. 24, T 32 N, R 7 W (1); Pine River Rd., SE 1/4 of SW 1/4 Sec. 9, T 31 N., R 7 W (9); Lucero place, SE 1/4 of NE 1/4 Sec. 17, T 31 N, R 7 W (1); E 1/2 of NW 1/4 Sec. 10, T 32 N, R 6 W (1); NW 1/4 Sec. 11, T 32 N, R 6 W (1); jct. Pine and San Juan Rivers, NW 1/4 Sec. 17, T 30 N, R 7 W (1); NW 1/4 of SW 1/4 Sec. 4, T 30 N, R 7 W (4); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (24); Pine River, NE 1/4 Sec. 7, T 30 N, R 7 W (1); Pine River Canyon, Sec. 20, T 31 N, R 7 W (2); Sec. 29, T 30 N, R 8 W, 5800' (3); 5 1/2 mi. N and 1 1/2 mi. W of Water-flow, Sec. 12, T 30 N, R 16 W (11); 1 1/2 mi. N and 1 1/2 mi. E of Waterflow (2); 2 1/2 mi. N and 1 1/4 mi. E of Waterflow, Sec. 28, T 30 N, R 15 W (4); near Fruit-land (Bailey, 1931, p. 153); 2 mi. NW of Blanco (4); Blanco (Hoffmeister, 1951, p. 39); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (1); 9 mi. S of Bloomfield, Sec. 10, T 27 N, R 11 W (5); 1 mi. E and 9 mi. S of Bloomfield, Sec. 11, T 27 N, R 11 W (1); 3 1/2 mi. E and 7 mi. S of Bloomfield, Sec. 32, T 28 N, R 10 W (4). Rio Arriba Co.: SW 1/4 Sec. 23, T 32 N, R 5 W (1).

- Peromyscus Gloger
White-footed Mice

Four species (Peromyscus crinitus, P. maniculatus, P. truei, and P. boylii).

of this genus occur in the study area. In some localities, all four may be taken in close proximity to one another. None, however, has the same distribution as any other.

Peromyscus crinitus has the most restricted habitat requirements and the most restricted range within the area. Specimens were taken exclusively among rocks within the pinyon-juniper zone.

In contrast, P. maniculatus spans the entire study area, occurring from spruce forest at the northern checkpoint south through all vegetational units into grasslands south of the San Juan. It attains greatest numbers where competition from other species is of low level (as in cultivated fields, spruce and ponderosa pine-Douglas fir forests, and in sagebrush), but does occur with all the other species.

Peromyscus truei and P. boylii overlap broadly in their ranges, but the former is somewhat more tolerant of xeric and open areas than is P. boylii; the latter is more tolerant of the habitats found at higher altitudes. Thus, P. boylii is absent in the south from areas occupied by P. truei; the reverse is true in the north. Within the areas of sympatry, P. truei tends to be more common on rather open slopes and in croplands and riparian growth than is P. boylii; the latter tends to be commonest in the more rocky areas or in areas of heavy nonriparian plant cover. The habitats of the two kinds are not mutually exclusive, however.

- Onychomys leucogaster (Wied-Neuwied)
Northern Grasshopper Mouse

The northern grasshopper mouse was rarely taken within the study area. A crew of the University of Utah Ecological Researches captured several specimens in the vicinity of Rosa, Rio Arriba Co., N. Mex. (S.D. Durrant, personal communication). All other specimens are from south of the Junction Land Form.

Specimens collected during the course of this study were taken from an area of sagebrush with grassland nearby, from grassland, and from sparse pinyon-juniper growth.

Localities: NEW MEXICO: San Juan Co.: Laplata (Hollister, 1914, p.446); near Fruitland (Bailey, 1931, p. 138); 2 mi. NW of Blanco (1); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (1); 11 mi. E and 13 mi. S of Farmington (3); 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (1). Rio Arriba Co.: river mile 165 from jct. San Juan and Colorado Rivers (S. D. Durrant, in litt.); river mile 165.5 (S. D. Durrant, in litt.); river mile 166 (S.D. Durrant, in litt.).

- Neotoma albigula Hartley
White-throated Wood Rat

This wood rat is widespread, occurring from riparian valleys within the lower levels of the ponderosa pine-Douglas fir zone south to the edges of grassland washes south of the San Juan. It was not taken in sagebrush.

Rocky areas are favored when available; where rocks are absent, burrows along the edges of arroyos are utilized. In addition, one nest, probably constructed by this species, was found built about the base of a wild olive tree.

Localities: COLORADO: La Plata Co.: Mancos -San Juan River region in Montezuma and La Plata Counties (Warren, 1942, p. 212); near Bondad (Warren, 1942, p. 212). Archuleta Co.: Stollsteimer Creek near mouth of Deep Canyon (1); SE 1/4 of NW 1/4 Sec. 18, T 32 N, R 4 W (1); 2 mi. W and 1 mi. N of Juanita (1). NEW MEXICO: San Juan Co.: Pine River Rd. N 1/2 of SW 1/4 Sec. 25, T 32 N, R 7 W (1); Pine River, Sec. 6, T 30 N, R 7 W (1); about 3 mi. E and 3 mi. S of Farmington (1); Gallegos Canyon, Sec. 9, T 28 N, R 12 W (1); 9 mi. S and 6 1/2 mi. W of Bloom-

field (1); 11 mi. E and 13 mi. S of Farmington (1).

- Neotoma stephensi Goldman
Stephens' Wood Rat

In the Junction Land Form, N. stephensi occupies cliffs and rock outcrops of the pinyon-juniper zone. To the south, it may occur away from rocky areas in well developed, but not necessarily dense, pinyon-juniper stands.

In the latter areas, dens are built about the bases or low-slung branches of junipers or in vertical crevices in the alluvium or clay of arroyo banks. When built about junipers, burrows, of a size suggesting they may belong to this species, are often present near the nest. On two occasions, arboreal nests were found in junipers. One such nest had its base approximately five feet above the surface of the ground on an almost horizontal limb, some 2 1/2 - 3 feet from the trunk; the nest was about 1 1/2 feet in height and in horizontal diameter. The other arboreal nest was some six feet above ground and several feet from the main trunk, but was little more than a covered platform, less than a foot in height.

Nests are constructed mainly of juniper twigs, many of which retain green foliage. Chunks of manure, bones, and cactus joints may or may not be present.

Localities: NEW MEXICO: San Juan Co.: Pine River Rd., N 1/2 of SW 1/4 Sec. 25, T 32 N, R 7 W (1); jct. San Juan and Pine Rivers, NW 1/4 Sec. 17, T 30 N, R 7 W (1); Sec. 29, T 30 N, R 8 W, 5800' (1); about 3 mi. E and 3 mi. S of Farmington (1); Blanco (Goldman, 1932b, p.67); about 3 mi. E and 3 mi. S of Blanco, Sec. 34, T 29 N, R 9 W, 5800' (1); 9 mi. S of Bloomfield, Sec. 10, T 27 N, R 11 W (3); 1 mi. E and 9 mi. S of Bloomfield, Sec. 11, T 27 N, R 11 W (1).

- Neotoma mexicana
Baird Mexican Wood
Rat

The Mexican wood rat is a rock dweller in the ponderosa pine-Douglas fir and pinyon-juniper zones, extending in places to the very southern edge of the latter, where only scattered junipers occur. A specimen is available also from a relict conifer area.

