BREEDING BIRDS
OF
ELEPHANT BUTTE MARSH

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NEW MEXICO ORNITHOLOGICAL
SOCIETY PUBLICATION NO. 5

— 1978 —

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INTRODUCTION

Elephant Butte Marsh is one of the few wetlands remaining in the Rio Grande Valley of New Mexico outside of the La Joya and Bosque del Apache refuges in Socorro County. This "marsh" supports an interesting, varied, and unique avifauna for New Mexico, and no complete summary of the breeding birds of the area has ever been published. In fact, it is only recently that riparian breeding avifaunas have been detailed in the state, and the present is one of the few studies from the Rio Grande Valley.

Like most surviving wetlands along the Rio Grande in New Mexico, habitats at Elephant Butte Marsh do not qualify as either undisturbed or fully native types. It is, however, one of the largest remaining wetlands in the Middle Valley and is the most important area in the state in terms of its extensive waterbird rookery.

Current plans of various governmental and quasi-governmental agencies indicate that modification of riparian habitats in the Valley will continue at least into the immediate future. At the same time, socio-political procedures have been established recently which increase the probability that impacts of environmental modification on faunal communities will be considered in planning processes. To provide a base-line for historical comparison and planning, this paper places on record the breeding birds of Elephant Butte Marsh and the immediately surrounding area. I have also compared the results of my study with two other recent studies of lowland riparian avifaunas in New Mexico, i.e. Hubbard (1971) in the Gila Valley in the southwest and Schmitt (1976) in the San Juan Valley in the northwest.

ACKNOWLEDGMENTS

I am indebted to the U. S. Bureau of Land Management and the New Mexico Department of Game and Fish for permission to work in the Elephant Butte Marsh Habitat Management Area. I am also grateful to the staff of the BLM Socorro District Office for continual assistance and encouragement, and to the Game and Fish Endangered Species Program for financial support during 1975.

I want to thank the following individuals who helped with field work or other aspects of this study: Craig Andrews, Jack Durham, Barbara Escher, Dan Finley III, Sol Hayhurst, Lynda Hundertmark, Charles Hyder, Robert Jost, Richard Rigby, Mary Alice Root, Warren Wagner, and Gary Zahm.

Larry Brin prepared vegetation maps of the marsh which were used in planning and assessing field work. Bruce Hayward, J. David Ligon, James Sands, and Ro Wauer provided critical readings of various drafts of this paper.

Finally, I am grateful to John Hubbard who offered guidance, encouragement, and editorial assistance at all stages of the study.

This paper incorporates and supercedes my preliminary report and progress reports to BLM and New Mexico Game and Fish Department.

LOCATION AND ORNITHOLOGICAL HISTORY

Elephant Butte Marsh is located in the floodplain of the Rio Grande, on the west side of the channel just north of the area known as the Narrows. It is in the northern part of Sierra County, New Mexico, lying primarily in Secs. 20 and 29, T.10S., R. 3W., but occupying portions of Secs. 16, 21, and 28 as well (Figure 1). It is within the upper basin of Elephant Butte Reservoir, although waters from there seldom back up into that area.

The marsh has only recently been isolated from the river channel, and the name Elephant Butte Marsh appears to be newly-applied to the area. Consequently, until rather recently there appear no specific references to the area in the literature. The broader area of Elephant Butte Reservoir, however, has received intermittent ornithological attention. From 1909 through 1947 the entire reservoir withdrawal area was also designated the Rio Grande Wildlife Refuge. U.S. Biological Survey and other personnel collected in the area and made observations in at least the 1930's and 1940's. S. E. Aldous and C. S. Williams collected cormorants on the lake in 1931 and 1932 (Mendall, 1936), and Monson (1946) recorded data on a number of species for both the Rio Grande and Bosque del Apache refuges.

When Bosque del Apache National Wildlife Refuge was established in 1931, the Rio Grande Wildlife Refuge was managed jointly with it. From 1940 through 1947, the annual reports of the Bosque del Apache refuge contain scattered notes on the avifauna of the Rio Grande Wildlife Refuge. Few data area available from the latter area until 1969 and later, when Jack Durham, a wildlife biologist with BLM, identified Elephant Butte Marsh as a suitable area for Mexican Duck (*Anas diazi*) recovery efforts. Since that time both Bosque del Apache refuge personnel and BLM biologists in the Socorro District Office have recorded data on birds of the marsh.

DESCRIPTION OF THE STUDY AREAS

The Rio Grande heads in the southern Rocky Mountains of Colorado, east of the Continental Divide, and enters New Mexico as a swift flowing mountain stream. South of White Rock Canyon, near Española, the river leaves the confining walls and slopes of the mountains and enters the lowlands. Before the introduction of extensive water control programs, the river's lowland course was characterized by broad meanders bordered with scattered oxbow lakes and wetlands. From 1905 onward, the river was extensively modified by the Rio Grande Project, which included Elephant Butte Dam and various irrigation works. From 1929 onward, the Middle Valley (Velarde to Elephant Butte Dam) has been systematically drained and channelized. The oxbow lakes and native wetlands of the Middle Valley have been largely eliminated by drainage ditches, low-flow channels, confining jetties and pilot channels; these modifications were designed to straighten the river course and speed water flow.

A major component of the Middle Valley water control system is a low-flow channel on the west side of the Rio Grande from San Acacia south to the Narrows. The section of the low-flow channel from Bosque del Apache National Wildlife Refuge south to the Narrows was constructed during the 1950's. The low-flow channel confines the river to the eastern side of its floodplain, while draining the western side of the floodplain. South of San Marcial the drained portion of the old floodplain reaches a width of nearly 2 miles in places. The alluvium of the old river bed and floodplain supports a continuous strip of woodland and shrubland, with salt cedar (*Tamarix chinensis*), Rio Grande cottonwood (*Populus wislizeni*), and Goodding willow (*Salix gooddingii*) as dominants. Salt cedar grows extensively in the area and is apparently successional in some areas to cottonwood or mixed

deciduous woodlands corresponding roughly to the Class IV and Class V communities of Campbell and Dick-Peddie (1964). In other cases, salt cedar may form a disclimax, corresponding to their Class III.

