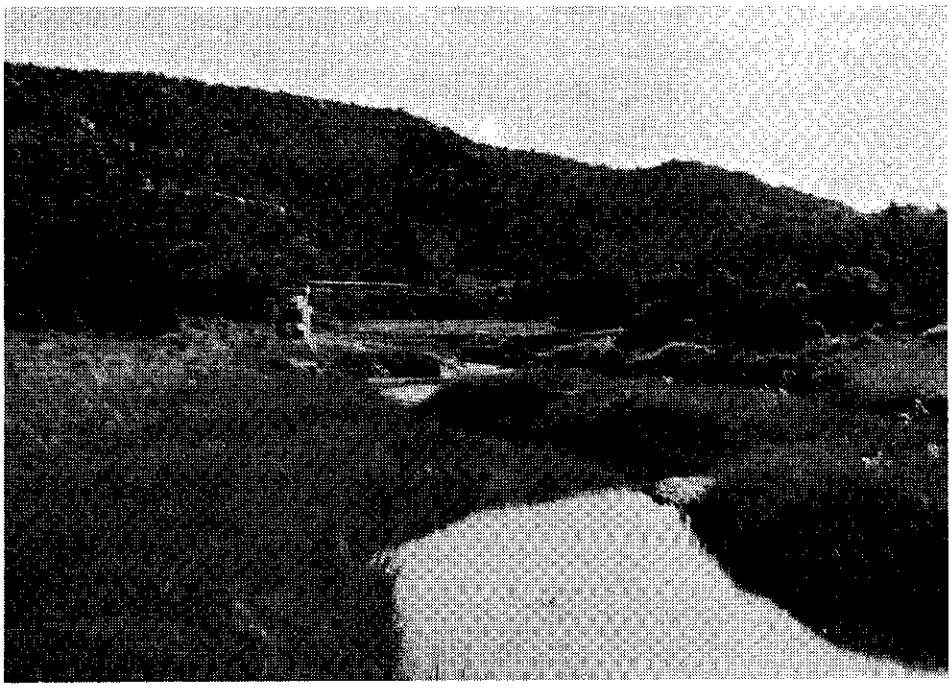
ZUNI PROJECT

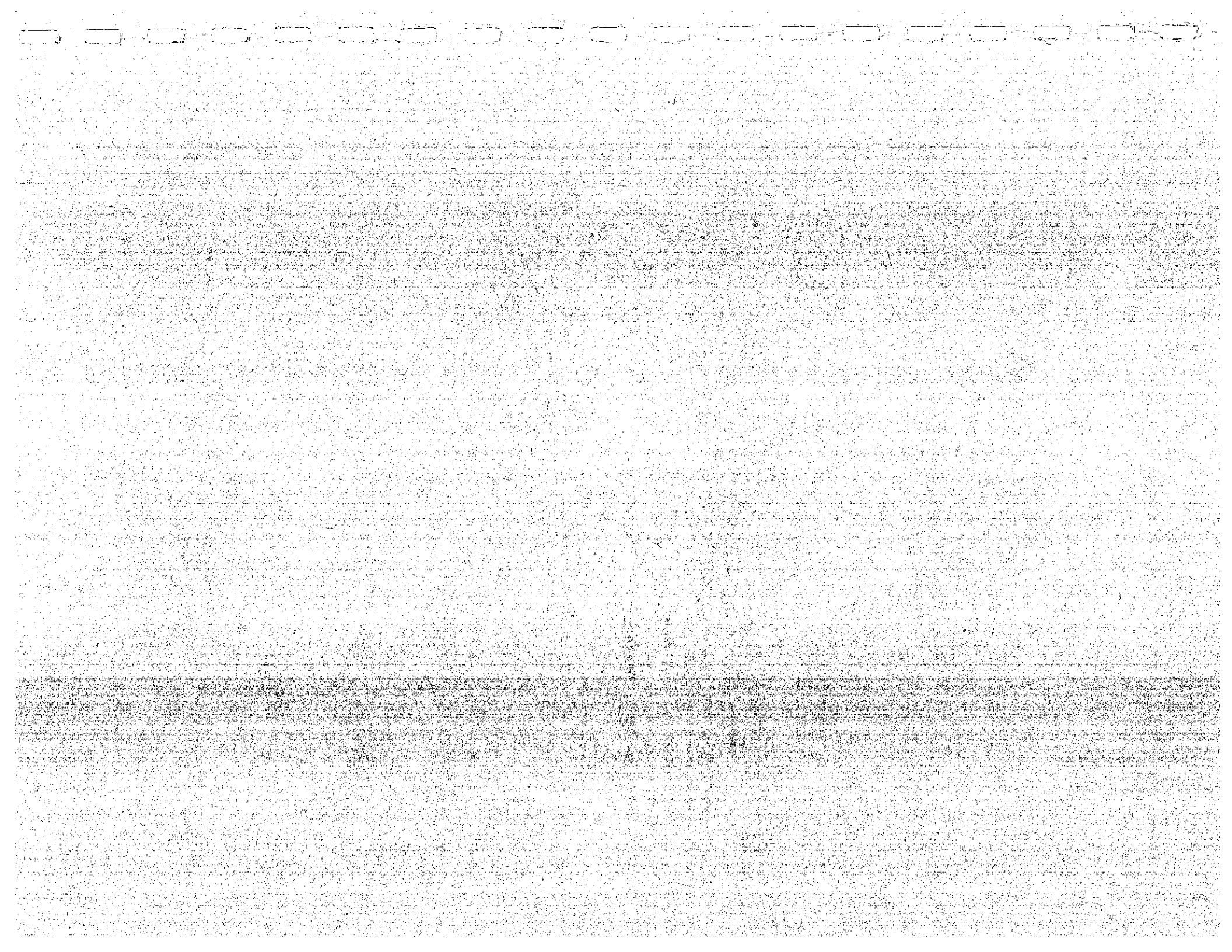
FISH and WILDLIFE

COORDINATION ACT REPORT



U.S. Fish and Wildlife Service

September 1982



Zuni Project
McKinley County, New Mexico
Fish and Wildlife Coordination Act Report

September 1982

Submitted to:

Bureau of Reclamation
Lower Colorado Region
Boulder City, Nevada

Prepared by:
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Cover photo is the Rio Pescado on the Zuni Indian Reservation
All Photos by Brian Hanson

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UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
AREA OFFICE, ARIZONA - NEW MEXICO
2953 W. INDIAN SCHOOL ROAD
PHOENIX, ARIZONA 85017

September 15, 1982

Memorandum

To: Regional Director, Bureau of Reclamation, Boulder City, Nevada

From: Acting Area Manager, U.S. Fish and Wildlife Service, Phoenix, Arizona

Subject: Fish and Wildlife Coordination Act Report for the Zuni Project, McKinley County, New Mexico

This report has been prepared under the authority of and in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) for your Zuni Project Feasibility Study. Fish and wildlife investigations leading to this report were made in cooperation with the Zuni Fish and Wildlife Department, New Mexico Department of Game and Fish, U.S. Fish and Wildlife Service, Dr. G. R. Smith of the University of Michigan, Dr. R. Koehn of the State University of New York and the Bureau of Reclamation's Lower Colorado Region office. The New Mexico Department of Game and Fish concurs with the findings of this report by letters dated April 21 and July 21, 1982 (Appendix 3 and 4). Suggestions presented in these letters have been incorporated into this report.

The purpose of the project is to provide flood control for the Pueblo of Zuni within the Zuni Indian Reservation in west-central New Mexico. A map of the project area is shown in Figure 1. The Bureau of Reclamation began a feasibility study for flood control alternatives in September 1977. Project engineering data in this report was supplied by the Bureau of Reclamation December 1980. Should project plans change or a considerable amount of time elapse before this project is authorized then impacts on fish and wildlife should be re-examined.