Localities: COLORADO: Archuleta Co.: Stollsteimer Creek near mouth of Deep Canyon (1); Deep Canyon, 4 mi. S and 1/2 mi. W of Chimney Rock (3); Piedra River, NW 1/4 Sec. 4, T 32 N, R 5 W (1); NE 1/4 of SE 1/4 Sec. 18, T 32 N, R 4 W (1). NEW MEXICO: San Juan Co.: Benito Canyon, NE 1/4 of NW 1/4 Sec. 29, T 32 N, R 7 W (1); NW 1/4 of SW 1/4 Sec. 4, T 30 N, R 7 W (1); jct. San Juan and Pine Rivers, NW 1/4 Sec. 17, T 30 N, R 7 W (1); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (6); 18 mi. N and 1 mi. E of Farmington (Finley, 1958, p. 288); Laplata (J. A. Allen, 1893, p. 81); 5 1/2 mi. N and 1 1/2 mi. W of Waterflow, Sec. 12, T 30 N, R 16 W (1); Fruitland (Goldman, 1933, p. 472); near Pine River, Sec. 20, T 31 N, R 7 W (4).

- Neotoma cinerea (Ord)
Bushy-tailed Wood Rat

Bailey (1931, p.191) reports the bushy-tailed wood rat from Farmington; from Shiprock, west of the study area; and from Chaco Canyon, to the south. He gives its habitat as open desert-valley country, usually in sandstone cliffs and ledges in the upper Sonoran life-zone.

In contrast to the above subspecies, N. c. arizonae, N. c. orolestes dwells in the transition and Canadian Life-zones, in the mountainous regions of Colorado and New Mexico. Two specimens of this form were collected from the upper Piedra River. Considerable trapping in potential habitat within the Reservoir area failed to produce evidence of bushy-tailed rats there.

Thus, there appears to be a hiatus, within which lies the study area, between the geographic ranges of the two subspecies.

Localities: COLORADO: Archuleta Co.: near jct. Gordon Creek and Piedra River (2). NEW MEXICO: San Juan Co.: 18 mi. N and 1 mi. E of Farmington (Finley, 1958, p. 270); Fruitland (Goldman, 1910, p. 106); Farmington (Bailey, 1931, p. 191).

- Neotoma Say
and Ord Wood
Rats

Neotoma albigula, N. mexicana, N. stephensi, and N. cinerea occur in the study area. One of these, N. cinerea, is represented by two subspecies, N. c. orolestes in the extreme north and N. c. arizonae in the vicinity of Farmington.

The major portion of the study area appears to be within a hiatus in the range of N. cinerea. N. c. orolestes is known from the northern checkpoint at Gordon Creek, but not to the south; N. c. arizonae has been reported from Farmington, but not to the northeast. The areas are far different, with spruce and ponderosa pine-Douglas fir forests in the north, scattered pinyon-juniper in the south.

Of the other species, all have been taken in the vicinity of the junction of the San Juan and Pine Rivers at seemingly identical sites insofar as vegetation and physiographic features are concerned. Considering the ranges of each within the study area as a whole, N. mexicana extends to higher altitudes than does N. albigula, and N. stephensi is limited approximately to the pinyon-juniper zone.

- Microtus
pennsylvanicus (Ord)
Meadow Vole

The meadow vole occurs along the San Juan River south of the Junction Land

Form. Although it seems not to extend north beyond the neighborhood of Blanco on the San Juan, its range does extend up the valley of the Animas River north of Aztec.

During the period of investigation, no sign of this animal was found except in marshy areas that supported sedges, despite nearby fields of dense grasses and crops that would seem to provide equally good cover.

The northward distribution of this species would seem to be limited by the availability of marshy areas. At present, there are large gaps separating any sizeable areas of marshland or sloughs north of Blanco, on the San Juan, and north of Cedar Hill, on the Animas. The animal is not known from Colorado west of approximately the continental divide

Localities: NEW MEXICO: San Juan Co.: Laplata (Bailey, 1931, p. 203); Aztec (Bailey, 1931, p. 203); 5 1/2 mi. N of Aztec on state road 550 (1); Fruitland (Bailey, 1931, p. 203); Farmington (Bailey, 1931, p. 203); 4 mi. W of Bloomfield (1); 1 1/2 mi. W of Bloomfield (2); Blanco (1); San Juan River at Blanco (1).

- Microtus montanus (Peale)
Montane Vole

The habitat of Microtus montanus extends from the Canadian life-zone (Warren, 1942, p. 230) down through the ponderosa pine-Douglas fir zone into thick grasses, irrigated croplands, and riparian growth within the pinyon-juniper zone. It requires very thick cover, usually in the form of dense grass. In most of the study area, this means it is limited mainly to stream borders and marshy areas. South of Sambrito Creek, on the San Juan, such habitat is greatly restricted or absent.

Localities: COLORADO: La Plata Co.: Florida (Warren, 1942, p. 230);

Allison (2). Archuleta Co.: 2 mi. E and 1/2 mi. N of Chimney Rock (7); 1 1/4 mi. E and 1 mi. S of Chimney Rock (4); NE 1/4 of SW 1/4 Sec. 17, T 32 N, R 4 W (1); NE 1/4 Sec. 23, T 32 N, R 6 W (2). NEW MEXICO: San Juan Co.: E 1/2 of NW 1/4 Sec. 10, T 32 N, R 6 W (2); Sambrito Creek, S 1/2 Sec. 15, T 32 N, R 6 W (2).

- Microtus longicaudus (Merriam)
Long-tailed Vole

The long-tailed vole occurs south to the lower border of the ponderosa pine-Douglas fir forest. At the lower limits, it was found in dense riparian habitat. Elsewhere, it seems to prefer the more open shrubbery along wash edges and debris within the ponderosa pine-Douglas fir zone.

Localities: COLORADO: Archuleta Co.: Deep Canyon, 4 mi. S and 1/2 mi. W of Chimney Rock (24); Stollsteimer Creek near mouth of Deep Canyon (1); 1 1/4 mi. E and 1 mi. S of Chimney Rock (1); NE 1/4 of SE 1/4 Sec. 18, T 32 N, R 4 W (1).

- Microtus Schrank
Meadow Voles

Three species of Microtus occur within the study area, M. pennsylvanicus in the south, and M. montanus and M. longicaudus in the north.

Microtus pennsylvanicus at present is limited rather strictly to mesic areas of sedges and, perhaps, other thick, low vegetation along watercourses; it seems unable to bypass even relatively short distances lacking such habitat.

Microtus montanus and M. longicaudus are sympatric over much of their ranges in the study area. In general, M. montanus occurs most often in areas of

low, thick vegetation, while M. longicaudus tends to inhabit more open areas. Although M. longicaudus may inhabit generally more xeric habitats than M. montanus, it does not extend as far south as the latter. This well may be a result of the relationships of vegetative covers south of the range of M. longicaudus where, though dense cover is available in the immediate vicinity of streams and in irrigated croplands, away from such areas the vegetative cover becomes extremely scanty with little or no transition. Thus dense cover ideal for M. montanus is available, but surrounding cover is insufficient for M. longicaudus.

- Ondatra zibethicus (Linnaeus)
Muskrat

Muskrats occur in the irrigated regions and in marshy places near the permanent streams of the study area. Burrows and feeding stations were seen in a number of instances.

All specimens are of skulls or carcasses picked up in the field. Some may not represent places of live occurrence. For example, the specimen from one mile east and nine miles south of Bloomfield was found several miles from the nearest permanent water.