Elephant Butte Marsh lies at the lower end of the portion of old floodplain isolated by the low-flow channel. Seepage from the low-flow channel, backwater from the river, and a spring-fed seep at the edge of the floodplain have inundated a portion of the riparian woodland and shrubland, creating wetland. During the period of this study, the extent of water on the "marsh" (actually more closely a swamp) has fluctuated from a low of about 185 surface acres to as much as about 960 surface acres. Salt cedar shrubland and willow woodland are the primary habitats flooded, although at the periods of extreme high water cottonwood woodland has also been inundated. When water covers extensive areas, some salt cedars at the southern portion of the marsh are completely immersed.

DESCRIPTION OF THE HABITATS

Riparian Habitats

These habitats occur in the floodplain of the river and are dependent upon the river.

Riparian shrubland. Much of this habitat type is characterized by salt cedar as the woody dominant. In some areas, however, the native seepwillow (*Baccharis glutinosa*) is the dominant. Annual herbs, barnyard grass (*Echinochloa crusgalli*), various annual grasses, and scattered cottonwoods and willows also occur.

Riparian woodland. In the study area, this habitat type occurs in two forms. Cottonwood woodland occurs in the northern part of the study area, principally along the western edge of the floodplain. Cottonwoods comprise the overstory, while an understory of varying density is formed by salt cedar and Goodding willow. Ground cover includes barnyard grass, jimson weed (*Datura meteloides*), thistle (*Cirsium* sp.), crucifer (*Descurainia* sp.), mallow (*Sphaeralcea* sp.), dandelion (*Taraxacum officionale*), and other grasses and herbs.

The second form of riparian woodland is dominated by Goodding willow, which forms the overstory. Salt cedar sometimes occurs as an understory, and herbs and grasses provide ground cover of varying density.

Marshland. This is comprised of inundated salt cedars, willows, and some seepwillow--thus more properly termed "swampland." When the water level is low, the seep area along the northwestern marsh edge sometimes supports a narrow stand of cattails (*Typha* sp.). Water levels vary as described previously, but generally there is some open water. Aquatic vegetation is scant in the area, apparently limited by turbidity of the water.

Nonriparian Habitat

Nonriparian shrubland. Three broad types of nonriparian shrubland occur in the vicinity of the marsh. Atop the mesa land which borders the floodplain creosote bush (*Larrea tridentata*) is the dominant. Other species present are fluff grass (*Tridens pulchella*), mesquite (*Prosopis juliflora*), four-wing saltbush (*Atriplex canescens*), broom snakeweed (*Gutierrezia sarothrae*), bush muhly (*Muhlenbergia porteri*) and dropseeds (*Sporobolus* spp.).

An association in which mesquite (*P. juliflora*) and littleleaf sumac (*Rhus microphylla*) are the dominants occurs principally in the sandy bottoms of arroyos. Major associated species are fluff grass, bush muhly and broom indigobush (*Dalea scoparia*). Scattered junipers

(*Juniperus monosperma*) are found in some arroyos, and occasional salt cedars occur at varying distances up some arroyos.

The third association found directly adjacent to the marsh and extending up the sandy slopes of the mesas consists of broom indigobush as the dominant, along with fluff grass, broom snakeweed, sand dropseed (*Sporobolus cryptandrus*), and mesquite.

METHODS

From 1970 through 1975 I spent all or part of 74 days at Elephant Butte Marsh, including 45 days during May through July, which I consider to be the peak of the breeding season. In addition, I surveyed Elephant Butte Lake, south of the marsh, on 14 occasions, and investigated areas north of the marsh as far as San Marcial on six occasions.

I recorded species of birds seen, numbers seen, evidence of nesting, and contents of nests. Surveys were made by foot, by boat, and occasionally by wading. I covered riparian habitats primarily. About one-third to one-half of my field time was spent in nonriparian habitats or edge areas between riparian and nonriparian habitats.

ANNOTATED LIST OF BREEDING BIRDS

The following list includes all species of birds for which I found evidence of breeding at or near Elephant Butte Marsh and all species seen during June and July from 1970 through 1975. An asterisk (*) is used to designate breeding birds and probable breeding birds. The designation is based on presence of active nests, dependent young, singing males, distress behavior related to an apparent nest site, regular occurrence of adults or young during June and July, and/or adults carrying nest material.

I have summarized habitat usage by each breeding species using the categories developed by Hubbard (1971). They are:

Restricted Riparian (RR)--occupying riparian habitats exclusively or nearly so in breeding season.
Primary Riparian (PR)--occupying primarily riparian habitats in the breeding season, but making varying use of adjacent nonriparian habitats.
Secondary Riparian (SR)--occupying nonriparian habitats extensively in the breeding season, but making varying use of riparian habitats.
Nonriparian (NR)--occupying nonriparian habitats exclusively or nearly so in the breeding season except for drinking and bathing.

I have followed Hubbard (1970) in designating abundance and frequency of occurrence using the following terminology:

Abundance	Frequency
rare (least numerous)	regular (annual or nearly so)
uncommon	irregular
fairly common	occasional
common	casual (recorded every 10 years or so)
abundant (most numerous)	

Annotations refer to the status of the bird during the breeding season unless otherwise indicated (Also see Appendix I for more details on breeding of cormorants and certain herons in the Middle Valley).

EARED GREBE: *Podiceps caspicus*. Four seen on 7 June 1975 were probably late migrants.

*WESTERN GREBE: *Aechmophorus occidentalis*. (RR) -- Irregular during breeding season; uncommon to fairly common on the marsh. From 1 to 13 seen regularly from May through July 1975.

*PIED-BILLED GREBE: *Podilymbus podiceps*. (RR) -- Regular, but rare on the marsh during breeding season. On 1 July 1973, an adult remained close to me and feigned injury while I waded through an area of salt cedars, but I was not able to find a nest.

*DOUBLE-CRESTED CORMORANT: *Phalacrocorax auritus*. (RR) -- Regular on the marsh since 1970. About 260 pairs nested in a multi-species rookery in the marsh during 1975. The birds nest in willows from March through August (also see Appendix 1).

*OLIVACEOUS CORMORANT: *Phalacrocorax olivaceus*. (RR) -- Irregular to regular on the marsh since 1972. Six or seven pairs nested in the rookery on the marsh during 1975. Nests were in willows (also see Appendix 1).