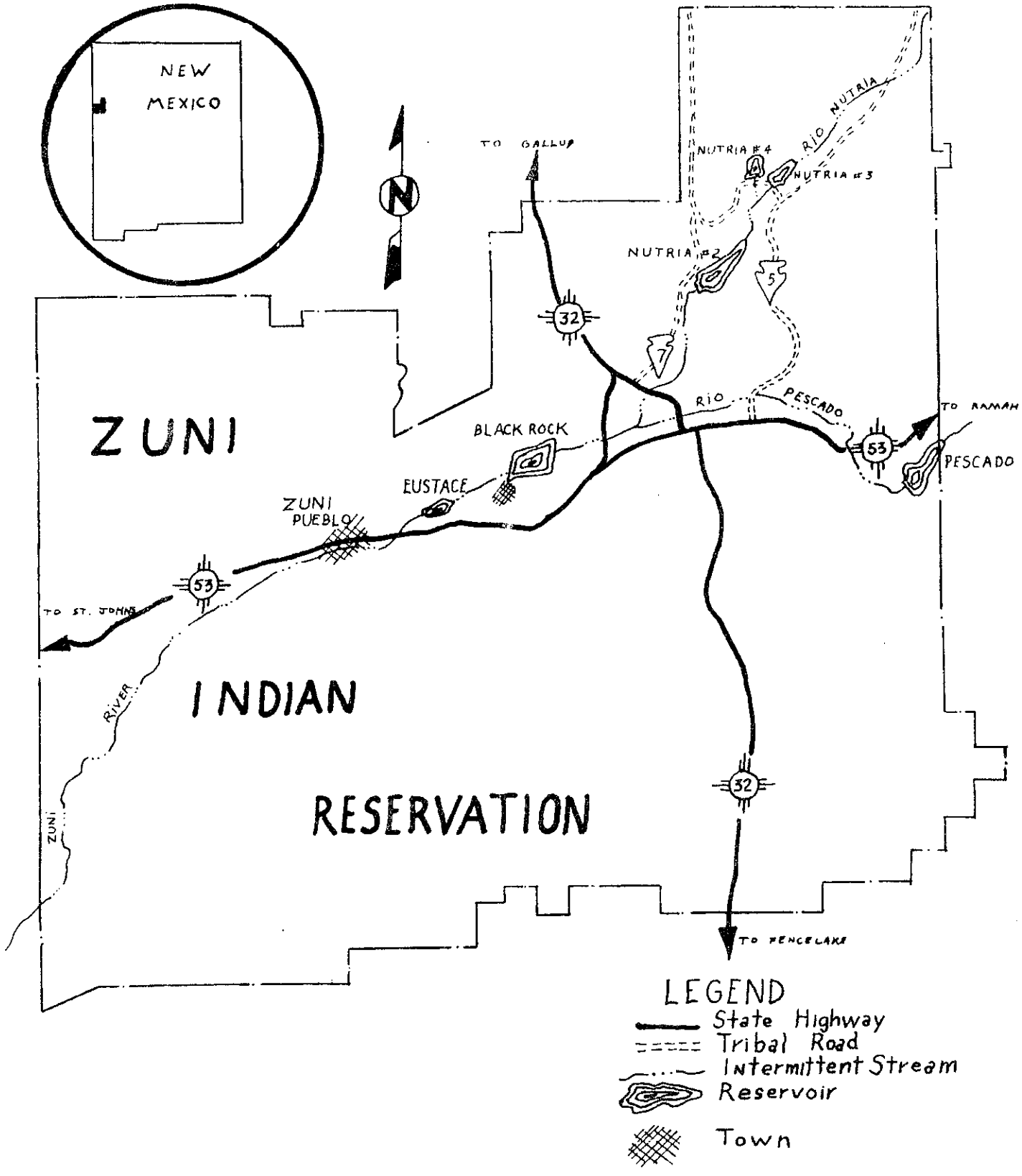


Figure 1. Zuni Indian Reservation, west-central New Mexico.

Fish and wildlife information collected for this project is summarized in the following reports:

1) " Environmental Quality Planning Aid Report," September 12, 1978

2) "Habitat Evaluation Procedure," June 11, 1979

3) "Fishery Management Activities Affecting the Zuni Mountain Sucker, Catostomus discobolus yarrowi," July 1979, Merkel, T.J.

4) "Status of the Zuni Mountain Sucker," July 1979, Smith and Koehn

5) "Biological Inventory, Zuni Project, McKinley County, New Mexico," May 1980

6) "Summary of Zuni Mountain Sucker Transplants," July 11, 1980

7) "Fish Survey of the Streams in the Zuni River Drainage, New Mexico," August 1980

8) "Draft Fish and Wildlife Coordination Act Report," June 1981.

To determine the relative value of fish and wildlife habitats in the project area, Habitat Evaluation Procedures (HEP) have been used. These procedures have been patterned after Daniel and Lamaire, 1974 and were subsequently developed by the Fish and Wildlife Service, 1976. The HEP consists of a non-monetary evaluation that uses habitat units to express a measure of habitat quality, and a user-day or monetary evaluation. The non-monetary evaluation is a measure of the quality of a habitat to animal life. This evaluation is rated on a scale of 0 to 100 where 0 represents no value to animals and 100 represents the best habitat for all the selected species. Impacts on aquatic and terrestrial animals were analyzed for the 100 year project life. The non-monetary HEP field evaluation was conducted June 18-22, 1979. Participants in HEP included biologists from the Bureau of Reclamation, Zuni Fish and Wildlife Department and the Fish and Wildlife Service.

The monetary segment of the evaluation is a measure of consumptive and non-consumptive use of fish and wildlife resources in the study area. The monetary evaluation conforms to procedures established by the Water Resources Council published in the Federal Register, December 14, 1979.

It should be noted that all fish and wildlife enhancement recommendations must be cost shared by a non-Federal public body amounting to 25 percent of such cost (Federal Water Project Recreation Act, PL 93-251).

DESCRIPTION OF THE AREA

The Zuni Project area lies within the Zuni Indian Reservation in west-central New Mexico approximately 25 miles south of Gallup. The 409,000 acre reservation is in McKinley and Valencia Counties. Elevations range from 6,200 to 7,390 feet above sea level. The Reservation receives approximately 11 inches of precipitation per year, the majority of which occurs in the late summer months in the form of thunderstorms. Temperatures in the summer range from 60° to 100°F.

The project area is on the western slope of the continental divide and is drained by the Rio Nutria and Rio Pescado which join in New Mexico to form the Zuni River, a tributary to the Little Colorado River in Arizona. The Rio Nutria is perennial only in the headwaters in Cibola National Forest. The Rio Nutria, Rio Pescado, and Zuni River are intermittent in the project area. Stream flow in the Rio Nutria is augmented by seepage from the existing Nutria 2 Reservoir, while the Rio Pescado receives additional flows from springs and irrigation return flow. Small springs also occur in the headwater areas of many canyons.

Eustace, Black Rock, and Nutria 2 and 4 Reservoirs are in the project area. Eustace Reservoir is one mile east of the Pueblo of Zuni and impounds the Zuni River. Black Rock Reservoir also impounds the Zuni River 1.4 miles upstream from Eustace Reservoir. Nutria Reservoirs 2, 3 and 4 are on the Rio Nutria. Nutria 3 Reservoir has been silted in and only contains shallow water after heavy runoff.

The majority of the soils in the valley bottoms are deep sandy loam with some clay. Rock outcrops are composed of sandstone with shallow sandy soils on the mesas. Erosion is evident throughout the project area resulting in siltation of project area reservoirs. Watershed erosion has resulted from prolonged overgrazing by livestock. Sheep and cattle ranching, as well as small subsistence farming, are the primary uses of the land within the project area. Most of the farming occurs in small irrigated tracts with production limited mainly for the family. Common crops are alfalfa, corn, wheat, oats, and beans. Irrigation systems extending downstream from Black Rock Reservoir provide water for cropland near the Pueblo of Zuni. A smaller diversion dam on the Rio Pescado near Pescado Springs provides irrigation water for cultivated land in the Rio Pescado valley.

HABITAT TYPES

Terrestrial and aquatic habitats consist of mixed shrub, sagebrush, pinon/juniper, juniper, cottonwood/willow, agriculture, wetland reservoir and stream types. A map showing these habitat types can be found in Appendix 1.

The mixed shrub habitat type occurs in lower elevations below the mesas, less than 6,700 feet. Broom snakeweed is the dominant plant species. Rubber rabbitbrush and four-wing saltbush are interspersed with sparse stands of big sagebrush. Some small areas are dominated by blue grama grass, western wheatgrass, cheatgrass and squirreltail grass. Bare ground is prevalent in some areas.

The sagebrush habitat type is also found below the mesas and is composed of dense stands of big sagebrush. Due to overgrazing, bare ground is prevalent under the sagebrush. Blue grama grass is the second most abundant plant. Occasionally sagebrush is interspersed with saltbush, rubber rabbitbrush and broom snakeweed. Portions of the sagebrush areas have small grassland areas.

The pinon/juniper habitat type occurs on benches above 6,700 foot elevation. Pinon pine and one-seed juniper are the dominant species. Ponderosa pine occurs sporadically in this type. Shrubs include Gambels oak, four-wing saltbush, antelope bitterbrush, mountain mahogany, and big sagebrush. Grasses include sideoats grama, blue grama, muttongrass, galleta, sand dropseed and Indian ricegrass.

The juniper habitat type is located in the Zuni River valley and is dominated by one-seed juniper with occasional pinon pine and alligator juniper. Shrubs scattered throughout this type include big sagebrush, broom snakeweed and rubber rabbitbrush. Grasses include blue grama, crested wheat, red three-awn, cheatgrass, sixweeks fescue, Indian ricegrass and squirreltail.

The cottonwood/willow habitat type is located on the upstream side of Black Rock Reservoir and continues upstream on the banks of the Zuni River to the highway crossing. Dominant trees include the Rio Grande cottonwood with some saltcedar and Russian olive in the understory. Dense willow growth occurs on the edges of the cottonwood bosque. Grasses collected in the cottonwood/willow habitat include red three-awn, cheatgrass, sixweeks fescue, galleta and muttongrass. This is the largest cottonwood bosque found in the Zuni River watershed and attracts many species of wildlife, especially birds.

The agriculture habitat type is cultivated for crops or maintained as improved pasture for livestock or has been cultivated in the past and is fallow. Agriculture lands are located north of Highway 53 and west of Black Rock Reservoir. Crops include alfalfa, corn, wheat, oats and beans. Some pastures used for livestock have a variety of grasses including crested wheatgrass, western wheatgrass, sixweeks fescue, Indian ricegrass, and others. Fallow and abandoned fields have vegetation similar to the mixed shrub habitat with a dominance of grasses and forbs.