Localities: COLORADO: La Plata Co.: Allison (1). NEW MEXICO: San Juan Co.: Sambrito Creek, S 1/2 Sec. 15, T 32 N, R 6 W (1); Farmington (Bailey, 1931, p. 207); Blanco (Bailey, 1931, p. 208); 1 mi. E and 9 mi. S of Bloomfield (1).

- Mus musculus Linnaeus
House Mouse

House mice were found in marshy areas along the permanent streams of the study area, mainly near farms, but also in weedy situations.

Localities: COLORADO: La Plata Co.: Allison, E 1/2 NW 1/4 Sec. 15, T 32 N, R 6 W (8). NEW MEXICO: San Juan Co.: Pine River Canyon, Sec. 20, T 31 N, R 7 W (1); extreme NW 1/4 of NW 1/4 Sec. 9, T 32 N, R 6 W (1); Pine River, SW 1/4 Sec. 8, T 30 N, R 7 W (1); 1 1/2 mi. W of Bloomfield (1); Bloomfield (1); Blanco (1).

- Zapus princeps J.A. Allen
Western Jumping Mouse

A single specimen was taken in a dense mixture of grasses and willows at the edge of a small stream within the pinyon-juniper zone. Sagebrush and greasewood are found on the immediate borders of the small valley. The stream is fed largely by runoff from irrigation and probably was very small or impermanent before irrigation.

The Utah Ecological Researches crew trapped several specimens in similar habitat in the same general area (S.D. Durrant, personal communication).

Localities: COLORADO: La Plata Co.: Florida (Warren, 1942, p. 242). Archuleta Co.: NW 1/4 Sec. 23, T 32 N, R 6 W (1).

- Erethizon dorsatum (Linnaeus)
Porcupine

The porcupine is widespread and rather common as far south as the southern rim of the Junction Land Form. It occurs also in the Blanco Land Form. Either the animal or definite signs of its presence were observed in spruce forest, ponderosa pine-Douglas fir forest, relict conifer stands, pinyon-juniper, cropland, and riparian habitats. It may be most common in the pinyon-juniper zone.

Localities: COLORADO: La Plata Co.: Allison (1). Archuleta Co.: Gordon Creek near jct. with Piedra River (1). NEW MEXICO: San Juan Co.: Laplata (J.A.Allen, 1893, p. 70); Fruitland (Bailey, 1931, p. 224) ; Farmington (Bailey, 1931, p. 224); extreme SW corner Sec. 14, T 32 N, R 6 W (1); 4 mi. S and 1/2 mi. E of Allison (1); near Pine River, Sec. 20, T 31 N, R 7 W (1); Pine River, NE 1/4 Sec. 7, T 30 N, R 7 W (1); San Juan River, NW 1/4 Sec. 8, T 30 N, R 7 W (1); E 1/2 T 31 N, R 8 W(2); Blanco (Bailey, 1931, p. 224). Rio Arriba Co.: SE 1/4 of NW 1/4 Sec. 27, T 32 N, R 6 W (1).

- Canis
latrans Say
Coyote

Control measures have extirpated or greatly reduced the number of coyotes in many portions of the West. The Junction and Blanco Land Forms within the study area would seem to fall into this category. Coyotes are said to have been not uncommon in earlier days, but none was seen nor heard during the period of investigation north of the San Juan River.

South of the San Juan, the coyote still is present despite control measures. One animal was found dead, probably from poison, in the grasslands.

Localities: NEW MEXICO: San Juan Co.: Laplata (Bailey, 1931, p. 316); Barker's Canyon, 40 mi. S and a little W of Durango (Jackson, 1951, p. 302); Fruitland (Bailey, 1931, p. 318); Dulce (Bailey, 1931, p. 319); Blanco (Bailey, 1931, p.319); Canyon Blanco (Bailey, 1931, p. 319); 7 mi. S and 6 mi. W of Bloomfield, Sec. 4, T 27 N, R 12 W (1); Largo (Bailey, 1931, p. 319).

- Canis lupus
Linnaeus Gray
Wolf

The wolf is not known to exist at present within the study area. In the past,

it probably ranged over the entire region at times.

Localities: NEW MEXICO: San Juan Co.: Laplata (Goldman, 1944, p. 463). Rio Arriba Co.: 35 to 45 mi. SW of Dulce (Goldman, 1944, p. 463).

- Vulpes fulva
(Desmaret) Red
Fox

Although commonly considered a montane form in the Southwest (Bailey, 1931; Warren, 1942), this fox also enters at least the pinyon-juniper zone in northwestern New Mexico. Records given by Bailey and a specimen in the University of New Mexico Collection of Vertebrates indicate a distribution along the San Juan River and in the broken mesa country to the east.

Localities: NEW MEXICO: San Juan Co.: Shiprock (Bailey, 1931, p. 297); Fruitland (Bailey, 1931, p. 297); Liberty (Bailey, 1931, p. 297); Farmington (Bailey, 1931, p. 297); Canyon Largo, 5 mi. SE of Blanco (1).

- Vulpes macrotis
Merriam Kit Fox

The kit fox occurs in the country south of the Junction Land Form. Bailey (1931, p. 298) reports unsubstantiated accounts of this fox from Shiprock and from near Fruitland. The author has specimens from the grasslands south of the San Juan and has seen it in the Gallegos Canyon region. A rancher from the latter area reports it as the commonest carnivore of the area.

Localities: NEW MEXICO: San Juan Co.: 11 mi. E and 13 mi. S of Farmington (1); 16 mi. S and 1 mi. W of Farmington, Sec. 17, T 26 N, R 13 W (1).

- Urocyon cinereoargenteus (Schreber)
Gray Fox

The gray fox is common in the Junction Land Form of the study area. It has been seen in the lower portions of the ponderosa pine-Douglas fir zone, in the croplands surrounding Allison, and throughout the pinyon-juniper zone in broken country. It may well occur in rough country south of the San Juan, although no records are available.

Localities: COLORADO: Archuleta Co.: Sambrito Creek near Allison (1). NEW MEXICO: San Juan Co.: Blanco (Bailey, 1931, p. 302). Rio Arriba Co.: San Juan River, Sec. 8, T 30 N, R 7 W (1).

- Ursus americanus
Pallas Black Bear

Black bear were neither seen nor reported as present within the study area. Inhabitants did report, however, that they occurred there in the past. It is not unlikely that some still live in or visit the region, at least in the north. South of the Junction Land Form, any occupancy in the past probably was sporadic.

- Ursus horribilis
Ord Grizzly Bear

There seems to be no record of this species, present or past, from the study area. However, in view of the wide ranging of individuals and of records of their presence in nearby highlands in the past, it appears likely that occasional individuals entered the region.

Localities: COLORADO: Archuleta Co.: Navajo Mtn., near Chromo (Warren, 1942, p. 38).

- Bassariscus astutus (Lichtenstein)
Ringtail

No records of the ringtail are available for the San Juan Basin in New Mexico, though it occurs in southwestern Colorado, west and north of the study area.

A small ring-tailed animal was seen crossing a dirt road near the junction of the San Juan and Pine Rivers, in San Juan Co. It was probably of this species, but as it was seen only fleetingly by car headlight, the possibility of its having been a young raccoon cannot be overruled.

If this animal does occur in the study area, it may be expected about the canyons and rocky areas in the pinyon-juniper of the Junction and Blanco Land Forms.

- Procyon lotor
(Linnaeus) Raccoon

Raccoons were present along the permanent watercourses of the study area, particularly where cliffs and rock debris afford shelter. Although not observed, they may occur far up the Piedra, Pine, and San Juan Rivers north of the study area.