*GREAT BLUE HERON: *Ardea herodias*. (RR) -- Uncommon but regular on the marsh. One bird flew over the marsh 9 July 1974 carrying a large stick which it dropped; probably nests in the vicinity.

*GREEN HERON: *Butorides striatus*. (RR) -- Regular on marsh; uncommon to fairly common. Three active nests found in inundated willows and salt cedars during July 1974. Present during June and July annually from 1972 through 1975.

*LITTLE BLUE HERON: *Florida caerulea*. (RR) -- Irregular to regular in recent years; rare to uncommon on the marsh. Two active nests located in the rookery during July 1975 (also see Appendix 1).

*CATTLE EGRET: *Bubulcus ibis*. Irregular to regular on marsh in recent years; rare to uncommon. Two active nests in the rookery during June and July 1975 (also see Appendix 1).

*GREAT EGRET: *Casmerodius albus*. (RR) -- Irregular to regular on the marsh; uncommon to fairly common. Five to six active nests in the rookery during 1974 and 1975 (also see Appendix 1).

*SNOWY EGRET: *Egretta thula*. (RR). Regular on the marsh. An estimated 200 - 300 pairs nested in the rookery during 1975 (also see Appendix 1).

*BLACK-CROWNED NIGHT HERON: *Nycticorax nycticorax*. (RR) -- Regular on the marsh. An estimated 300 - 500 pairs nested in the rookery during 1975 (also see Appendix 1).

*LEAST BITTERN: *Irobrychus exilis*. (RR) -- Irregular to occasional on marsh; uncommon. Three nests in salt cedars in 1972, and one nest in cattails 1 July 1973. The absence of this species during 1974 and 1975 from areas previously occupied is puzzling.

WHITE-FACED IBIS: *Plegadis chihi*. Small flock present 10 June 1971 and one present 4 June 1974.

*MALLARD: *Anas platyrhynchos*. (RR) -- Regular; uncommon on marsh and channel. Female with 3 nearly fledged young swimming on low-flow channel 27 July 1975.

*MEXICAN DUCK: *Anas diazi*. (RR) -- Irregular or regular; rare to uncommon on marsh. Pairs seen by Jack Durham or me on 1 June 1969, 21 April 1972, 14 May 1972, and 18 July 1975. On 15 April

1970, Durham saw a small flock (pers. comm.). Prior to 1975, I made no particular effort to sort out Mexican Ducks from female Mallards except under very favorable conditions.

GADWALL: *Anas strepera*. One pair present 18 July 1975 and 4 seen on 26 July 1975; also present 10 June 1971.

GREEN-WINGED TEAL: *Anas crecca carolinensis*. Four present 18 July 1975.

BLUE-WINGED TEAL: *Anas discors*. Three present 7 June 1975 and one pair present 26 July 1975.

REDHEAD: *Aythya americana*. Female present 9 July 1974.

*RUDDY DUCK: *Oxyura jamaicensis*. (RR) -- Irregular in June and July; rare on marsh. An adult male in breeding plumage was seen on the marsh 30 June 1973. This occurrence is particularly interesting in context of sightings upstream and downstream from the marsh in 1975. On the small marsh near San Marcial, a male Ruddy Duck was seen in courtship display with two females 19 June, and two males and a female were present 11 July. A male in breeding plumage was accompanying a female on a marsh just below Elephant Butte Dam 16 June 1975; however, the marsh was drained shortly thereafter.

*TURKEY VULTURE: *Cathartes aura*. (NR) -- Irregular to regular; fairly common in summer. From one to nine seen over shrubland most visits in June and July 1975. Probably breeds in Fra Cristobal Mountains, on the east side of the river, and/or other nearby areas of rocky bluffs.

*COOPER HAWK: *Accipiter cooperi*. (PR) -- Irregular to regular; uncommon in riparian woodland. A total of four young fledged from two nests on marsh in 1975 (one nest in a cottonwood, and one in a willow).

RED-TAILED HAWK: *Buteo jamaicensis*. An individual seen on several visits during June 1975 may have nested in shrubland away from marsh.

GOLDEN EAGLE: *Aquila chrysaetos*. One present in nonriparian shrubland 18 June 1975.

*OSPREY: *Pandion haliaetus*. (PR) -- Individual seen 1 July 1973 and 9 July 1974; apparently nests in lower basin of Elephant Butte Reservoir.

*AMERICAN KESTREL: *Falco sparverius*. (SR) -- Irregular to regular; uncommon during breeding season in nonriparian shrubland. An adult with two dependent young was present 18 June 1975.

SCALED QUAIL: *Callipepla squarnata*. One seen 10 June 1971 and one on 7 June 1975.

*GAMBEL QUAIL: *Lophortyx gambelii*. (SR) -- Regular in nonriparian shrubland, primarily in arroyo bottoms; fairly common to common. Female with 7 chicks seen 14 June 1976, and an adult with 1 chick seen 18 June.

*RING-NECKED PHEASANT: *Phasianus colchicus*. (RR) -- Occasional or irregular; rare in woodland and riparian shrubland. This introduced species has apparently spread south from Bosque del Apache NWR.

*AMERICAN COOT: *Fulica americana*. (RR) -- Regular and common on the marsh. Eight nests found in cattails, salt cedars, or willows in June and July 1973 and one in salt cedars 10 July 1974.

*KILLDEER: *Charadius vociferus.* (RR) -- Regular and fairly common to common along marsh edge. Adult with two nearly grown young at marsh edge 27 July 1975; at least five territories were located around marsh that year.

*SPOTTED SANDPIPER: *Actitis macularia.* (RR) -- Regular and uncommon along low-flow channel. During May and July 1975, I saw a few of this species whenever I spent time along the low-flow channel.

LEAST SANDPIPER: *Erolia minutilla.* Twenty-five seen on 27 July 1975 were probably early migrants.

AMERICAN AVOCET: *Recurvirostra americana.* From 5 to 15 seen 16 July, 26 July and 27 July 1975.

RING-BILLED GULL: *Larus delawarensis.* Two seen 17 June 1975.

BONAPARTE GULL: *Larus philadelphia.* One seen 30 June 1973 was presumably a vagrant.

FORSTER TERN: *Sterna forsteri.* One seen 18 June 1975 was presumably vagrant

BLACK TERN: *Chlidonias niger.* From one to three seen 14 June, 17 June and 22 June 1975.