Wetland habitat occurs downstream from Nutria 2, Black Rock, and Eustace Reservoirs and in the Rio Pescado. These wetlands are persistent emergent

wetlands in the Palustrine system. The Palustrine system includes non-tidal wetlands dominated by trees, shrubs, persistent emergents, and emergent mosses or lichens. These wetlands are dominated by cattails with grasses and sedges occasionally present along the shorelines. A photograph of the wetland below Eustace Reservoir is in Figure 2.

Figure 2. Wetland below Eustace Reservoir

The reservoir habitat type is represented by Eustace, Black Rock and Nutria 2 Reservoirs. The reservoirs are classified as unconsolidated bottom, within the Lacustrine system. The Lacustrine system includes wetlands and deep water habitats which are situated in a topographic depression or a dammed river channel lacking trees, shrubs persistent emergents, emergent mosses or lichens and whose area exceeds 20 acres. Portions of the reservoirs include aquatic beds of submergent vegetation. All the reservoirs receive inflow from intermittent streams. Eustace Reservoir is shown in Figure 3.

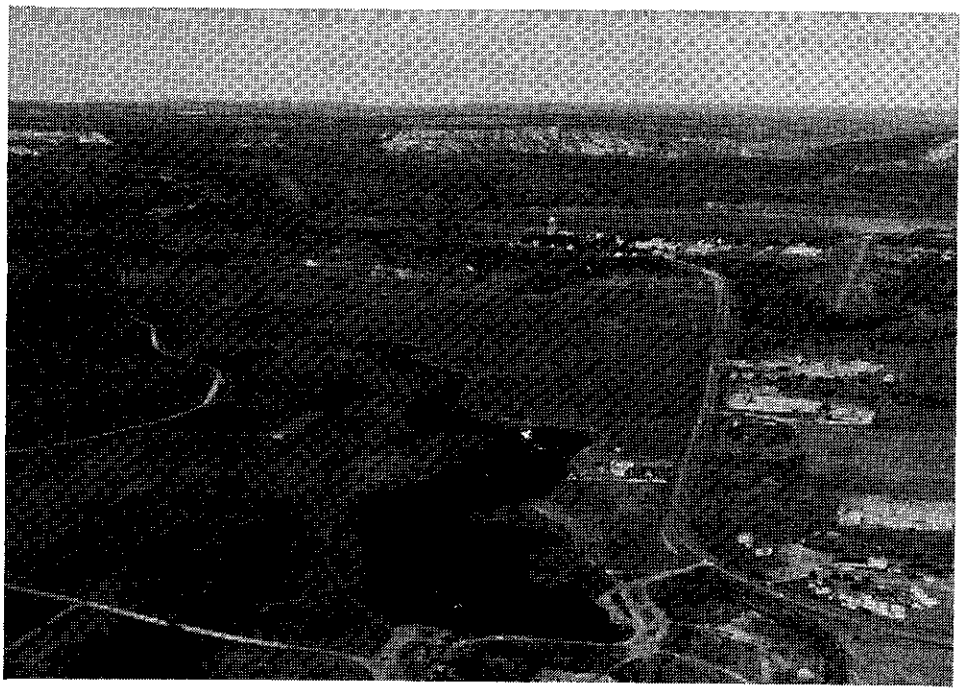


Figure 3. Eustace Reservoir

The stream habitat type is divided into four segments based on physical characteristics. The four separate segments include the Zuni River downstream of Black Rock Reservoir (Lower Zuni River), Zuni River upstream of Black Rock Reservoir, (Upper Zuni River), Rio Pescado and the Rio Nutria downstream of Nutria 2 Reservoir. All of the streams are characterized by a well developed floodplain with some dry portions of channel during part of the year. All the streams are shallow with slow moving water.

The Lower Zuni River is characterized by a straight uniform channel whereas the other three segments are characterized by a stream channel which meanders about the stream bed with an associated change in direction of flow. The Rio Nutria consists of a living substrate, whereas the other three segments have unconsolidated substrate. The Lower Zuni River substrate type ranges from silt-clay to pebble-sand and the Upper Zuni

River and Rio Pescado substrate types range from pebble-sand to cobble-gravel. The Lower Zuni River and the Rio Nutria are dominated by sections of shallow water, small volumes and low surface water velocity. The Rio Pescado is dominated by pools with the Upper Zuni River dominated by sections of deeper water, large volumes of water, and higher surface water velocity.

PLAN OF DEVELOPMENT

Floodplain Management, Yellowhouse Reservoir, and Channelization are the three alternatives proposed by the Bureau of Reclamation to protect the Pueblo of Zuni from floods. Figure 4 shows the locations of the three alternatives. The area of a 100-year flood or flow which has a one percent probability of occurring during any one year is shown in Figure 5.

The Floodplain Management Alternative entails installation of a flood warning system, the relocation of all buildings, residences and other structures that would be damaged by flooding, and zoning the 100-year floodplain to exclude new construction. As flooding occurs and structures receive damage, they would be relocated to areas outside the 100-year flood overflow area. New services such as streets, sewers, electricity and water would be provided. Most of the new structures would be located south of the Zuni River because the land north of the Zuni River is being used for agriculture. No improvement of Black Rock Dam would be made with this alternative.

The Yellowhouse Reservoir Alternative includes a proposed dam located .4 miles upstream of the junction of the Rio Pescado and Rio Nutria blocking these two streams. The dam would be earth filled with a height of 128 feet and a crest length of 2,170 feet. The elevation of the dam crest would be 6,656 feet above sea level. Water would be released through a gated outlet works. The reservoir would store the peak inflow flood of 84,000 cubic feet per second and a volume of 136,500 acre-feet. The 100-year flood would have a volume of 9,960 acre-feet.

The capacity of the reservoir would be 190,860 acre-feet, with a maximum water surface elevation of 6,650 feet above sea level and a maximum water surface area of 5,000 acres. At the maximum flood pool 5.1 miles of the Rio Pescado and 6.0 miles of the Rio Nutria would be inundated.

Dead storage is the volume of water behind the dam which cannot be evacuated by gravity. Dead storage for Yellowhouse Dam would be from 6,528.0 to 6,560.0 feet above sea level with a capacity of 1,400 acre-feet. Exclusive flood control or surcharge is from 6,608.5 to 6,650.0 feet above sea level with a capacity of 146,460 acre-feet of water. Any water above 6,608.5 feet elevation would be quickly evacuated to maintain

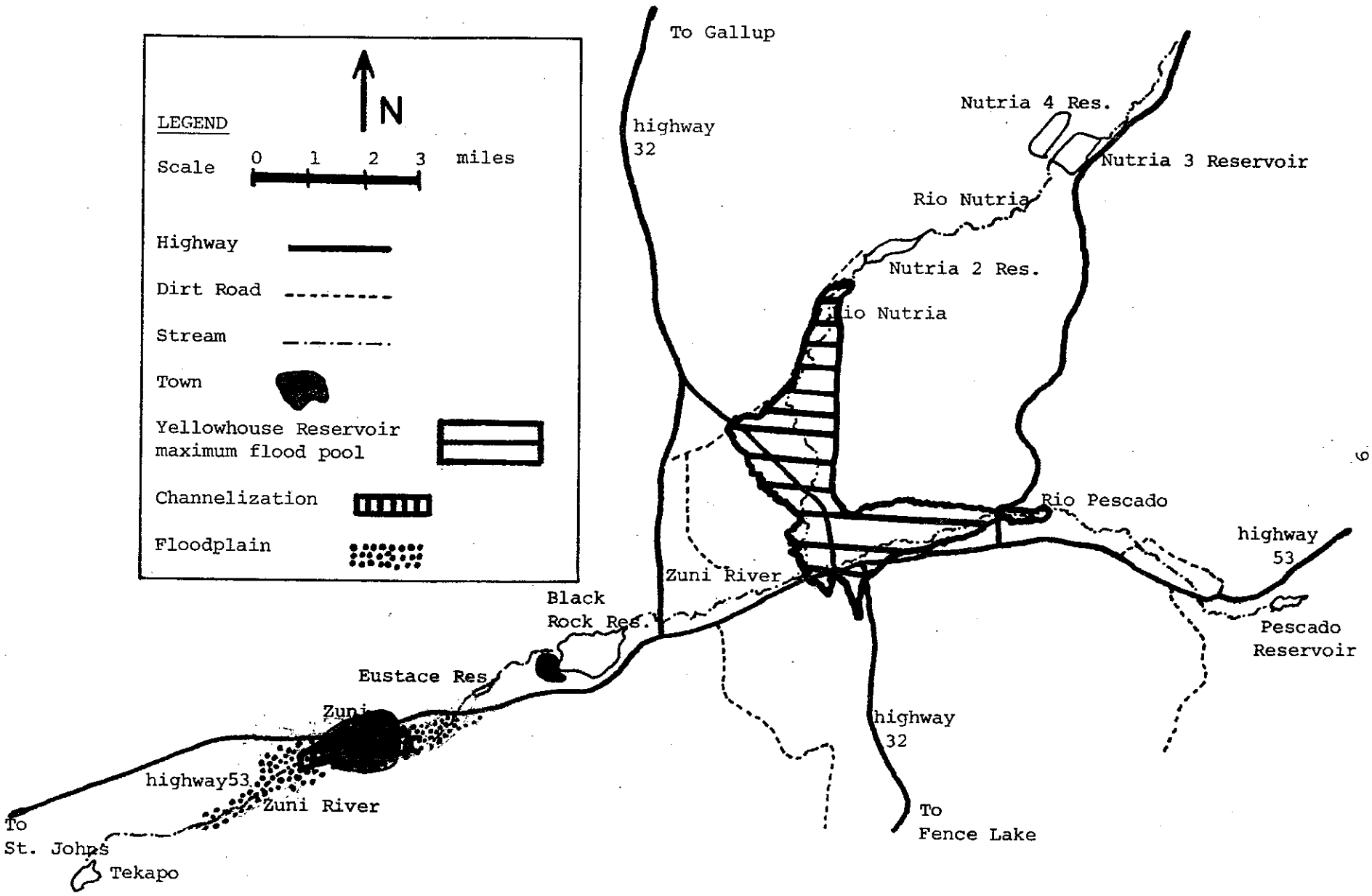


Figure 4. Flood control alternatives proposed by the Bureau of Reclamation for the Zuni Indian Reservation, McKinley County, New Mexico