Localities: NEW MEXICO: San Juan Co.: Pine River, NE 1/4 of NE 1/4 Sec. 18, T 32 N, R 7 W (1); San Juan River Valley (Bailey, 1931, p. 348).

- Mustela frenata
Lichtenstein Long-tailed Weasel

An individual was found dead on a road amidst croplands near the junction of the ponderosa pine-Douglas fir zone with the pinyon-juniper zone. Bailey's records, which are not backed up by specimens, indicate distribution through at least the major river valleys of the region.

Localities: COLORADO: La Plata Co.: 2 mi. N of Ignacio (1). NEW MEXICO: San Juan Co.: Fruitland (Bailey, 1931, p. 328); Liberty (Bailey, 1931, p. 328); near Farmington (Bailey, 1931, p. 328).

- Mustela vison
Schreber Mink

The mink probably occurs, at least in small numbers, along all the permanent streams of the study area. A single lower jaw was picked up in a pack rat nest; otherwise, no evidence was found. Bailey's records apparently are based mainly on reports.

Localities: COLORADO: Archuleta Co.: Gordon Creek near jct. with Piedra River (1). NEW MEXICO: San Juan Co.: vicinity of Laplata (Bailey, 1931, p. 325); Animas and San Juan Rivers near Farmington (Bailey, 1931, p. 325); Liberty (Bailey, 1931, p. 325); Fruitland (Bailey, 1931, p. 325).

- Taxidea taxus
(Schreber) Badger

Badgers were found within the pinyon-juniper zone of the Junction Land Form and are probably common throughout the study area.

Localities: COLORADO: La Plata Co.: Allison (1). Archuleta Co.: NE of Chromo (Warren, 1942, p. 85). NEW MEXICO: San Juan Co.: San Juan River, NW 1/4 of SE 1/4 Sec. 22, T 32 N, R 6 W (1); Pine River, SE 1/4 of NE 1/4 Sec. 18, T 31 N, R 7 W (1); Lucero Ranch, W side of Pine River (1); throughout San Juan Valley (of New Mexico) (Bailey, 1931, p. 345).

- Spilogale putorius
(Linnaeus) Spotted Skunk

This small skunk was seen in open ponderosa pine forest two miles east and

one mile north of Juanita, Archuleta Co., Colo. One specimen was trapped among rocks within the pinyon-juniper zone in New Mexico.

Warren (1942, p. 77) states that they "do not go above the Transition zone, 8,000 feet being about the limit in Colorado."

Localities: COLORADO: La Plata Co.: Bondad (Van Gelder, 1959, p. 288). NEW MEXICO: San Juan Co.: Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (1).

- Mephitis mephitis
(Schreber) Striped Skunk

Striped skunks are common in river valleys, mountain forests, and cultivated lands from the upper Piedra River in the north to the southern edge of the Junction Land Form; Bailey reports them from several places in the San Juan Valley south of this area. They were not found in sagebrush or grassland habitats, but may occur there.

Localities: COLORADO: La Plata Co.: Allison, E 1/2 of NW 1/4 Sec. 15, T 32 N, R 6 W (1). Archuleta Co.: Gordon Creek near jct. with Piedra River (1); Deep Canyon, 4 mi. S and 1/2 mi. W of Chimney Rock (1); mouth of Sandoval Canyon (1). NEW MEXICO: San Juan Co.: Sambrito Creek, S 1/2 Sec. 15, T 32 N, R 6 W (2); Pine River, SW 1/4 Sec. 8, T 30 N, R 7 W (1); Pine River, NW 1/4 Sec. 7, T 30 N, R 7 W (1); Fruitland (Bailey, 1931, p. 332); Blanco (Bailey, 1931, p. 333).

- Felis concolor Kerr
Mountain Lion

The only indication that the mountain lion presently enters the study area is a second hand report of a fight between two of these animals near the junction of the San Juan and Pine Rivers. It is likely that

most of the country as far as the southern edge of the Junction Land Form is visited by this big cat on occasion.

About the third week of September, 1962, F. W. Eddy and Beth L. Dickey saw the carcass of an old male lion shot the same day by Mrs. Ethridge, of Allison, Colo. (F.W.Eddy, personal communication, Jan. 1963). Skull and skin were to be turned over to the Colorado Fish and Game Department for bounty. The locality was in Sec. 6, T 32 N, R 5 W, Archuleta Co., Colo.

- Lynx rufus (Schreber) Bobcat

Evidences of bobcats were found in the upper Piedra River spruce forest, in ponderosa pine-Douglas fir forest, and within the pinyon-juniper zone. Bailey records them from the San Juan Valley south of the Junction Land Form. They may be expected anywhere north of the San Juan River and in areas of rough topography to the south.

Localities: COLORADO: Archuleta Co.: Gordon Creek near jct. with Piedra River (1); near mouth of Archuleta Canyon (1); Villareal Canyon, about 3 mi. SE of Juanita (1). NEW MEXICO: San Juan Co.: Fruitland (Bailey, 1931, p. 291). Rio Arriba Co.: Dulce (Bailey, 1931, p. 294).

- Cervus canadensis Erxleben
Wapiti

The wapiti, or elk, has been observed along Stollsteimer Creek near the mouth of Archuleta Canyon. J. Sands, of the New Mexico Department of Game and Fish, says that sightings of this animal have been made on Carracas Mesa, in the vicinity of the Colorado-New Mexico state line just east of the Reservoir area.

The University of New Mexico Collection of Vertebrates includes an antler

from the alluvium of an arroyo cut in Bancos Canyon, T 31 N, R 4 W, Rio Arriba Co., New Mexico. However, there is a possibility that this specimen is of Pleistocene, rather than Recent, age.

- Odocoileus hemionus (Rafinesque)
Mule Deer

The mule deer was observed throughout the study area to the southern edge of the Junction Land Form, but not south of that region.

The mule deer may be found in riparian growth and croplands along permanent streams and also in ponderosa pine-Douglas fir forest and pinyon-juniper far from any permanent water.

- Antilocapra americana (Ord)
Pronghorn

At one time, the pronghorn apparently was plentiful in the grasslands of northwestern New Mexico; at present, they are almost absent. It is doubtful if the species occurs north of the Blanco Land Form. It was not observed within the study area during the period of investigation, but small numbers are reported from the grasslands south of the San Juan.

One pronghorn has been observed in the Reservoir area (F.W.Eddy, personal communication, Jan., 1963). The animal was seen several times from 1 June to 8 June 1962 on large sagebrush flats. That such occurrences are unusual was shown by the surprise of local workmen. It was first seen in the SE 1/4 Sec. 16, T 32 N, R 6 W; it was later sighted in the SW 1/4 Sec. 22, T 32 N, R 6 W.

- Ammotragus lervia Pallas
Barbary Sheep

This North African bovid has been introduced in recent years into the Largo Canyon region east of the study area.

DISCUSSION

A vast biological change occurs between the northern checkpoint and the southern edge of the study area. At Gordon Creek, the northern checkpoint, there is a well-watered forested area subject to heavy snows and frequent sub-zero temperatures in winter, frequent showers and relatively cool temperatures in summer. The growing season is brief. To find these general moisture and temperature conditions at sea level, a journey of many hundred miles to the north would be required.

In the south, the growing season is long, but precipitation is scanty. Hot days and rather cool nights in summer, cold temperatures in winter, are the general rule. A treeless expanse, frequently lacking significant vegetative cover, is the result.