BAND-TAILED PIGEON: *Columba fasciata.* An individual seen at marsh edge 6 June 1975 was presumably a vagrant.

*MOURNING DOVE: *Zenaida macroura.* (SR) -- Regular in all habitats; rare or common in shrubland and fairly common to common in riparian habitats. Six active nests found in 1972, one in 1973, and 10 in 1975 (including one second nesting). Seven nests were in salt cedars, four in willows, one in a cottonwood, one in a juniper, and one on a rock ledge.

*YELLOW-BILLED CUCKOO: *Coccyzus americanus.* (RR) -- Occasional to irregular; rare or uncommon in riparian woodland. One nest on a willow branch 10 July 1974. One seen by Durham and Hubbard 16 June 1972 (pers. comm.).

*ROADRUNNER: *Geococcyx californianus.* (SR) -- Regular and uncommon to fairly common in shrubland and riparian woodland. Nest in salt cedar 18 June 1975 with three eggs.

*GREAT HORNED OWL: *Bubo virginianus.* (SR) -- Regular and uncommon or fairly common; heard regularly at night. Young seen on several occasions during 1975; also an adult with two young in the nest in a dirt bank just off the study site 10 May 1975.

*POOR-WILL: *Phalaenoptilus nuttallii.* (NR) -- Occasional and rare in nonriparian shrubland. Heard one or two the nights of 14 June, 19 July, and 26 July 1975. Presumably breeds despite infrequency of observations.

*COMMON NIGHTHAWK: *Chordeiles minor.* (NR) -- Regular; common in nonriparian shrubland and in flight over riparian habitat.

*LESSER NIGHTHAWK: *Chordeiles acutipennis.* (NR) -- Regular; common in nonriparian shrubland and over riparian habitats. Adult and two young flew from ground in creosotebush shrubland on 18 July 1975.

WHITE-THROATED SWIFT: *Aeronautes saxatalis.* Irregular and rare in June and July. Adult seen 18 June 1975 along southern bluffs.

*BLACK-CHINNED HUMMINGBIRD: *Archilochus alexandri*. (PR) -- Regular and common in riparian shrubland and woodland. One nest found in 1972, two nests in 1974, and five nests in 1975 in willows and salt cedars.

*COMMON FLICKER: *Colaptes auratus*. (PR). Regular and uncommon to fairly common in woodland during breeding season. Adult with two young out of nest in cottonwoods 16 July 1975.

*HAIRY WOODPECKER: *Picoides villosus*. (RR) -- Irregular or regular; uncommon in woodland. Two adults with two young out of nest in cottonwoods 21 June 1975.

*LADDER-BACKED WOODPECKER: *Picoides scalaris*. (SR) -- Regular in riparian woodland and adjacent shrubland; uncommon or fairly common. Nest in willow snag in 1972, one in cottonwood cavity in 1973 and in June 1975.

*WESTERN KINGBIRD: *Tyrannus verticalis*. (SR) -- Regular in riparian habitats and in nonriparian shrubland, nests in snags and in cottonwoods along the periphery of the marsh.

*ASH-THROATED FLYCATCHER: *Myiarchus cinerascens*. (SR) -- Regular and fairly common all habitats. Single active nest in 1970, 1973, and 1974 and seven during 1975. Nests in junipers in shrubland, in cottonwood snags over water, and in cottonwoods and willows in riparian woodland.

*BLACK PHOEBE: *Sayornis nigricans*. (RR) -- Irregular and rare in riparian habitats. Pair present regularly on a territory through the breeding season in 1972 and 1973. High water may have prevented use of the same area during 1974 and 1975.

*SAY PHOEBE: *Sayornis saya*. (NR) -- Occasional to irregular along bluffs and arroyo banks; uncommon. Nest under rock overhang in 1972; nest in Narrows 8 June 1975.

*WILLOW FLYCATCHER: *Empidonax traillii*. (RR) -- Regular in riparian woodland or shurbland; fairly common. One nest in 1972, 10 nests or family groups in 1974, and six nests or family groups in 1975. Nests predominantly in salt cedar with some in willows and nearly all nests over water.

WESTERN FLYCATCHER: *Empidonax difficilis*. Individuals seen 10 June 1971 and 17 June 1975 were presumably late migrants.

*WESTERN WOOD PEWEE: *Contopus sordidulus*. (RR) -- Irregular and rare to fairly common in woodland. Probably nests in riparian woodland.

VIOLET-GREEN SWALLOW: *Tachycineta thalassina*. Irregular in summer; uncommon to fairly common over marsh. June sightings may represent birds breeding in vicinity or late migrants.

*TREE SWALLOW: *Iridoprocne bicolor*. (RR) -- Regular on the marsh since 1972; uncommon to fairly common. Single active nest found during 1972, 1973, and 1974; three nests or family groups in 1975. All nests were in cottonwood or willow snags over water.

*ROUGH-WINGED SWALLOW: *Stelgidopteryx ruficollis*. (PR) -- Regular; fairly common in vicinity of marsh and low-flow channel. Two nests in cliff face 18 June and 21 June 1975. May also nest in banks of low-flow channel.

*BARN SWALLOW: *Hirundo rustica*. (SR) -- Regular and fairly common over the marsh during breeding season. Colony of seven to ten active nests in the Narrows about a mile south of the marsh 8 June 1975.

RAVEN: *Corvus* sp. (probably *corax*). One seen in nonriparian shrubland 29 June 1975 and five on 12 July 1975.

*VERDIN: *Auriparus flaviceps*. (NR) -- Regular in nonriparian shrubland; fairly common, apparently nesting primarily in salt cedars. One active nest found in 1972 and 1973; adult building nest 24 May 1975--all nests in salt cedars. There appear to be at least three territories along the western edge of the marsh.

LONG-BILLED MARSH WREN: *Cistothorus palustris*. One seen and heard in cattails on 10 June 1971 may have been a late migrant.

CANYON WREN: *Catherpes mexicanus*. Occasional to irregular; rare along bluffs. One heard singing 18 June 1975 may have been a late migrant or vagrant.

*ROCK WREN: *Salpinctes obsoletus*. (NR) -- Regular on slopes of southern bluffs; common in that area, and up rocky arroyos. Four nests or family groups found in 1975, and eight territorial males counted.