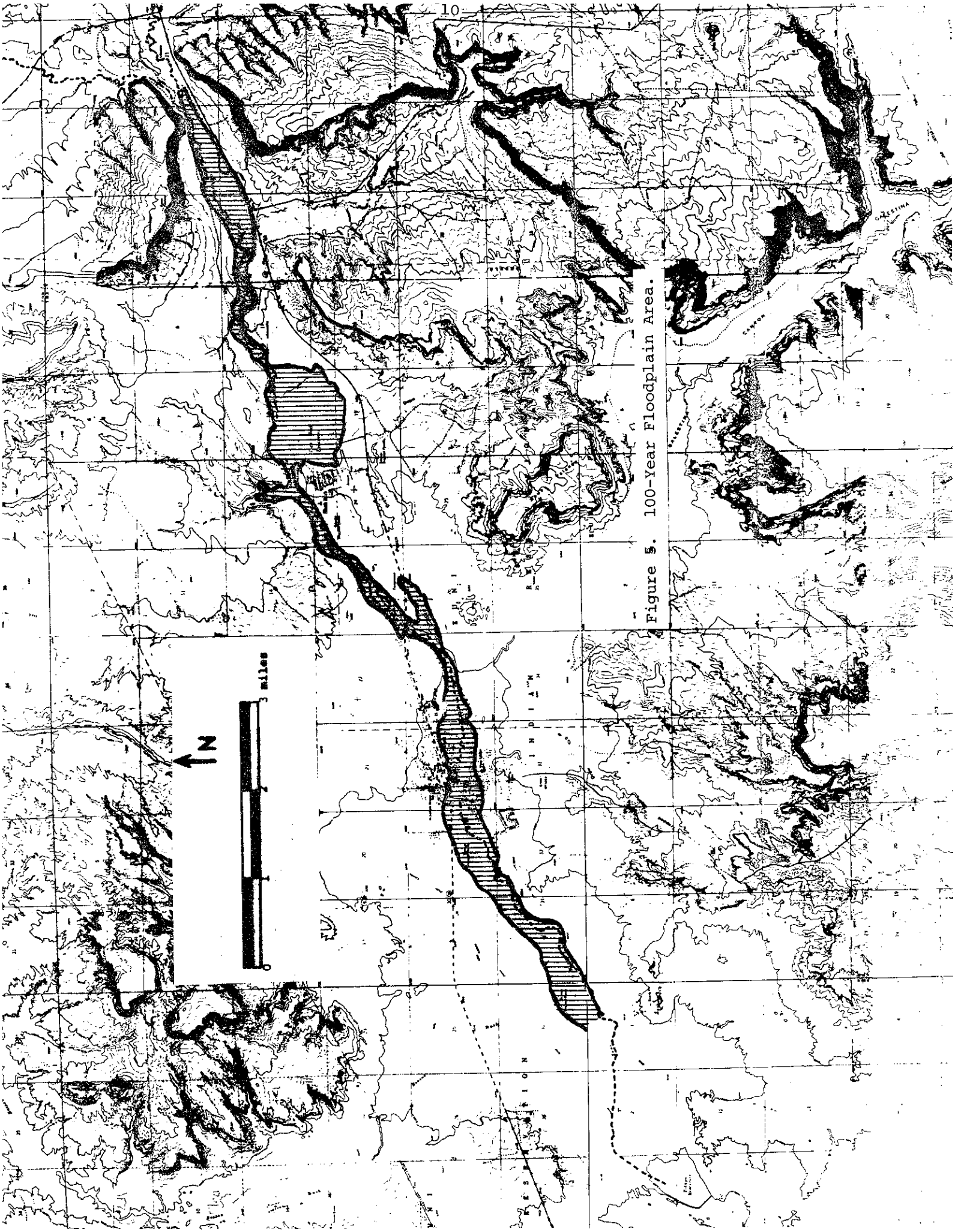


Figure 5. 100-Year Floodplain Area.

flood protection. The outlet works would be designed to release a maximum of 3,000 cubic feet per second in order to minimize flood damage downstream. With the reservoir full it would take 26 days to evacuate surcharge volume.

The net evaporation rate at the reservoir would be 2.8 feet per year. The average sedimentation rate would be 294 acre-feet per year. Average monthly inflows would be lowest during November, January and June and highest during March, April and August. The average annual inflow for the 100-year life of the project would be 5,170 acre-feet. Ninety four out of 100 years the average inflow would be 3,578 acre-feet with the remaining six years having an average inflow of 30,061 acre-feet. Inflows would be highly variable from year to year. Hydrologic analyses indicate a minimum annual inflow of 1,011 acre-feet and a high annual inflow of 33,985 acre-feet. Yellowhouse Reservoir would be dry in some years. The Bureau of Reclamation has indicated that water would only be released for flood control or irrigation purposes and that there would be no minimum pool or reserved water for fishery or recreation. The existing Nutria 2 and 4 Reservoirs upstream from the Yellowhouse site would be managed as before.

With the construction of Yellowhouse Dam approximately 2.5 miles of U.S. Highway 53 would have to be relocated along with telephone lines. Several residences would also have to be moved. Within the maximum flood pool area 326 cultural sites exist. Many of these sites would have to be excavated prior to dam construction.

The spillway, embankment and outlet works of Black Rock Dam would have to be improved with the Yellowhouse Reservor Alternative. The spillway would be designed to release 11,000 cubic feet per second. Construction of Yellowhouse dam would take approximately four years.

The Channelization Alternative would start 1.5 miles downstream of Eustace Reservoir on the Zuni River and continue downstream for 1.67 miles. The channel would be concrete lined with a 300 feet bottom width and dike of approximately 18 feet above the channel bottom with the top of the dikes 75 feet wide. The channel would carry 100-year flood flows of 23,400 cubic feet per second in the lower reach and 20,500 cubic feet per second in the upper reach. In addition to the concrete channel, levees would be built to direct water into the channel.

In addition to the concrete channel, Eustace Dam and Black Rock Dam would have to be removed. Eustace Dam would be breached by a 100-foot wide channel with 4:1 side slopes and riprap through the embankment and silt bed. Black Rock Dam would be removed by excavating a 100 foot wide channel through the dam embankment and reservoir silt. The channel would extend upstream to a point where the Zuni River enters the reservoir. Side slopes would be excavated with a slope of four to one. The bridge in the Pueblo of Zuni would also have to be replaced.

AQUATIC RESOURCES WITHOUT THE PROJECT

Three habitat types occur in the project area; reservoir, stream and wetland. Eustace, Black Rock and Nutria 2 and 4 Reservoirs provide fishing in the project area. Northern pike, channel catfish and largemouth bass are game fish in Eustace Reservoir. Black Rock Reservoir provides fishing for northern pike and limited fishing for channel catfish, green sunfish and largemouth bass. Occasionally rainbow trout are stocked. Rainbow trout are stocked in Nutria 2 Reservoir. Nutria 2 is shallow and some years is not stocked due to lack of water. In spite of attempts to eradicate green sunfish they still overpopulate Nutria 2 resulting in little or no growth in stocked game fish. Fathead minnows are also found in Nutria 2 Reservoir. Nutria 4 Reservoir is stocked with rainbow trout and has recently been stocked with brook trout and channel catfish. Nutria 4 also has had overpopulations of green sunfish.

Of all the reservoirs Nutria 2 provides the best habitat for amphibians followed by Eustace and Black Rock and Nutria 4. Leopard frogs are the most abundant amphibian followed by Woodhouse's toad.

There are no game fish in the streams. Fish habitat in the Lower Zuni River is very poor because of limited water and previous channelization. Fathead minnows and green sunfish are numerous in this stream segment. The Upper Zuni River provides poor habitat for fish due to intermittent flows and lack of pools. Fathead minnows, plains killifish, green sunfish and the Zuni mountain sucker were found in this stream reach during fish surveys conducted in 1978-79, with fathead minnows the most numerous. The Rio Pescado is good habitat for fathead minnows and plains killifish with lesser numbers of green sunfish and the Zuni mountain sucker. The Rio Nutria downstream of Nutria 2 Reservoir provides habitat for the Zuni mountain sucker, fathead minnow, plains killifish and green sunfish, with the fathead minnow the most numerous. This stream stretch is not good habitat for the Zuni mountain sucker. Occasionally when water is spilling from Nutria 2 Reservoir, trout will be washed down into the Rio Nutria resulting in some fishing in the stream.