Between these two extremes lies an intermediate area where, in general, change in climate is quite gradual. The biota, governed in part by the climate, also changes rather gradually, allowing a finer distinction of distributional differences and, to some degree, ecological tolerances, than would be the case were the climatic changes more abrupt. Perhaps unfortunately, the land changes somewhat more abruptly than the climate. The sudden changes in elevation and topography wrought by the Junction Land Form and, to a lesser degree, the Blanco Land Form, serve to make more difficult the interpretation of climatic effects upon the biota--but at the same time, allow study of the effects of this portion of the environment upon organisms.

Because of the changes in climate and physiography and probably also because

of interspecific relationships of the organisms, a large number of life forms are unable to span the area from the upper Sonoran grasslands of the south to the boreal forests and meadows of the north. Taking into consideration only those organisms for which there is reasonable knowledge of distribution and ecological tolerances, it may be seen that in a transect from the area of the upper Piedra River to the grasslands in the vicinity of Gallegos Canyon, some twenty species appear in the more northerly areas but are absent in the extreme south; some twenty-nine species appear somewhere within the southern portions but are absent in the extreme north (Gordon Creek area). Four species seem absent both in the north and in the south, but occur between these two extremes. Some of these relationships are shown in Figures 9, 10, and 11. One species, represented by two nominal sub-species, is present in the north and south, but has not been found in the central portion of the study area.

Eight groups in which the members possess approximately common range limitations within such a transect may be tentatively delineated. A ninth group spans the area. Composition of these groups is given in Figure 12.

The factors affecting the composition of the various groups cannot be sorted out with any great degree of accuracy at present, but possible explanations have been advanced for individual species in some cases in the specific or generic accounts. In some groups, part or all of the organisms concerned probably have a common background, having evolved to fit a similar set of circumstances (for example, the

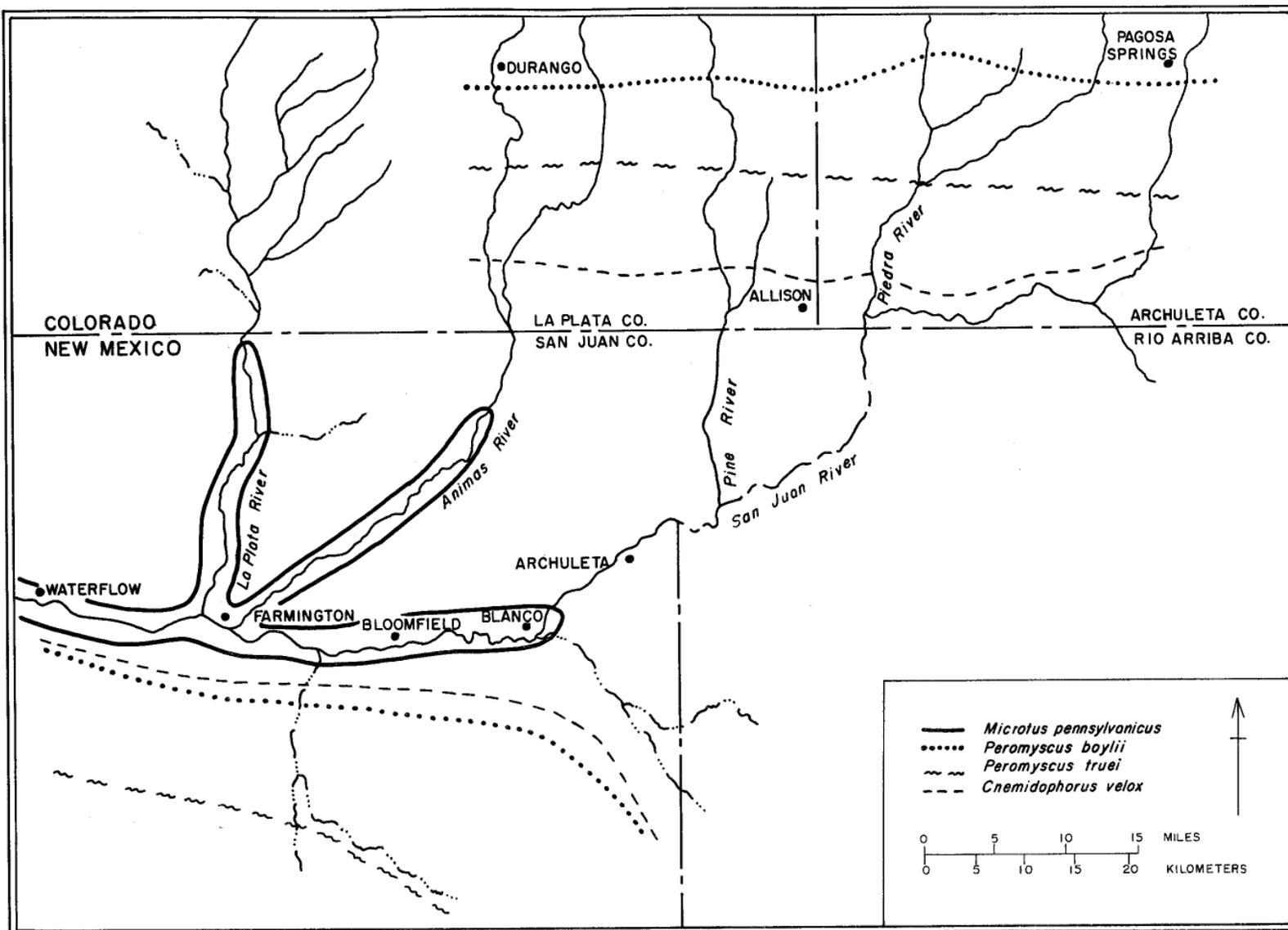


Fig. 11. Approximate distributions of member species of Group IX.

total geographical ranges of the members of Group V would seem to indicate similar origins). In other cases, similar environmental requirements appear to limit creatures of widely separate histories (as, for example, Neotoma mexicana and Eutamias quadrivittatus of Group IV—probably limited because of cover requirements). In yet other cases, competition may prevent extensions of an animal's range into an area where it is otherwise physically able to

exist (thus Sceloporus graciosus may be prevented from entering portions of the Junction Land Form because of the presence of S. undulatus). These and other possible conditions account for the pattern of distribution within the study area—it will be many years, however, before sufficient data are available to explain adequately the principle factors causing each species to form its pattern of distribution.

Fig. 12. List of species composing nine groups of associated animals.