*MOCKINGBIRD: *Mimus polyglottos*. (NR) -- Irregular and rare or uncommon in nonriparian shrubland. Active nest found 20 June 1970 in salt cedar. Only one territory has been located in the immediate vicinity of the marsh.

*CRISSAL THRASHER: *Toxostoma crissale*. (NR) -- Frequency of occurrence uncertain; rare to uncommon in nonriparian shrubland. Two adults seen with one short-tailed young out of nest 15 June 1975.

*AMERICAN ROBIN: *Turdus migratorius*. (RR) -- Irregular to regular; uncommon in riparian woodland. Immature seen in August 1972, and adult with two just-fledged young in cottonwoods 6 June 1975.

*STARLING: *Sturnus vulgaris*. (RR) -- Irregular to regular; uncommon, but status may be changing. Nest in willow cavity 5 June 1974. Nesting density is quite low compared with similar habitat in the Albuquerque area. This exotic species may have reached the vicinity of the marsh only recently.

SOLITARY VIREO: *Vireo solitarius*. One seen 5 June 1974 was presumably a late migrant.

WARBLING VIREO: *Vireo gilvus*. About 20 seen 5 June 1974 were presumably late migrants.

ORANGE-CROWNED WARBLER: *Vermivora celata*. Two seen 4 June 1974 were presumably late migrants.

*LUCY WARBLER: *Vermivora luciae*. (PR) -- Regular in riparian woodland and marsh edge (frequency in shrubland uncertain); uncommon to fairly common in riparian woodland and edge areas. One nest or family group each year 1971, 1973, and 1974; four nests or family groups in 1975--two in woodland, one at the marsh edge, and one in shrubland.

YELLOW WARBLER: *Dendroica petechia*. Two seen 17 July 1975.

MACGILLIVRAY WARBLER: *Oporornis tolmiei*. One seen 14 June 1975 was presumably a late migrant.

*COMMON YELLOWTHROAT: *Geothlypis trichas*. (RR) -- Regular in riparian shrubland around the marsh and along the river; fairly common to common. Singing males present in several areas May through July 1975.

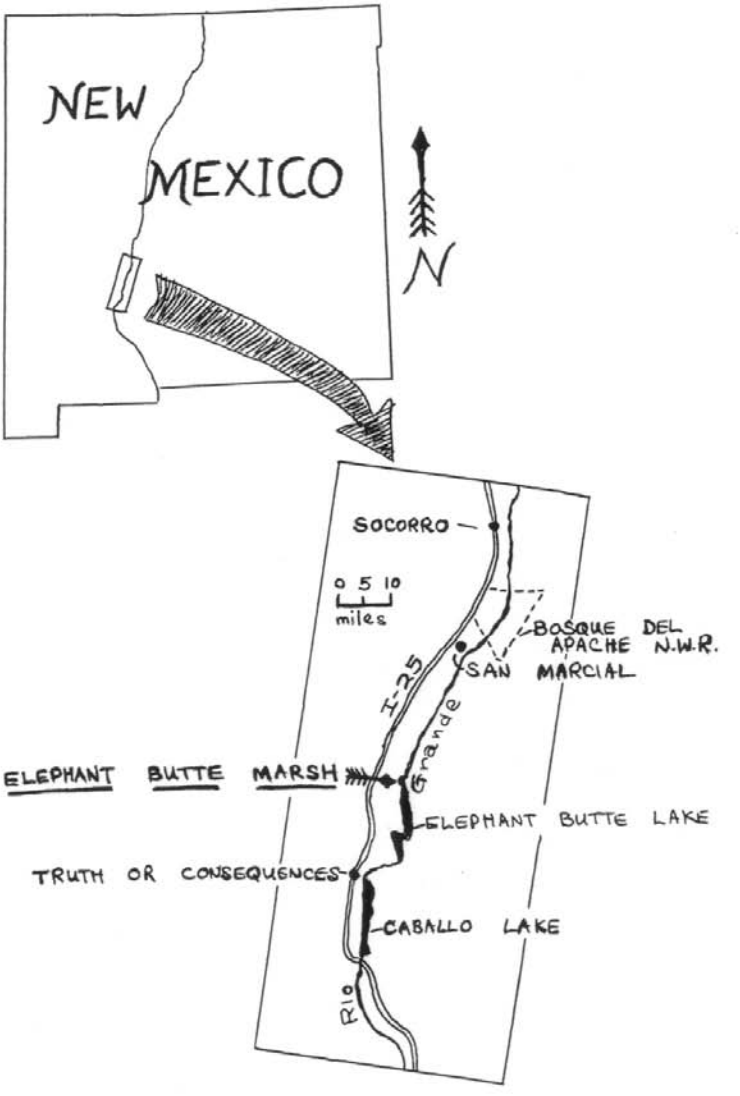

Figure 1. Study area, Sierra County, New Mexico.

*YELLOW-BREASTED CHAT: *Icteria virens*. (PR) -- Regular in riparian shrubland and woodland; fairly common to common. Three nests in 1972, one in 1973 and in 1974, and two in 1975; five of the nests were in salt cedars and two in willows.

*RED-WINGED BLACKBIRD: *Agelaius phoeniceus*. (RR) -- Regular and common on the marsh, nesting in salt cedars, willows, and cattails when available. Active nests found every year from 1972 through 1975. Thirty-one active nests or family groups during 1975, primarily in salt cedars.

*NORTHERN (BULLOCK) ORIOLE: *Icterus galbula bullockii*. (PR) -- Regular on marsh and in marsh edge areas; fairly common. One nest in 1971 and in 1972, and three nests or family groups in June and July 1975; all nests in cottonwoods.

*GREAT-TAILED GRACKLE: *Quiscalus mexicanus*. (PR) -- Regular on marsh; uncommon to fairly common. Two nests in salt cedars recorded in June 1975.

*BROWN-HEADED COWBIRD: *Molothrus ater*. (SR) -- Regular in riparian habitats; fairly common. An egg was found in a Willow Flycatcher nest in 1972 and 1974, one in a Lucy Warbler nest on 6 June 1975, and one in a Red-winged Blackbird nest on 7 June 1975.

WESTERN TANAGER: *Piranga ludoviciana*. Female seen 4 June 1974 and two males seen the following day were apparently late migrants.