Amphibians live in the stream areas which contain enough water during the warmer months. The Rio Nutria provides the best habitat in the project area for amphibians followed by the Rio Pescado, Lower Zuni River and Upper Zuni River. Leopard frogs and the Woodhouse's toads are the most abundant amphibian species in this area.

Wetlands are immediately downstream of Nutria 2, Black Rock and Eustace Reservoirs and in the Rio Pescado. The wetlands below Black Rock and Eustace Reservoirs provide habitat for fathead minnows, green sunfish and northern pike. The wetland below Nutria 2 Reservoir contains fathead minnows, plains killifish and green sunfish. The wetlands in the Rio Pescado support good populations of fathead minnows with lesser numbers of

plains killifish and Zuni mountain suckers. Leopard frogs and Woodhouse's toads are more abundant in the wetlands than other amphibians, with leopard frogs the most common.

The aquatic habitats analyzed for each alternative and the present habitat value as determined by HEP is listed in Table 1. There are no anticipated changes in habitat quality in the streams or wetlands in the future. Siltation of the reservoirs will decrease aquatic habitat

Table 1. Aquatic Habitats Analysed in each Alternative with the Area and present Habitat Value as determined by Habitat Evaluation Procedures (1976) conducted June 18-22, 1979.

Habitat	Area or Length	Habitat Value per acre[1]
Floodplain Management		
Stream, Lower Zuni River	5.8 miles	18
Channelization		
Stream, Lower Zuni River	1.7 miles	18
Reservoir, Eustace	19.0 acres	52
Reservoir, Black Rock	224.0 acres	40
Wetland[2]	24.0 acres	36
Yellowhouse Reservoir		
Stream, Upper Zuni River	4.6 miles	19
Stream, Rio Pescado	3.5 miles	51
Stream, Rio Nutria	5.2 miles	43
Reservoir (Black Rock)	224.0 acres	50
Wetland	5.0 acres	36

1. Habitat Values range from 0 to 100 with 100 representing the best.
2. Below Eustace and Black Rock.

quality in the future. Conditions at Eustace are expected to decline in habitat quality with no fishing in 50 years. Black Rock will decline with no fishing expected in 30 years. Nutria 2 Reservoir will decline faster with no fishing in 10 years. Nutria 4 Reservoir will provide fishing for a longer time declining to 0 in 100 years. Mandays of fishing projected for the next 100 years is presented in Table 2.

No Federally listed endangered aquatic species occur in the project area. One State endangered group number two species, the Zuni mountain sucker, occurs in the area. Group two species are defined as species whose prospects of survival or recruitment within the State may become in jeopardy in the foreseeable future.

Table 2. Total mandays of fishing and dollar value projected for the 100 year life of the project.[1]

Reservoir	Mandays of Fishing	Dollar Value
Eustace	50,000	103,500
Black Rock	15,000	31,050
Nutria 2	15,000	31,050
Nutria 4	300,000	621,000

1 A manday of fishing is worth $2.07 according to Principles and Standards as calculated from the Federal Register, December 1979.

Surveys were conducted to determine the distribution of the Zuni mountain sucker, Figure 6. The Zuni mountain sucker, shown in Figure 7, has not been found in reservoirs. The three major streams in the area; Zuni River, Rio Pescado and the Rio Nutria support Zuni mountain suckers located on the Zuni Indian Reservation. The greatest abundance of Zuni mountain suckers in the project area is found in the Rio Pescado. The Rio Pescado is crucial to the survival of this fish on the Reservation. This location of Zuni mountain suckers is one of only three existing in New Mexico. We do not expect habitat conditions for the Zuni mountain sucker to change in the future without the project.

The Zuni tribe is improving the watershed with an intensive range management program. Erosion should decrease, thus decreasing silt loads to the reservoirs thereby extending the lives of the reservoirs. During low flow water years stream pools would fill up with sediment. During high flow water years deep pools would be created by scouring. This has been happening for hundreds of years and would continue. Overgrazing during the past 100 years has contributed to erosion which has created bank erosion along the streams. The wetlands downstream from reservoirs are not expected to change because they are silted in during low stream flow and scoured out during high flows.

TERRESTRIAL RESOURCES WITHOUT THE PROJECT

Terrestrial wildlife include mammals, birds and reptiles. Within the project area eight terrestrial wildlife habitat types occur; cottonwood/willow, wetland, reservoir, sagebrush, mixed shrub, juniper, pinon/juniper and agriculture. For a detailed description of these habitats, see the Habitat Types section.

Figure 6. Fish electroshocking.

Figure 7. Zuni mountain sucker.

Each habitat has special wildlife values. The more common wildlife associated with each habitat are summarized in Table 3. The cottonwood/willow habitat supports an abundance of wildlife. This area has a greater diversity of bird species than any other habitat on the Zuni Indian Reservation or within the Zuni River watershed. Eighty six species of birds have been confirmed using this habitat. Many birds such as the red-winged blackbird and American bittern are dependent on the wetland habitat. Reservoirs in the project area provide a water supply for mammals and birds. Waterfowl use the reservoirs for nesting and for resting and feeding during migration. The reservoirs also provide water for the wetland and cottonwood/willow habitat. A photograph of the cottonwood/willow habitat is in Figure 8.

Sagebrush areas on the Zuni Indian Reservation support species such as the sage thrasher, brewer's sparrow, vesper sparrow and sage sparrow which strongly prefer this habitat. In the mixed shrub habitat desert cottontails utilize the arroyo banks on the Rio Nutria and Rio Pescado for den sites. Reptiles do well in sagebrush habitat due to sparse vegetation, while other animal populations are low. Prairie dogs are limited to the mixed shrub and agriculture habitat on the Reservation. The agriculture habitat supports rabbits and mice which in turn support raptors such as the American kestrel and loggerhead shrike. Botta's pocket gopher is also common, due to the looseness of the soil.

Juniper habitat supports predators such as bobcats, gray fox and coyote. Pinon/juniper habitat is preferred by mule deer on the Reservation. Deer were radio collared and monitored to determine deer use as seen in Figure 9 and 10. The presence of escape cover and browse is essential for their life requirements. Species such as the pinon jay, common bushtit and pinon mouse prefer this habitat.

The terrestrial habitats analyzed for each alternative and the present habitat value as determined by HEP is listed in Table 4. Future wildlife habitat conditions are expected to remain the same for the cottonwood/willow, wetland, sagebrush, juniper and pinon/juniper habitats. Wildlife values will increase in the mixed shrub habitat because of improved range management. Wildlife in the agriculture habitat will also increase because of more irrigation. We expect that without the project there will be more irrigation than there is today. More of the available water will be used and there will be more efficient use of water in the future. Due to additional irrigation there will be less water stored in Black Rock and Eustace Reservoirs. Wildlife species such as waterfowl which depend on reservoirs will decrease.

Endangered wildlife species that may occur in the project area include three Federal endangered species, the black-footed ferret, bald eagle

Table 3. Wildlife species which are commonly found in each habitat type in the Zuni project area, 1978-79.[a]

HABITAT	COMMON SPECIES		
Mixed Shrub	Desert Cottontail	Striped Skunk	Common Raven
	Black-tailed Jackrabbit	Western Meadowlark	Eastern Fence Lizard
	Gunnison's Prairie Dog	Horned Lark	Short-horned Lizard
	Botta's Pocket Gopher	American Kestrel	Gopher Snake
	Deer Mouse	Mountain Bluebird	Western Rattlesnake
	Coyote		
Sagebrush	Black-tailed Jackrabbit	Vesper Sparrow	Sagebrush Lizard
	Deer Mouse	Sage Sparrow	Short-horned Lizard
	Coyote	Common Raven	Gopher Snake
	Sage Thrasher	Eastern Fence Lizard	Western Rattlesnake
	Brewer's Sparrow		
Pinon/juniper	Desert Cottontail	Bobcat	Pinon Jay
	Pinon Mouse	Mule Deer	Common Raven
	White-throated Woodrat	Mountain Chickadee	Hairy Woodpecker
	Coyote	Townsend's Solitaire	Western Rattlesnake
	Gray Fox	Plain Titmouse	
	Striped Skunk	Common Bushtit	
Juniper	Desert Cottontail	Striped Skunk	Pinon Jay
	Deer Mouse	Bobcat	Brewer's Sparrow
	Pinon Mouse	Dark-eyed Junco	Short-horned Lizard
	Porcupine	Gray-headed Junco	Western Terrestrial Garter Snake
	Coyote	Western Bluebird	
	Gray Fox	Common Raven	Western Rattlesnake
Agriculture	Desert Cottontail	Western Meadowlark	Common Raven
	Botta's Pocket Gopher	Mourning Dove	American Kestrel
	Deer Mouse	Starling	
Wetland	Raccoon	Killdeer	American Coot
	American Bittern	Virginia Rail	Western Terrestrial Garter Snake
	Red-winged Blackbird	Sora	
Cottonwood/ willow	Deer Mouse	Great-horned Owl	Yellow-breasted Chat
	Coyote	Common Flicker	Northern Oriole
	Raccoon	Robin	Rufous-sided Towhee
	Bobcat	Warbling Vireo	Chipping Sparrow
	Cooper's Hawk	Yellow Warbler	Western Terrestrial Garter Snake
	Mourning Dove		
Reservoir	Bats	Redhead	Killdeer
	Raccoon	Ruddy Duck	Violet-green Swallow
	Eared Grebe	American Coot	
	Pied-billed Grebe		

[a] Common species are defined as species which can be easily observed during their seasons of occurrence or which can be easily detected by their sign (tracks etc.).