Group I. - Limits not within transect.			
<i>Ambystoma tigrinum</i>	<i>Rana pipiens</i>	<i>Reithrodontomys megalotis</i>	<i>Taxidea taxus</i>
<i>Bufo woodhousei</i>	<i>Thamnophis elegans</i>	<i>Peromyscus maniculatus</i>	<i>Mephitis mephitis</i>
Group II. - Southern limits within transition life-zone.			
<i>Bufo boreas</i>	<i>Eutamias minimus</i>	<i>Citellus lateralis</i>	
<i>Sorex vagrans</i>	<i>Thomomys talpoides</i>	<i>Neotoma cinerea orolestes</i>	
Group III. - Southern limits near northern edge Junction Land Form.			
<i>Lampropeltis doliata</i>	<i>Marmota flaviventris</i>	<i>Microtus longicaudus</i>	<i>Cervus canadensis</i>
<i>Sylvilagus nuttalli</i>	<i>Microtus montanus</i>	<i>Zapus princeps</i>	
Group IV. - Southern limits near southern edge Blanco Land Form.			
<i>Pseudacris nigrita</i>	<i>Citellus variegatus</i>	<i>Neotoma mexicana</i>	<i>Erethizon dorsatum</i>
<i>Eutamias quadrivittatus</i>	<i>Castor canadensis</i>	<i>Ondatra zibethicus</i>	<i>Urocyon cinereoargenteus</i>
Group V. - Northern limits south of the San Juan River.			
<i>Holbrookia maculata</i>	<i>Cnemidophorus inornatus</i>	<i>Arizona elegans</i>	<i>Citellus spilosoma</i>
Group VI. - Northern limits within Blanco Land Form.			
<i>Uta stansburiana</i>	<i>Citellus leucurus</i>	<i>Dipodomys ordi</i>	<i>Neotoma cinerea arizonae</i>
<i>Cnemidophorus tigris</i>	<i>Perognathus flavus</i>	<i>Dipodomys spectabilis</i>	<i>Vulpes macrotis</i>
			<i>Antilocapra americana</i>
Group VII. - Northern limits near north edge of Junction Land Form.			
<i>Crotaphytus collaris</i>	<i>Masticophis taeniatus</i>	<i>Sylvilagus auduboni</i>	<i>Peromyscus crinitus</i>
<i>Sceloporus graciosus</i>	<i>Pipistrellus hesperus</i>	<i>Perognathus apache</i>	<i>Onychomys leucogaster</i>
			<i>Neotoma stephensi</i>
Group VIII. - Northern limits in northern portion of Arboles Land Form or north of main study area.			
<i>Sceloporus undulatus</i>	<i>Thamnophis cyrtopsis.</i>	<i>Antrozous pallidus</i>	<i>Thomomys bottae</i>
<i>Phrynosoma douglassi</i>	<i>Crotalus viridis</i>	<i>Lepus californicus</i>	<i>Neotoma albigula</i>
Group IX. - Northern and southern limits within transect.			
<i>Cnemidophorus velox</i>	<i>Peromyscus boylii</i>	<i>Peromyscus truei</i>	<i>Microtus pennsylvanicus</i>

THE FISHES OF THE NAVAJO RESERVOIR DISTRICT

by WILLIAM J. KOSTER

The following list is based upon an examination of over 3, 100 specimens captured during 1959, 1960, and 1961. Fish were taken by seine, electric shocker, gill net, fry net, hook and line, and rotenone. The last was used as a part of a fish-management program designed to remove, by thorough poisoning, the "rough" fish prior to stocking the new lake with game species. Collections were made at various points in the San Juan and Pine Rivers from the Colorado-New Mexico Boundary down to the dam site, as well as in the only small stream in the impoundment area, Sambrito Creek. The following individuals in one way or another aided in securing specimens: D. Davies, A. E. Dittert, Jr., A. H. Harris, J. McClelland, D. Martin, H. Olson, and M. Seibel. Their aid is gratefully acknowledged.

A total of fourteen species, six native and eight introduced, was found in the area. The native species include: the speckled dace, Rhinichthys osculus (Girard); the bonytail, Gila robusta Baird and Girard; the Colorado squawfish, Ptychocheilus lucius Girard; the flannelmouth sucker, Catostomus latipinnis Baird and Girard; the blue-head sucker, Pantosteus delphinus (Cope); and the mottled sculpin, Cottus bairdi Girard. Most of these species were common and distributed throughout the area. The squawfish was the exception. Only six specimens were taken and all were from the San Juan proper. The introduced species include: the brown trout, Salmo trutta Lin-

naeus; the carp, Cyprinus carpio Linnaeus; the fathead minnow, Pimephales promelas Rafinesque; the white sucker, Catostomus commersoni (Lacepee); the channel catfish, Ictalurus punctatus (Rafinesque); the blue catfish, Ictalurus melas (Rafinesque); and the bluegill, Lepomis macrochirus Rafinesque. Two hybrid combinations were also found. One sucker was interpreted as a hybrid between Catostomus commersoni and Pantosteus delphinus and another as a cross between Catostomus latipinnis and Pantosteus delphinus. With the exception of the blue catfish, which was observed among a catch of channel catfish taken by a fisherman, specimens of the above are preserved at the University of New Mexico.

In a discussion of the possibility of using such fish remains as might be found in archaeological ruins as clues to past conditions in the region, Koster (1961) listed ten species known to occur natively in the upper Colorado River Basin. Of these ten, eight might reasonably have been expected in the Navajo Reservoir District on geographic ground. Six actually were found, and it is possible that two species, the cutthroat trout, Salmo clarki Richardson, and the humpback sucker, Xyrauchen texanus (Abbott), were present and missed. The discovery in the Pine River of the brown trout, a taxonomic and ecologic cognate of the cutthroat suggests that conditions in the Pine River at least, are not far from being suitable for cutthroats. Since tributary streams a short distance to the north are

inhabited by trout and the cutthroat is the native trout of the area, it is conceivable that, particularly in winter, a few cutthroat might work into the area. There are, however, no records or reports of cutthroats ever having been taken within the impoundment area. The presence of the humpback sucker is suggested by an angler's report of the occasional capture of a "humpie", a humpbacked fish. Because this was the only species reported but not taken, crew members of the New Mexico State Game and Fish Department who aided in the pre-impoundment poisoning of the area were urged to be on a special look-out for "humpies." They found none.

At present, despite the existence of a few brown trout in the Pine River, all the waters in the impoundment area would be classified by fisheries' biologists as non-trout waters. Existing conditions, however, are so close to those tolerated by trout that if trout remains should be found in the archaeological sites, it would

be rash to conclude that there had been a major change in the ecology of the area. Other than the introduced competitors, the chief hindrance to trout appears to be temperature. The presence of trout in the Pine River and the persistence into July of temperatures low enough for trout in the San Juan River just above its confluence with the Pine indicate that a relatively slight change in regional temperature would permit trout to survive throughout the area. Indeed, it is possible that some trout were able to exist throughout the impoundment area before the activities of white man modified the streams. The reduction of stream cover by cutting and grazing and the reduction of stream flow by diverting water for irrigation have undoubtedly resulted in an elevation of the stream temperatures. Conversely, just as only a minor change in temperature would be required to permit trout to persist over the entire area, so a relatively minor shift in the opposite direction would completely eliminate them.

APPENDIX B

BIRDS NOTED IN THE NAVAJO RESERVOIR DISTRICT

by DAVID M. NILES

Parts of the period from July 21 to August 24, 1961 were spent near or within the projected empoundment area of the Navajo Reservoir, and a record was kept of all birds seen. The following list presents the locality, date and noted habitat of all birds recorded, and supplements previous work done in the area (Dittert, *et al*, 1961, pp. 31-32; White and Behle, 1961).

Information on the breeding status of a species in the area can be found in White and Behle (1961) for all but four of the birds listed here. Sharp-shinned hawks and Marsh Hawks are probably permanent residents; MacGillivray's Warblers and Wilson's Warblers are probably transients. Other than marking records involving immature birds with an asterisk, I have made no further attempt to separate probable resident and transient species.

For precise localities of Laboratory of Anthropology (LA) sites readers are referred to Dittert, *et al* (*op cit.*).

Nycticorax nycticorax (Linnaeus)
Black-crowned Night Heron

*Near Allison, Aug. 10, marshy stream surrounded by farmland.

Anas platyrhynchos Linnaeus
Mallard

Approx. 1/2 mi. NE of Allison, Aug. 10, small stream in farmland.

Cathartes aura (Linnaeus)
Turkey Vulture

Near Ignacio, July 23, farmland; rim of Pine River Canyon above LA 4269, Aug. 14, pinyon-juniper woodland; LA 4380, Aug. 18, big sage and cottonwoods along river, pinyon-juniper on nearby slopes.