*SUMMER TANAGER: *Piranga rubra*. (PR) -- Regular in riparian woodland; uncommon to fairly common. Territorial males present regularly May through July.

*BLACK-HEADED GROSBEAK: *Pheucticus melanocephalus*. (PR) -- Irregular and rare in riparian woodland. A newly fledged bird was seen on 18 July 1975.

*BLUE GROSBEAK: *Guiraca caerulea*. (PR) -- Regular and fairly common in riparian woodland. One nest found in 1974, and two in 1975, one in a willow and one in a salt cedar.

*INDIGO BUNTING: *Passerina cyanea*. (PR) -- Frequency of occurrence and abundance uncertain. I saw an adult male at the marsh 11 May 1975 and 16 July 1975, one in willow woodland and one in cottonwood gallery with salt cedar understory. On 12 July 1975, I saw a male in salt cedars between San Marcial and the marsh, and an individual male plus a pair just across the river from Elephant Butte Marsh. Cumulative data indicates breeding in the vicinity, if not at the marsh proper.

*HOUSE FINCH: *Carpodacus mexicanus*. (SR) -- Regular; fairly common to common along marsh and woodland edges and in immediately adjacent brushland. Nests found in 1972 and 1973 (4 nests), primarily in salt cedars; six nests in 1975--four in salt cedars, one in a willow, and one in a cottonwood cavity from which it apparently evicted a Lucy Warbler.

AMERICAN GOLDFINCH: *Carduelis tristis*. Two males and a female seen 6 June 1975.

LESSER GOLDFINCH: *Carduelis psaltria*. Present 10 June 1971.

*RUFOUS-SIDED TOWHEE: *Papilo erythrophthalmus*. (PR) -- Regular and fairly common in riparian woodland. One nest under log in cottonwood woodland 7 June 1975, and adults with fledgling 18 July 1975 in mixed woodland.

LARK SPARROW: *Chondestes grammacus*. Frequency and abundance uncertain; individuals seen 11 June and 12 July 1975. Nests at Elephant Butte Lake and Bosque del Apache NWR.

*BLACK-THROATED SPARROW: *Amphispiza bilineata*. (NR) -- Regular and common in nonriparian shrubland. Adult feeding young out of nest in 1974. Six nests or family groups in 1975, all in shrubland or at shrubland/woodland edge.

CHIPPING SPARROW: *Spizella passerina*. Occasional and rare. Two present 4 June 1974; also an adult with dependent young in salt cedars near San Marcial 19 June 1975.

DISCUSSION

Rookery

The most important component of the breeding bird population at Elephant Butte Marsh is the rookery, comprising seven species of nesting birds. The species which make up the rookery are listed in Table 1 together with the number of active nests during the 1975 breeding season (Table 1).

TABLE 1

Species of Rookery-nesting Birds Present in 1975

Species	Number of Pairs
Double-crested Cormorant[1]	260 ± 15
Olivaceous Cormorant[2]	6 - 7
Little Blue Heron[3]	2 (or more)
Cattle Egret[3]	3 (or more)
Great Egret[3]	5
Snowy Egret[4]	200 - 300
Black-crowned Night Heron[4]	300 - 500

[1] Based on actual count 6 June 1975.
[2] It is highly probable that one of the nests identified as belonging to this species was used only as a roosting platform, leaving only 6 active nests.
[3] Lower limit represents actual count.
[4] Figures for these species are estimates.

The rookery at Elephant Butte Marsh was active from 1969 through 1976, although most of the birds abandoned the site during 1973 and moved south of the Narrows to the lower reservoir basin. Historical records suggest that the Double-crested Cormorants, Great Egrets, Snowy Egrets and Black-crowned Night Herons represent a population which has nested at varying sites in the reach from Bosque del Apache National Wildlife Refuge to Elephant Butte Reservoir over at least the last several decades.

Double-crested Cormorants probably bred in the reservoir vicinity as early as 1932 when C. S. Williams collected five specimens 18 - 25 June (Mendall, 1936). They were definitely nesting at the reservoir by 1937 (Monson, 1946). From 1950 through 1963 this species nested on the Bosque del Apache NWR (US F.& W.S., 1940 - 73). Great Egrets were first recorded breeding in the area in 1940, when they nested on either the Bosque del Apache or Rio Grande refuges (US F.& W.S., 1940 - 73). Snowy Egrets were first recorded nesting in the Rio Grande Valley of New Mexico at Las Cruces in 1933 (Ligon, 1961), and nested on Bosque del Apache refuge from 1950 through 1962. Black-crowned Night Herons also nested on Bosque del Apache from 1950 to 1962. All four of these species have been recorded breeding elsewhere in the

state; however, the Double-crested Cormorant has only been reported nesting at Harroun Lake on the lower Pecos, and the certainty of that record has not been established.

Olivaceous Cormorants, Little Blue Herons and Cattle Egrets have not been recorded as nesting birds anywhere else in New Mexico. Charles Hyder and I first found Olivaceous Cormorants nesting at the marsh on 15 and 16 May 1972. I found Cattle Egrets nesting in the marsh rookery on 22 June 1975, and Little Blue Herons on 13 July 1975. Both the Olivaceous Cormorant and the Little Blue Heron are now listed as endangered or threatened species by the New Mexico Department of Game and Fish. Although the present known breeding population of Cattle Egrets is also small, the success of that species along the Gulf Coast and Atlantic Coast of the United States suggests that the population in New Mexico can be expected to expand.

The Elephant Butte Marsh rookery is the largest active breeding colony of water birds in the state. Its continued existence, however, is by no means certain. Aggradation of the river channel below the marsh makes control of the water level impractical. Current water levels may kill inundated vegetation if sustained for many more years. Most alternative nesting sites have been eliminated by human activity in recent years. Suitable rookery habitat has apparently not been available on Bosque del Apache NWR since the early 1960's, and the marsh at San Marcial was drained by construction of the low-flow channel. A proposed tree eradication will eliminate additional suitable habitat south of the Narrows. Clearly some type of active management, including restoration or creation of suitable nesting habitat, appears essential to long-term maintenance of the rookery population.

Summary of Breeding Status

I recorded 94 species of birds in the Elephant Butte Marsh vicinity during the summer (June and July) between 1970 and 1975. Of these, 64 species have nested or probably have nested on the marsh or in the vicinity.