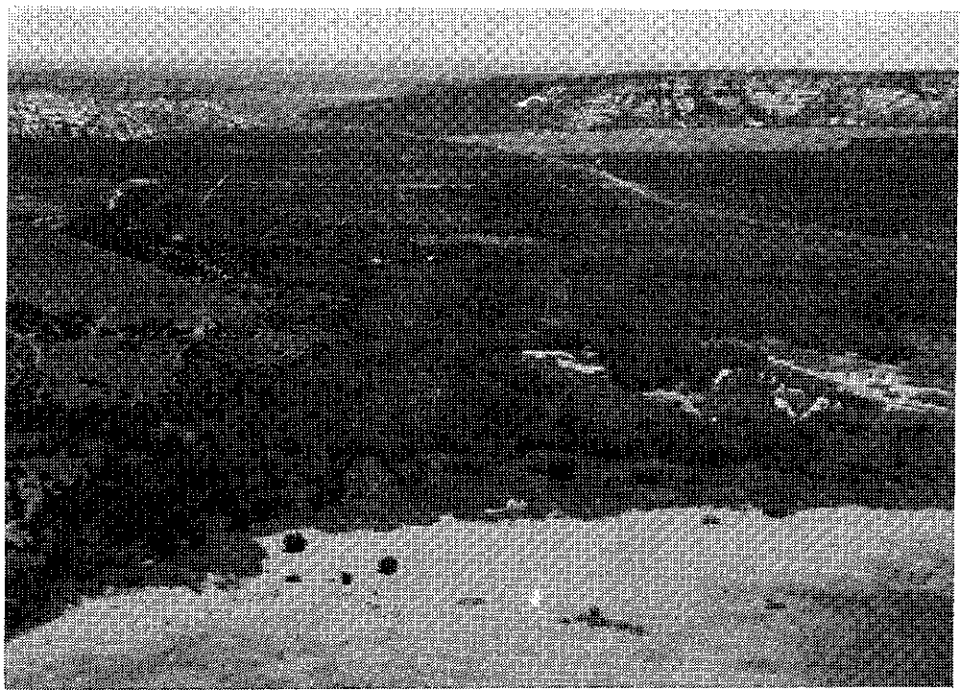


Figure 8. Cottonwood/willow habitat.

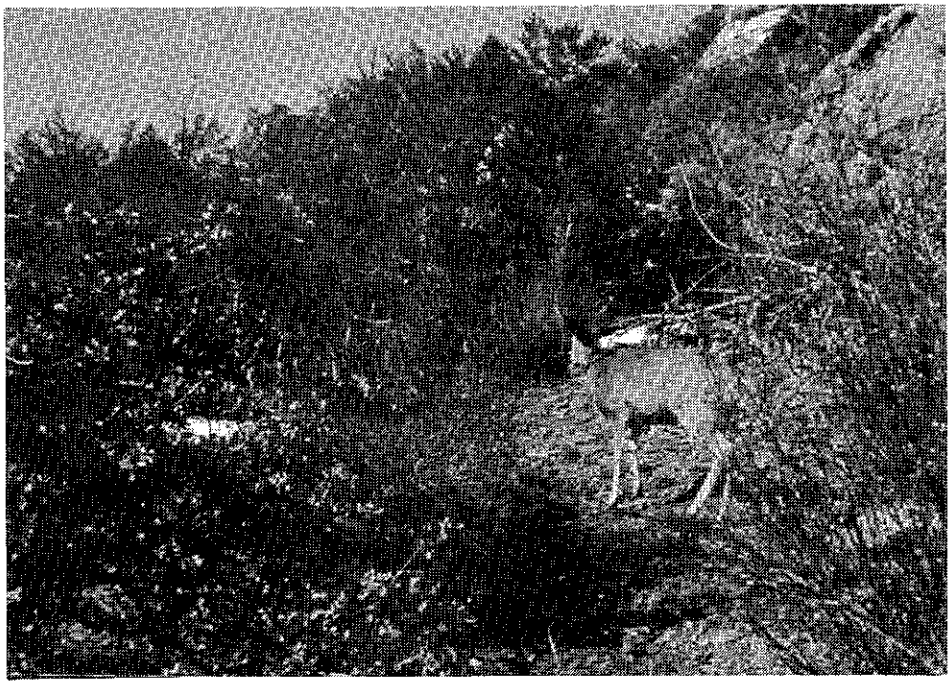


Figure 9. Radio collared deer.

Figure 10. Deer monitoring.

Table 4. Terrestrial Habitat Analyzed in each Alternative with the Area and Present Habitat Value as determined by Habitat Evaluation Procedures (1976) conducted June 18-22, 1979.

Habitat	Area (acres)	Habitat Value per acre[1]
Floodplain Management		
Mixed shrub	110	46
Channelization		
Mixed shrub	45	46
Agriculture[2]	4,040	58
Cottonwood/willow	480	71
Wetland[3]	24	36
Reservoir, Eustace	19	44
Reservoir, Black Rock	224	74
Yellowhouse Reservoir		
Mixed shrub	1,622	46
Agriculture	4,045	58
Cottonwood/willow	480	71
Wetland	5	36
Reservoir (Black Rock)	224	74
Sagebrush	363	55
Juniper	1,175	51
Pinon/juniper	5,666	57

1. Habitat Values can range from 0 to 100 with 100 representing the best.
2. Includes cropland, pasture land and fallow fields.
3. Wetlands below Eustace and Black Rock Reservoirs.

and peregrine falcon. In addition, the red-headed woodpecker is listed on the New Mexico State Endangered Group Number two list. Group two species are defined as species whose prospects of survival or recruitment within the State may become in jeopardy in the foreseeable future.

Black-footed ferret surveys were conducted in 1978 and 1979 in the area. The mixed shrub habitat north of Nutria 4 Reservoir appeared to be the most promising area, however, our surveys did not confirm the ferret. The black-footed ferret could inhabit prairie dog towns found within the Yellowhouse Alternative area. No prairie dog towns are presently found within the Channelization and Floodplain Management Alternative areas. However, prairie dog towns could become established in these areas in the future. Habitat conditions in the Yellowhouse Alternative area for the black-footed ferret are not expected to change significantly in the future.

The bald eagle is a winter visitor to reservoirs in the project area. All the reservoirs, in combination, supply food for bald eagles during this period. Future conditions of these reservoirs will be less favorable for bald eagles since reservoirs will continue to be filled with sediment and irrigation will increase, thus decreasing the water in the reservoirs.

The peregrine falcon has been sighted several times in the project area. All of the habitats could supply prey, chiefly birds and rodents, for the falcon. However, since this species has been sighted so infrequently, it is doubtful that this species is dependent on the project area for survival. Peregrine falcon sightings are probably birds flying to a destination outside of the project area. We do not expect habitat conditions for the peregrine to change in the project area.

Within the project area the red-headed woodpecker might be found in the cottonwood/willow habitat. This habitat is preferred by this species however its presence has not been confirmed in the project area. Habitat conditions are not expected to change in the cottonwood/willow habitat for the red-headed woodpecker.

FLOODPLAIN MANAGMENT IMPACTS

This alternative would improve the aquatic habitat of the Lower Zuni River through the Pueblo of Zuni. As more people move out of the floodplain there would be less human disturbance. In addition channel work that is periodically accomplished to control water flows would no longer be necessary.

Some mixed shrub habitat, 110 acres, would be eliminated by the relocation of the town now in the floodplain. Vegetation would increase near the river channel in the vacated floodplain area. Habitat conditions for the

red-headed woodpecker should increase. A summary of habitat units lost or gained with this alternative is presented in Table 5.

Table 5. Aquatic and Terrestrial Habitat Units With and Without the Three Alternatives.[1]

Habitat	Habitat Units (Hu) per Year		
	Present Hu	Future Hu change w/o project[2]	Future Hu change with project[2]
Floodplain Management-Aquatic			
Stream, Lower Zuni River	75.6	0.0	+14.7
Floodplain Management-Terrestrial			
Mixed Shrub	5,060.0	+209.0	-3,877.0
Cottonwood/willow	0.0	0.0	+1,265.0
Yellowhouse Reservoir-Aquatic			
Stream, Rio Pescado	132.6	0.0	-98.7
Stream, Rio Nutria	163.4	0.0	-144.1
Stream, Upper Zuni River	64.6	0.0	-28.6
Reservoir, Black Rock	11,200.0	-4,760.0	-11,200.0
Reservoir, Yellowhouse	0.0	0.0	+7,595.0
Wetland	180.0	0.0	+78.5
Yellowhouse Reservoir-Terrestrial			
Mixed shrub	74,612.0	+3,244.0	-66,392.0
Sagebrush	19,965.0	0.0	-12,766.0
Pinon/juniper	322,962.0	0.0	-37,769.0
Juniper	59,925.0	0.0	-11,916.0
Cottonwood/willow	34,080.0	0.0	-2,840.0
Agriculture	234,610.0	+7,078.8	+17,696.8
Wetland	180.0	0.0	0.0
Reservoir, Black Rock	16,576.0	-2,520.0	-7,840.0
Reservoir, Yellowhouse	0.0	0.0	+26,727.1
Channelization-Aquatic			
Stream, Lower Zuni River	21.6	0.0	-16.0
Reservoir, Eustace	988.0	-362.0	-988.0
Reservoir, Black Rock	8,960.0	-3,283.0	-8,960.0
Wetland	853.0	0.0	-853.0
Channelization-Terrestrial			
Mixed shrub	50,508.0	-12,748.8	+141,389.2
Cottonwood/willow	34,080.0	0.0	-28,350.0
Agriculture	234,320.0	+6,060.0	-164,533.5
Wetland	820.0	0.0	-820.0
Reservoir, Eustace	836.0	-102.0	-836.0
Reservoir, Black Rock	16,576.0	-2,024.0	-16,576.0

1 A habitat unit is the area in acres, multiplied by the habitat value, as determined from Habitat Evaluation Procedures.