Accipiter striatus Vieillot
Sharp-shinned Hawk

Pine River at LA 4269, Aug. 11, riparian woodland.

Buteo jamaicensis (Gmelin)
Red-tailed Hawk

Approx. 1 mi. NW of Allison, Aug. 21, farmland; T 27 N, R 11 W, San Juan Co., N.M., Aug. 24, big sage.

Aquila chrysaetos (Linnaeus)
Golden Eagle

*Approx. 1 mi. N of Allison, Aug. 17, mixed farmland and pinyon-juniper.

Circus cyaneus (Linnaeus)
Marsh Hawk

Near Ignacio, Aug. 23, farmland.

Falco sparverius Linnaeus
Sparrow Hawk

Near Allison, July 23, Aug. 10, farmland; approx. 1 mi. N of Allison, Aug. 21, mixed farmland and pinyon-juniper woodland.

Callipepla squamata (Vigors)
Scaled Quail

*T 27 N, R 11 W, San Juan Co., N.M.,
Aug. 24, big sage.

Rallus limicola Vieillot
Virginia Rail

*Approx. 1 mi. NW of Allison, Aug. 21,
small cattail choked stream in farmland.

Charadrius vociferus Linnaeus
Killdeer

Allison, Aug. 10, 'muddy margin of a
brush and cattail lined stream in farmland.

Actitis macularia (Linnaeus)
Spotter Sandpiper

Pine River at LA 4269, Aug. 14, sandy
river margin; LA 4380, Aug. 18, river mar-
gin.

Zenaidura macroura (Linnaeus)
Mourning Dove

Allison, July 23, Aug. 10, farmland; T
27 N, R 11 W, San Juan Co., N.M., July 23,
Aug. 2, 23, steeply cut washes, sparse
juniper; rim of Pine River Canyon above LA
4269, Aug. 14, pinyon-juniper.

Bubo virginianus (Gmelin)
Great Horned Owl

T 27 N, R 11 W, San Juan Co., N.M.,
July 24, steeply cut wash, sparse juniper;
Pine River at LA 4269, Aug. 14, riparian
woodland.

Chordeiles minor (Forster)
Common Nighthawk

T 27 N, R 11 W, San Juan Co., N.M.,
July 24, Aug. 2, steeply cut washes, sparse
juniper; Allison, Aug. 16, 23, farmland.

Selasphorus platycercus (Swains on)
Broad-tailed Hummingbird

T 27 N, R 11 W, San Juan Co., N.M.,
July 24, mixed juniper-big sage.

Selasphorus rufus (Gmelin)
Rufous Hummingbird

LA 4380, Aug. 18, mixed big sage and
riparian woodland.

Megaceryle alcyon (Linnaeus)
Belted Kingfisher

Allison, Aug. 10, brush lined stream;
Piedra River near Arboles, Aug. 22, riparian
woodland.

Colaptes cafer (Gmelin)
Red-shafted Flicker

Allison, Aug. 10, 16, riparian thickets,
pinyon-juniper and farmland; Pine River at
LA 4269, Aug. 11, riparian woodland; LA
4380, Aug. 18, pinyon-juniper and riparian
woodland.

Asyndesmus lewis (Gray)
Lewis' Woodpecker

Piedra River near Arboles, Aug. 9,
22, riparian woodland.

Dendrocopos villosus (Linnaeus)
Hairy Woodpecker

Allison, Aug. 10, telephone pole in
farmland; Pine River at LA 4269, Aug. 14,
riparian woodland; T 27 N, R 11 W, San
Juan Co., N.M., Aug. 23, mixed juniper-
big sage.

Dendrocopos pubescens (Linnaeus)
Downy Woodpecker

Allison, Aug. 17, cottonwoods border-
ing field.

Tyrannus verticalis Say
Western Kingbird

Allison, July 21, deciduous trees in town; Piedra River near Arboles, Aug. 22, riparian woodland.

Myiarchus cinerascens (Lawrence)
Ash-throated Flycatcher

T 27 N, R 11 W, San Juan Co., N.M., July 24, steeply cut wash, sparse juniper.

Sayornis saya (Bonaparte)
Say's Phoebe

Allison, Aug. 10, farmland; LA 4380, Aug. 18, riparian woodland.

Contopus sordidulus Sclater
Western Wood Pewee

Pine River at LA 4269, Aug. 14, riparian woodland; LA 4380, Aug. 18, riparian woodland.

Eremophila alpestris (Linnaeus)
Horned Lark

T 27 N, R 11 W, San Juan Co., N.M., July 24, Aug. 24, bare area in steeply cut wash and open areas among big sage.

Tachycineta thalassina (Swains on)
Violet-green Swallow

Near Ignacio, July 23, farmland; Allison, Aug. 10, 15, farmland; LA 4380, Aug. 18, over river; T 27 N, R 11 W, San Juan Co., N.M. Aug. 24, big sage and sparse juniper.

Stelgidopteryx ruficollis (Vieillot)
Rough-winged Swallow

Allison, Aug. 16, farmland; LA 4380, Aug. 18, over river.

Hirundo rustica Linnaeus
Barn Swallow

Near Ignacio, July 23, farmland; Piedra River near Arboles, Aug. 9, under bridge over river; Allison, Aug. 10, farmland, LA 4380, Aug. 18, over river.

Petrochelidon pyrrhonota (Vieillot)
Cliff Swallow

Piedra River near Arboles, Aug. 9, under bridge over river.

Aphelocoma coerulescens (Bosc)
Scrub Jay

Pine River at LA 4269, Aug. 11, riparian woodland; approx. 1 1/2 mi. N of Allison, Aug. 16, pinyon-juniper; LA 4380, Aug. 18, pinyon-juniper.

Pica pica (Linnaeus)
Black-billed Magpie

Allison, Aug. 10, farmland; Pine River at LA 4269, Aug. 14, pinyon-juniper; Piedra River near Arboles, Aug. 22, riparian woodland.

Corvus corax Linnaeus
Common Raven

T 27 N, R 11 W, San Juan Co., N.M., July 24, sparsely vegetated canyon; Pine River at LA 4269, Aug. 11, pinyon-juniper; LA 4380, Aug. 18, mudflats in river.

Gymnorhinus cyanocephala Wied
Pinyon Jay

Pine River at LA 4269, Aug. 11, pinyon-juniper; approx. 1 1/2 mi. N of Allison, Aug. 16, pinyon-juniper.

Parus atricapillus Linnaeus
Black-capped Chickadee

Pine River at LA 4269, Aug. 14, riparian woodland.

Parus inornatus Gambel
Plain Titmouse

Rim of Pine River Canyon above LA 4269, Aug. 14, pinyon-juniper; LA 4380, Aug. 18, pinyon-juniper.

Psaltriparus minimus (Townsend)
Common Bushtit

Rim of Pine River Canyon, above LA 4269, Aug. 14, pinyon-juniper; LA 4380, Aug. 18, pinyon-juniper.

Sitta carolinensis Latham
White-breasted Nuthatch

Allison, July 21, deciduous trees in town; Rim of Pine River Canyon above LA 4269, Aug. 14, pinyon-juniper; 1 1/2 mi. N of Allison, Aug. 16, pinyon-juniper.

Troglodytes aedon Vieillot
House Wren

Pine River at LA 4269, Aug. 11, brushy under story of riparian woodland; approx. 1 mi. N of Allison, Aug. 21, streamside vegetation in mixed pinyon-juniper, farmland.