The check-list for Bosque del Apache NWR includes 97 species as breeding in that vicinity. Some of the species listed as breeding on or near the refuge are not listed by me as breeding at Elephant Butte Marsh, but probably breed at least nearby. These include Red-tailed Hawk, Golden Eagle, Scaled Quail, Screech Owl, Vermilion Flycatcher, Common Raven, Yellow Warbler, Lesser Goldfinch, and Lark Sparrow. On the other hand, poor ground cover adjacent to the marsh due to overgrazing may account for the absence as breeding birds of certain species known to have nested at the refuge, including Gadwall, Green-winged Teal and Blue-winged Teal, which have occurred at the marsh during the summer but are not known to nest, and Pintail (*Anas acuta*), Cinnamon Teal (*Anas cyanoptera*), and Northern Shoveler (*Spatula clypeata*) which have not been seen at the marsh during summer.

Habitat Utilization by Breeding Species

As mentioned, I have used Hubbard's (1971) system for classifying habitat utilization by breeding birds. This system addresses the degree of dependence on riparian habitat, a matter of increasing import in environmental management in the Southwest. Of the 64 species known or believed to breed in the Elephant Butte Marsh area, 27 (42.2 %) are restricted riparian in their habitat utilization; that is, they are totally or nearly totally dependent on riparian habitat for their basic biological and breeding needs. Fifteen species (23.4 %) are classed as primary riparian; i.e., requiring such habitat to meet basic needs but also utilizing adjacent nonriparian habitat to meet some needs.

The elimination, deterioration, or reduction of diversity of riparian habitats in the area would result in adverse impacts on the species in these two categories. Adverse impacts would range from elimination of breeding populations to reduction in numbers, depending on the extent of habitat disturbance and degree of dependence of a species on the habitat type impacted. For example, elimination of wetland habitats in the area would probably eliminate all or most of the rookery-nesting birds. This would probably mean elimination of the Olivaceous Cormorant and possibly the Little Blue Heron as breeding birds in New Mexico. A reduction in the extent of riparian shrubland would result in a proportionate reduction in populations of Common Yellowthroat and Yellow-breasted Chats. Elimination of riparian woodland would probably eliminate Summer Tanagers as breeding birds and would at least drastically reduce the population of the Lucy Warblers.

Eleven (17.2 %) species of birds are classed as secondary riparian and 11 (17.2 %) as nonriparian in the marsh area. Populations of these species might be reduced in the absence of riparian habitat, but they would probably not be eliminated from the area. Adverse impacts of riparian habitat modification would be greater on birds in the secondary riparian category than on those in the nonriparian category. Many species in the secondary riparian category reach greater nesting density in riparian than in nonriparian habitats. This is the case for both Mourning Doves and Western Kingbirds, which reach densities in riparian habitats that are several times greater than densities in nonriparian habitats.

Schmitt (1976) found that the ecological distribution (habitat utilization) of birds in the San Juan Valley was similar to that which Hubbard (1971) found in the Gila Valley. The ecological distribution of birds at Elephant Butte Marsh, however, differs from those areas in that a greater percentage of the birds in the former area are dependent on riparian habitats (Table 2).

TABLE 2

Habitat Utilization	Elephant Butte Marsh	San Juan Valley	Gila Valley
Restricted Riparian	42.2%	26.5%	25.0%
Primary Riparian	23.4%	19.4%	24.1%
Secondary Riparian	17.2%	28.6%	22.3%
Nonriparian	17.2%	25.5%	28.6%

While my Elephant Butte Marsh studies have been primarily a single site survey--compared with the multiple site studies of Hubbard (1971) and Schmitt--the difference in ecological distribution seems to reflect actual differences in the areas rather than in the type of survey. To begin with, neither Hubbard nor Schmitt found wetlands of the extent and/or type found at Elephant Butte Marsh. Seven of restricted riparian species at Elephant Butte Marsh make up the rookery. Of these, only the Black-crowned Night Heron is listed as breeding in the Gila Valley and possibly the San Juan Valley. In addition, nonriparian habitats adjacent to the Gila and San Juan Valleys are more diversified than the nonriparian habitats adjacent to Elephant Butte Marsh. For example, the evergreen woodland of the Gila Valley and the pinyon-juniper woodland of the San Juan area are missing from the Elephant Butte Marsh area. Hubbard found such birds as Band-tailed Pigeon primarily in evergreen woodland, and Schmitt reported Blue-gray Gnatcatchers and Gray Vireos nesting in pinyon-juniper woodland.

SUMMARY

Elephant Butte Marsh supports the largest rookery of nesting water birds in New Mexico, including three species not known to have nested elsewhere in the state, i.e., Olivaceous Cormorant, Little Blue Heron, and Cattle Egret. A total of 64 species breed or probably breed in the vicinity of the marsh, while 30 others have occurred in summer. Of the breeders, 65.6 % are heavily dependent upon riparian habitats for basic biological and breeding needs. In this regard and as a rookery site, Elephant Butte Marsh is extremely valuable in terms of avian habitats in the state, and in some respects, it is unique.

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APPENDIX 1

Breeding Marsh Birds of the Middle Rio Grande Valley, New Mexico

The waterbird (cormorants and certain herons) colony which I observed at Elephant Butte Marsh represents a population which has apparently nested in various places in the Middle Rio Grande Valley of New Mexico since at least 1937. I have compiled the data on such nesting from U. S. Fish and Wildlife Service sources in Table A. My own data on numbers of active nests at Elephant Butte Marsh are summarized in Table B. In addition to the rookeries recorded in the tables, there was formerly a nesting colony of 1000 to 2000 Snowy and Great egrets at the now defunct San Marcial Lake just south of Bosque del Apache NWR (U. S. Fish and Wildlife Service, 1947).

Analysis of historic trends is difficult, due to the paucity of early data. Most of the historic data relates to the small rookery on the Bosque Refuge. The records for egrets at San Marcial Lake and Monson's (1946) data on cormorants on the Rio Grande refuge, however, suggest strongly that the Bosque del Apache rookery was peripheral to the major water bird population.

Judging from Monson's early data, the cormorant population appears to have remained relatively stable since 1937. On the other hand, if Fish and Wildlife Service data for San Marcial Lake are assumed to be even near accurate, the egret population in the Middle Valley has declined substantially since 1947. The decline may have been caused partially by competition for nesting sites from the Black-crowned Night Heron. This would have been only one factor, and the major probable cause of population decline appears to have been habitat loss.