2 The figures represent losses or gains each year for the project life of 100 years. Total habitat units lost or gained can be calculated by multiplying the above figures by 100.

YELLOWHOUSE RESERVOIR IMPACTS

Inundation and siltation caused by the reservoir pool would eliminate aquatic stream habitat in 2.6 miles of the Rio Pescado and 3.8 miles of the Rio Nutria. Figure 11 shows the proposed site of Yellowhouse Dam. The dam would be located between the two mesas in the upper right corner of the photo. Because there would be no water release to the Upper Zuni River from the proposed dam in the winter, 4.6 miles of aquatic habitat would decrease in value. Lack of water storage in Black Rock Reservoir would eliminate 15,000 mandays of fishing during the project life valued at $31,050.

Since inflows into Yellowhouse Reservoir during most years would be used for irrigation, there would be no fishery except during the first five years of the project and during high inflow years, which would occur six times in 100 years. Yellowhouse Reservoir would provide 33,000 mandays of fishing during the 100 year project life. Taking into consideration other reservoirs in the project area this alternative would result in no net gain of mandays of fishing as displayed in Table 6.

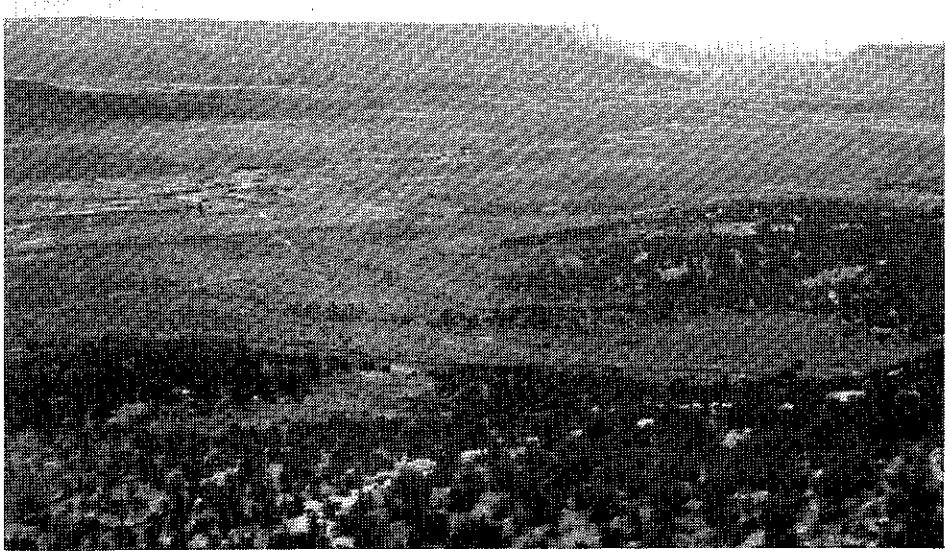


Figure 11. Proposed site of Yellowhouse Dam.

Table 6. Projected Mandays of fishing in each Reservoir for the 100 year Project Live, without and with Yellowhouse Reservoir

Reservoir	Mandays of Fishing without Yellowhouse	Mandays of Fishing with Yellowhouse
Eustace	50,000	48,000
Black Rock	15,000	0
Nutria 2	15,000	13,000
Nutria 4	300,000	286,000
Yellowhouse	0	33,000
Total	380,000	380,000

Siltation of the reservoir pool and inundation during high runoff would eliminate the Zuni mountain suckers in the Rio Pescado. This location is one of three locations where this fish exists today. This loss would increase the chances of the extinction of this unique subspecies and also increase the chances of this species being listed Federally.

Stored water behind Yellowhouse Dam will inundate 1,590 acres of mixed shrub, 223 acres of sagebrush, 61 acres of pinon/juniper and 269 acres of juniper. The relocation of Highway 53 south of Yellowhouse Reservoir would eliminate seven acres of mixed shrub, 26 acres of pinon/juniper and 17 acres of juniper. In addition, the new highway location would pass through a mule deer fawning area causing a decrease in the number of deer on Cheama Mesa. The new road would cause an increase in deer road kills and poaching. Black Rock Reservoir, 224 acres, would be lost for wildlife use in the winter due to no winter water storage. The cottonwood/willow habitat at Black Rock Reservoir would be expected to decrease in size and wildlife value because of the lack of stored water and flooding it currently experiences every other year.

It is expected that a five acre wetland would be created below Yellowhouse Dam due to seepage and water releases, which would benefit wildlife. Water stored in Yellowhouse during the winter could provide some habitat for wintering waterfowl. During years of high runoff benefits to fish and wildlife would increase in the reservoir area. Table 5 displays loses and gains of habitat units for the Yellowhouse Reservoir Alternative.

CHANNELIZATION IMPACTS

The concrete channel would eliminate 1.67 miles of the Zuni River through the Pueblo of Zuni. Black Rock Reservoir, 224 acres and Eustace Reservoir, 19 acres, would be eliminated since these dams would be breached. This

would eliminate 65,000 mandays of fishing at a projected loss of $134,550. The wetlands below Black Rock, 11 acres, and Eustace, 13 acres, would be lost five years after project construction because of the loss of water currently provided by the reservoirs.

The concrete channel would eliminate 33 acres of agriculture habitat. An additional 3,500 acres of agriculture habitat would become mixed shrub habitat because of the removal of the irrigation system at Black Rock Reservoir. Part of the town would be relocated because it is now in the path of the channel. The town relocation would eliminate 45 acres of mixed shrub. The cottonwood/willow habitat would decrease from 480 to 30 acres 25 years after project construction. The cottonwoods are present because of the high water table and periodic inundation as a result of Black Rock Dam. This alternative would remove these conditions and only the cottonwoods along the stream channel would remain. This alternative would eliminate habitat which could be occupied by the red-headed woodpecker. Habitat units lost or gained as a result of the Channelization Alternative is summarized in Table 5.

DISCUSSION

Watershed treatment and range management should be a part of each proposed alternative. These measures on the Zuni Indian Reservation and within the Zuni River watershed would improve aquatic and terrestrial habitats. Less erosion would allow streams, reservoirs and wetlands to maintain their aquatic values longer. In addition these measures would increase vegetation and would in turn increase wildlife values. These suggestions should be coordinated with the Zuni Tribe and the Soil Conservation Service.

Floodplain Management would result in beneficial impacts. Aquatic habitat would improve because the stream would no longer have to be channelized. We estimate the Lower Zuni River habitat would have an increase of 14.7 habitat units per year with the project. Restricting vehicle use and livestock from the floodplain would further increase wildlife values. Because of less disturbance in the floodplain, vegetation would increase also increasing terrestrial wildlife value, an estimated 1,265 habitat units each year.

Cottonwoods should be planted to increase the value of the 110 acres of floodplain through the Pueblo of Zuni for wildlife. The area should be plowed first and then planted with cottonwoods. Each tree site should be augered down to the water table to help the cottonwood roots reach ground water. The cottonwoods should be planted as seedlings from the same variety of Populus fremontii found at Black Rock Reservoir. The cottonwoods should be watered for at least one growing season and additional watering the next growing season if necessary. Trees should be protected from livestock and wildlife for two years to insure success. Approximately 100 trees should

be planted per acre. Dr. Bertin Anderson, Blythe, California has done some revegetation near the Colorado River in Arizona. He estimates that cottonwood planting would cost about $2,500 per acre for one year of work. Our proposed plantings would cost about $275,000 for the 110 acres.

Beneficial impacts due to the Yellowhouse Reservoir alternative would include the creation of a five acre wetland below the dam, and an increase in habitat quality in the agriculture habitat. The wetland would create 78.5 aquatic habitat units per year and 172.0 terrestrial habitat units per year. The agriculture habitat would increase by 10,618 habitat units per year.

Yellowhouse Reservoir would cause the loss of Zuni mountain suckers in the Rio Pescado. Creation of habitat in the Rio Pescado upstream of the maximum pool of Yellowhouse Reservoir would mitigate the loss of the suckers. Increasing stream flow in the Rio Pescado by using water which is now used for irrigation would create habitat for fry, juvenile and adult suckers. Spawning for the sucker can be insured by constructing a spawning bed. To insure access to the spawning bed fish barriers would have to be removed. Details of the plan are presented in Appendix 2. Due to this plan five acres of wetlands along the Rio Pescado would be eliminated because of changes in the Rio Pescado.

To mitigate the loss of habitat in Black Rock Reservoir 100 acre-feet of water should be stored in Black Rock Reservoir in the winter. To mitigate the loss of fish habitat in Black Rock Reservoir, the trees and shrubs in the reservoir pool area of Yellowhouse Reservoir should not be removed during dam construction. The trees and shrubs would provide valuable cover for fish.