Catherpes mexicanus (Swainson)
Canyon Wren

Pine River at LA 4269, Aug. 11, rocky slope in pinyon-juniper.

Salpinctes obsoletus (Say)
Rock Wren

T 27 N, R 11 W, San Juan Co., N.M., July 23, Aug. 23, sparsely vegetated washes, some juniper; Pine River at LA 4269, Aug. 11, rocky slope in pinyon-juniper.

Mimus polyglottos (Linnaeus)
Mockingbird

Allison Aug 10 riparian thickets

Turdus migratorius Linnaeus
Robin

Allison, July 21, Aug. 10, deciduous trees, riparian thickets, pinyon-juniper; Pine River at LA 4269, Aug. 11, 14, riparian woodland.

Sialia mexicana Swains on
Western Bluebird

Allison, July 21, Aug. 16, deciduous trees in town, farmland; *Pine River at LA 4269, Aug. 14, riparian woodland; LA 4380, Aug. 18, riparian woodland.

Sialia currucoides (Bechstein)
Mountain Bluebird

Allison, Aug. 10, farmland.

Polioptila caerulea (Linnaeus)
Blue-gray Gnatcatcher

Pine River at LA 4269, Aug. 11, 14, brush underneath cottonwoods; LA 4380, Aug. 18, riparian woodland and big sage; T 27 N, R 11 W, San Juan Co., N.M., Aug. 23, mixed juniper and big sage.

Lanius ludovicianus Linnaeus
Loggerhead Shrike

T 27 N, R 11 W, San Juan Co., N.M., July 24, mixed juniper and big sage.

Sturnus vulgaris Linnaeus
Starling

Allison, Aug. 15, trees in town.

Vermivora virginiae (Baird)
Virginia's Warbler

Pine River at LA 4269, Aug. 14, brushy understory of riparian woodland; T 27 N, R 11 W, San Juan Co., N.M., Aug. 23, mixed juniper and big sage.

Dendroica petechia (Linnaeus)
Yellow Warbler

Allison, July 21, Aug. 16, deciduous trees in town and low riparian vegetation; Pine River at LA 4269, Aug. 11, 14, brushy understory of riparian woodland; LA 4380, Aug. 18, riparian woodland.

Dendroica nigrescens (Townsend)
Black-throated Gray Warbler

Pine River at LA 4269, Aug. 14, brushy understory of riparian woodland and pinyon-juniper; T 27 N, R 11 W, San Juan Co., N.M., Aug. 24, mixed juniper and big sage.

Oporornis tolmiei (Townsend)
MacGillivray's Warbler

Pine River at LA 4269, Aug. 14, brushy understory of riparian woodland; T 27 N, R '11 W, San Juan Co., N.M., Aug. 23, mixed juniper and big sage.

Wilsonia pusilla (Wilson)
Wilson's Warbler

Pine River at LA 4269, Aug. 14, brushy understory of riparian woodland; Allison, Aug. 15, 16, 21, deciduous trees and low riparian vegetation.

Passer domesticus (Linnaeus)
House Sparrow

Allison, July 21- Aug. 21, farmyards and around dwellings.

Sturnella neglecta Audubon
Western Meadowlark

Near Ignacio, July 23, farmland; Allison, Aug. 10, farmland.

Xanthocephalus xanthocephalus (Bonaparte)
Yellow-headed Blackbird

Allison, Aug. 15, farmland.

Agelaius phoeniceus (Linnaeus)
Red Winged Blackbird

Near Ignacio, July 23, farmland and cattail marshes; Allison, Aug. 10, 15, 21, farmland and cattail marshes.

Icterus bullocki (Swains on)
Bullock's Oriole

Approx. 1 mi. N of Allison, Aug. 16, riparian growth and pinyon-juniper.

Euphagus cyanocephalus (Wagler)
Brewer's Blackbird

Near Ignacio, July 23, farmland; Allison, Aug. 10, 21, farmland.

Piranga ludoviciana (Wilson)
Western Tanager

Rim of Pine River Canyon above LA 4269, Aug. 14, pinyon-juniper.

Pheucticus melanocephalus (Swainson)
Black-headed Grosbeak

Allison, Aug. 10, farmland; approx. 1/2 mi. N of Allison, Aug. 21, riparian thickets.

Guiraca caerulea (Linnaeus)
Blue Grosbeak

Allison, Aug. 10, brush along small stream surrounded by farmland; approx. 1/2 mi. N of Allison, Aug. 21, riparian thickets.

Carpodacus mexicanus (Muller)
House Finch

T 27 N, R 11 W, San Juan Co., N.M., July 24, sparse juniper; LA 4380, Aug. 18, mixed big sage and riparian woodland.

Spinus pinus (Wilson)
Pine Siskin

Spinus tristis (Linnaeus)
American Goldfinch

Allison, Aug. 10, brush along road and small stream in farmland.

Spinus psaltria (Say)
Lesser Goldfinch

Allison, July 21, Aug. 10, 16, deciduous trees in town, brushy areas in farmland and riparian thickets.

Pipilo erythrophthalmus (Linnaeus)
Rufous-sided Towhee

*Pine River at LA 4269, Aug. 11, brushy understory in riparian woodland.

Pooecetes gramineus (Gmelin)
Vesper Sparrow

Allison, Aug. 10, brushy thickets along small stream.

Chondestes grammacus (Say)
Lark Sparrow

Allison, Aug. 15, brush on edge of field.

Amphispiza bilineata (Cassin)
Black-throated Sparrow

*T 27 N, R 11 W, San Juan Co., N.M., July 23, Aug. 2, sparse juniper in deeply cut washes, mixed juniper and big sage.

Spizella passerina (Bechstein)
Chipping Sparrow

*Allison, Aug. 10, 15, brushy areas beside road and mixed pinyon-juniper, big sage; rim of Pine River Canyon above LA 4269, Aug. 14, pinyon-juniper; approx. 1 mi. N of Allison, Aug. 16, 21, brushy areas along roads or streams.

Spizella breweri Cassin
Brewer's Sparrow

Allison, Aug. 10, brushy area beside road; T 27 N, R 11 W, San Juan Co., N.M., Aug. 24, big sage.

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LIST OF PREVIOUS NAVAJO PROJECT STUDIES

<u>Study Number</u>	<u>Publication</u>
1.	Dittert, A. E., Jr. 1958 <u>Preliminary Archaeological Investigations in the Navajo Project Area of Northwestern New Mexico.</u> Museum of New Mexico Papers in Anthropology, No. 1. The Museum of New Mexico and the School of American Research, Santa Fe.
2.	Dittert, A. E., Jr, J.J. Hester, and F. W. Eddy 1961 <u>An Archaeological Survey of the Navajo Reservoir District Northwestern New Mexico.</u> Monograph of the School of American Research and the Museum of New Mexico, No. 23, Santa Fe.
3.	Greninger, H.C. (assembler) 1961 <u>Papers from a Training Program in Salvage Archaeology.</u> Museum of New Mexico Papers in Anthropology, No. 3, Santa Fe.
4.	Eddy, F.W. 1961 <u>Excavations at Los Pinos Phase Sites in the Navajo Reservoir District.</u> Museum of New Mexico Papers in Anthropology, No. 4, Santa Fe.
5.	Hester, J.J. 1962 <u>Early Navajo Migrations and Acculturation in the Southwest.</u> Museum of New Mexico Papers in Anthropology, No. 6, Santa Fe.
6.	Schaafsma, P. 1963 <u>Rock Art in the Navajo Reservoir District.</u> Museum of New Mexico Papers in Anthropology, No. 7, Santa Fe.