Completion of the U. S. Bureau of Reclamation low-flow channel from the Narrows to Bosque del Apache NWR in the early 1950's drained the 2325-acre San Marcial Lake, as well as numerous small ponds in the upper Reservoir basin. This loss of habitat would certainly have led to major reductions in water bird populations in the area. Available habitat has, no doubt, been further reduced by increasing use of the lower basin of Elephant Butte Reservoir for recreational boating. It is unlikely, for example, that the previously-used McRae Canyon would be suitable for a large rookery with present levels of power boat activity there. The upper portion of the lower basin, however, remains sufficiently inaccessible to most boats to support a rookery during high water years. Finally, management practices on the Bosque Refuge eliminated suitable rookery habitat there, although habitat restoration is now planned there.

Based on the historical record, the Great Egret has been most severely impacted of the water birds nesting in the Middle Valley by this habitat reduction. The peak breeding population for this species on the Bosque Refuge was 55 pairs in 1954. This peak probably represented an absorption of birds displaced from San Marcial Lake by low-flow channel construction. The Snowy Egret population also increased at the Bosque the same year. Only six and five pairs of Great Egrets nested at Elephant Butte Marsh during 1974 and 1975, respectively. The reduction in population of Snowy Egrets may have been greater in absolute numbers than that of the Great Egrets, but the proportionate reduction was far greater for the latter species. Moreover, the low absolute number of breeding pairs of Great Egrets would not seem to provide for reproduction sufficient for the persistence of the species in the Rio Grande Valley.

The historical status of night herons in the Middle Valley is more difficult to evaluate. The only early breeding records for Black-crowned Night Herons are those from the Bosque Refuge, yet this species generally tends to be more widespread and abundant than the other marsh birds present in the area. While the difference between the current Elephant Butte Marsh population and the old Bosque population may represent an actual increase, it is more likely that night herons either were overlooked among other species or occupied one or more separate and unlocated rookeries.

There are no breeding records for Olivaceous Cormorants, Little Blue Herons, or Cattle Egrets in New Mexico before my observations at Elephant Butte Marsh in the 1970's. The lack of records should not be viewed as necessarily indicative of the absence of the birds as breeders. Any of the three could be easily overlooked if they occurred, as they do at Elephant Butte Marsh, in low numbers among the more common water birds previously discussed. Olivaceous Cormorants may even have nested in small numbers in the Rio Grande Valley prior to the anglo settlement, though there is no definite evidence of their presence as breeders. The specimens collected near Hatch in April 1854 (Hubbard, 1975), are however suggestive of this, given the early onset of nesting for the species. On the other hand, the absence of any records for Little Blue Herons in the state before 1952 suggests that this bird, at the western periphery of its breeding range, may indeed be a recent addition to the state's breeding avifauna. Finally, the Cattle Egret, whose rapid spread in the United States has occurred during the past four decades, is almost certainly a very recent arrival in New Mexico (Hubbard and Gennaro, 1975).

Should the present trend of habitat loss continue, the breeding water bird population of the Middle Valley will continue to decline. The populations of Olivaceous Cormorants, Little Blue Herons, and Great Egrets, already very low, would be most severely impacted, and the species could very easily disappear as breeders from the Rio Grande Valley of New Mexico. The Cattle Egret, although also occurring in low numbers, is quite adaptable and might survive as a breeding bird with marginal habitat. Double-crested Cormorants, Snowy Egrets, and Black-crowned Night Herons could survive in reduced numbers so long as some suitable habitat remains. Tree clearing now planned by the Bureau of Reclamation in the lower reservoir basin will eliminate additional habitat utilized by water birds. In addition, Elephant Butte Marsh is unstable and may not remain a suitable nesting area for more than a decade or two. Management efforts at Bosque Refuge may provide a suitable alternative habitat for part of the present rookery population. However, long-term survival of the present population at or near current numerical levels will depend upon active efforts to restore suitable habitat between San Marcial and the Narrows.

TABLE A

Breeding of Cormorants and Certain Herons in the Middle Rio Grande Valley, New Mexico, Prior to 1970[1]

Place, date	Numbers of pairs per species: Double-crested Cormorant	Great Egret	Snowy Egret	Black-crowned Night Heron
Rio Grande Bird Refuge, 1937	200			
McRae Canyon[2], 1937	50			
Bosque del Apache NWR,				
1950	10	12	35	4
1951	present	present	present	present
1952	present	present	present	present
1953	24	25	10	30
1954	15	55	200	15
1955	12	9	0	0
1956	10	18	0	2
1957	3	--	--	0
1958	6	0	0	0
1959	6	some?	some?	some?
1960	0	--	--	--
1961	some	--	--	--
1962	some	58[3]	240[3]	92[3]
1963	20	--	--	--

[1]Bosque del Apache NWR data based on refuge Narrative Reports and Rio Grande Bird Refuge data based on Monson (1946).
[2]McRae Canyon is located along the eastern shore of the lower Basin of Elephant Butte Lake.
[3]Indicates number of individuals.

TABLE B

Breeding of Cormorants and Certain Herons at Elephant Butte Marsh, Sierra County, New Mexico

Date	Numbers of nests per species: Double-crested Cormorant	Olivaceous Cormorant	Little Blue Heron	Cattle Egret	Great Egret	Snowy Egret	Black-crowned Night Heron
20 June 1970	18	--	--	--	--	--	--
12 Apr-June 1971	91+	--	--	--	--	--	200
Mar-May 1972	160[1]	4 or 5[1]	--	--	--	50-200[2]	350-500[2]
May-July 1973	31	--	--	--	--	--	--
1 July 1973[3] (lower basin)	23	--	--	--	--	--	75-100[4]
Apr-June 1974	100+	3±	--	--	6	100+	250-500
Mar-July 1975	260	6-7	2	3	5	200-300[2]	300-500[2]

[1]Nesting failed in 1972 apparently due to weather (hail).
[2]Estimated
[3]High water in 1972 apparently caused most of the rookery birds to relocate south of the Narrows, and I did not survey the full area utilized in the lower basin.
[4]These numbers refer to estimates of immature birds seen.