To maintain the cottonwood/willow habitat 800 acre-feet of water should be released from Yellowhouse in the spring every five years in order to flood the cottonwoods and willows for several weeks. This would encourage recruitment of this habitat. The releases should flood the area during early June. Elimination of grazing in this area should also be implemented to insure sapling survival. Fencing the cottonwood/willow habitat would cost $52,500.

The reservoir pool and highway construction would eliminate mixed shrub, sagebrush, pinon/juniper and juniper totaling 2,193 acres and aquatic habitat in the Rio Nutria and Rio Pescado. Habitat units lost every year are as follows; -66,392.0 mixed shrub, -12,766 sagebrush, -37,769 juniper, -2,840.0 cottonwood/willow, -7,840.0 Black Rock, stream, Rio Nutria -144.1, stream, Rio Pescado -98.7, Black Rock aquatic -8,960.0. Because of the abundance of these habitats on the Zuni Reservation and the possibility of creating higher value habitats, an area should be set aside for wildlife use for mitigation. The area should encompass Cheama and Radio Shack Mesas and the Zuni River valley from the proposed dam

site down to the paved road crossing over the Zuni River. The area totals 6,339 acres and includes four habitats; pinon/juniper, juniper, mixed shrub and sagebrush.

The two mesas and Zuni River valley bottom should be fenced to prevent livestock and vehicle access. Fencing the management area would require 2.5 miles of barb wire for Cheama Mesa, 1.5 miles for Radio Shack Mesa and 2.2 miles for the valley bottom. The cost of fencing would be $77,500 with $100 per year maintenance. The total cost of fencing would be $87,500 for the project life.

Cottonwoods should be planted along the Zuni River below Yellowhouse Dam. The plantings should follow the same procedures as mentioned in the Floodplain Management discussion. Cottonwoods should be planted within 100 feet of the Zuni River on both sides. Plantings should start at the confluence of the Rio Nutria and Zuni River and continue downsteam for 2.5 miles to the paved road bridge over the Zuni River covering 60 acres. Planting cottonwoods would cost $2,500 per acre for a total of $150,000 for the 60 acres. The total cost of this mitigation would be $237,500.

A highway route should be chosen to miss the fawning area on Cheama Mesa, for example a route running across the south end of Cheama Mesa. This highway alignment would require less mitigation. The proposed mitigation management area could be reduced in size by not including Radio Shack Mesa. This would decrease mitigation cost by $18,750.

Wetland enhancement could be accomplished by construction of wetlands directly below Nutria 4 and 3 Reservoirs. Thirty acres of wetlands could be created with enhancement of 1,725 aquatic habitat units per year and enhancement of 1,536 terrestrial habitat units per year. The initial excavation using a dragline would cost about $500,000. This includes the cost of hauling the excavated material away, planning and supervising the contractor. Every 20 years additional work on the wetland would be required, costing about $15,000 each time. The total cost would be approximately $560,000.

Yellowhouse Reservoir could provide additional mandays of fishing if the water could be managed strictly for the fisheries. A trout fisheries could be established during the first 15 years of the project by reserving 3,000 acre-feet of water. Stocking catchable size trout would cost approximately $18,000 per year. During this time the water depth would be sufficient to allow fish stocking and growth. With this management Yellowhouse Reservoir would provide 70,500 mandays of fishing during the 100 year project life. Taking into consideration the other reservoirs in the project area this alternative would result in a net gain of 25,250 mandays of fishing for the 100 year project life as displayed in Table 7.

Table 7. Projected Mandays of Fishing in each Reservoir for the 100 year Project Life, without and with Yellowhouse Reservoir and Fishery Enhancement.

Reservoir	Mandays of Fishing without Yellowhouse	Mandays of Fishing with Yellowhouse	Mandays of Fishing with Yellowhouse Enhancement
Eustace	50,000	48,000	47,000
Black Rock	15,000	0	0
Nutria 2	15,000	13,000	12,000
Nutria 4	300,000	286,000	275,750
Yellowhouse	0	33,000	70,500
Total	380,000	380,000	405,250

The agriculture habitat could be enhanced for wildlife by planting shelterbelts. This would increase terrestrial habitat units by 10,618 per year. A four row shelterbelt composed of 80 trees per row would cost $650. This would include plowing the furrows, purchasing the trees and labor for planting and irrigating; Soil Conservation Service estimate. After the first year planted trees which do not survive should be replaced. Each shelterbelt should be fenced and maintained, estimated to cost as much as $1,700 per shelterbelt. At least four shelterbelts per section should be planted for a total of 25 shelterbelts. Maintenance of the shelterbelts would cost $100 per year. The total cost for the 100 years would be approximately $70,000.

The Channelization Alternative would eliminate Black Rock and Eustace Reservoirs for a loss of 8,960 aquatic and 16,576 terrestrial habitat units annually for Black Rock and 988 aquatic and 836 terrestrial habitat units annually for Eustace. Two wetlands would be eliminated, one below Black Rock Dam and another below Eustace Dam for a total loss of 850 aquatic and 820 terrestrial habitat units annually. Habitat units would be lost in the cottonwood/willow habitat totaling 28,350. Some agriculture habitat would be lost totaling 164,533.5 terrestrial habitat units. Because of the many adverse impacts caused by this alternative to valuable and scarce habitats mitigation would not be possible.

Summary

Watershed treatment and range management which would increase plant growth and decrease erosion should be included with all alternatives studied. The Floodplain Management Alternative would provide aquatic and terrestrial enhancement. Further enhancement would result if vehicle access and livestock grazing in the floodplain are restricted and cottonwoods planted. Benefits of the Yellowhouse Reservoir Alternative include an increase in

habitat units in the agriculture habitat. Mitigation for the Yellowhouse Reservoir Alternative includes water storage in Black Rock Reservoir in the winter, creation of Zuni mountain sucker habitat upstream of Yellowhouse Reservoir, not removing trees and shrubs in the maximum pool area of Yellowhouse Reservoir, water releases from the dam to flood the cottonwood/willow habitat, cottonwood planting below Yellowhouse Dam, a different Highway 53 alignment and a management area including Radio Shack and Cheama Mesas and the juniper area below the dam. Enhancement for the Yellowhouse Alternative includes creation of wetlands, managing Yellowhouse Reservoir for a fishery and planting shelterbelts in the agriculture habitat. The Channelization Alternative would eliminate two reservoirs, two wetlands, the cottonwood/willow habitat and the Lower Zuni River habitat. Losses and gains in habitat units for each alternative is summarized in Table 8. Figure 12 is a map showing mitigation and enhancement areas.

Table 8. Aquatic and Terrestrial Habitat Units[1] With the Three Alternatives with mitigation and enhancement.

Habitat	Habitat Units (Hu) per Year[2] Future Hu change with project	Future Hu change with mitigation	Future Hu change with enhancement[3]
Floodplain Management-Aquatic			
Stream, Lower Zuni River	+14.7	+14.7	+14.7
Floodplain Management-Terrestrial			
Mixed Shrub	-3,877.0	-3,877.0	-3,877.0
Cottonwood/willow	+1,265.0	+1,265.0	+2,585.0
Yellowhouse Reservoir-Aquatic			
Stream, Rio Pescado	-98.7	-98.7	-98.7
Stream, Rio Nutria	-144.1	-144.1	-144.1
Stream, Upper Zuni River	-28.6	-28.6	-28.6
Reservoir, Black Rock	-11,200.0	-11,200.0	-11,200.0
Reservoir, Yellowhouse	+2,977.0	+2,977.0	+3,347.5
Wetland	+78.5	0.0	+793.5
Yellowhouse Reservoir-Terrestrial			
Mixed shrub	-66,392.0	-66,392.0	-66,392.0
Sagebrush	-12,766.0	-12,718.0	-12,718.0
Pinon/juniper	-37,769.0	+6,785.3	+6,785.3
Juniper	-11,916.0	-7,938.5	-7,938.5
Cottonwood/willow	-2,840.0	+323.5	+323.5
Agriculture	+17,696.8	+17,696.8	+21,236.3
Wetland	+172.0	0.0	+793.5
Reservoir, Black Rock	-7,840.0	-5,320.0	-5,320.0
Reservoir, Yellowhouse	+26,727.1	+26,727.1	+26,727.1
Channelization-Aquatic			
Stream, Lower Zuni River	-16.0	-16.0	-16.0
Reservoir, Eustace	-988.0	-988.0	-988.0
Reservoir, Black Rock	-8,960.0	-8,960.0	-8,960.0
Wetland	-853.0	-853.0	-853.0
Channelization-Terrestrial			
Mixed shrub	+141,389.2	+141,389.2	+141,389.2
Cottonwood/willow	-28,350.0	-28,350.0	-28,350.0
Agriculture	-164,533.5	-164,533.5	-164,533.5
Wetland	-820.0	-820.0	-820.0
Reservoir, Eustace	836.0	-836.0	-836.0
Reservoir, Black Rock	-16,576.0	-16,576.0	-16,576.0

1 A habitat unit is the area in acres, multiplied by the habitat value, as determined from Habitat Evaluation Procedures.

2 The figures represent losses or gains each year for the project life of 100 years. Total habitat units lost or gained can be calculated by multiplying the above figures by 100.

3 Enhancement also includes complete mitigation.

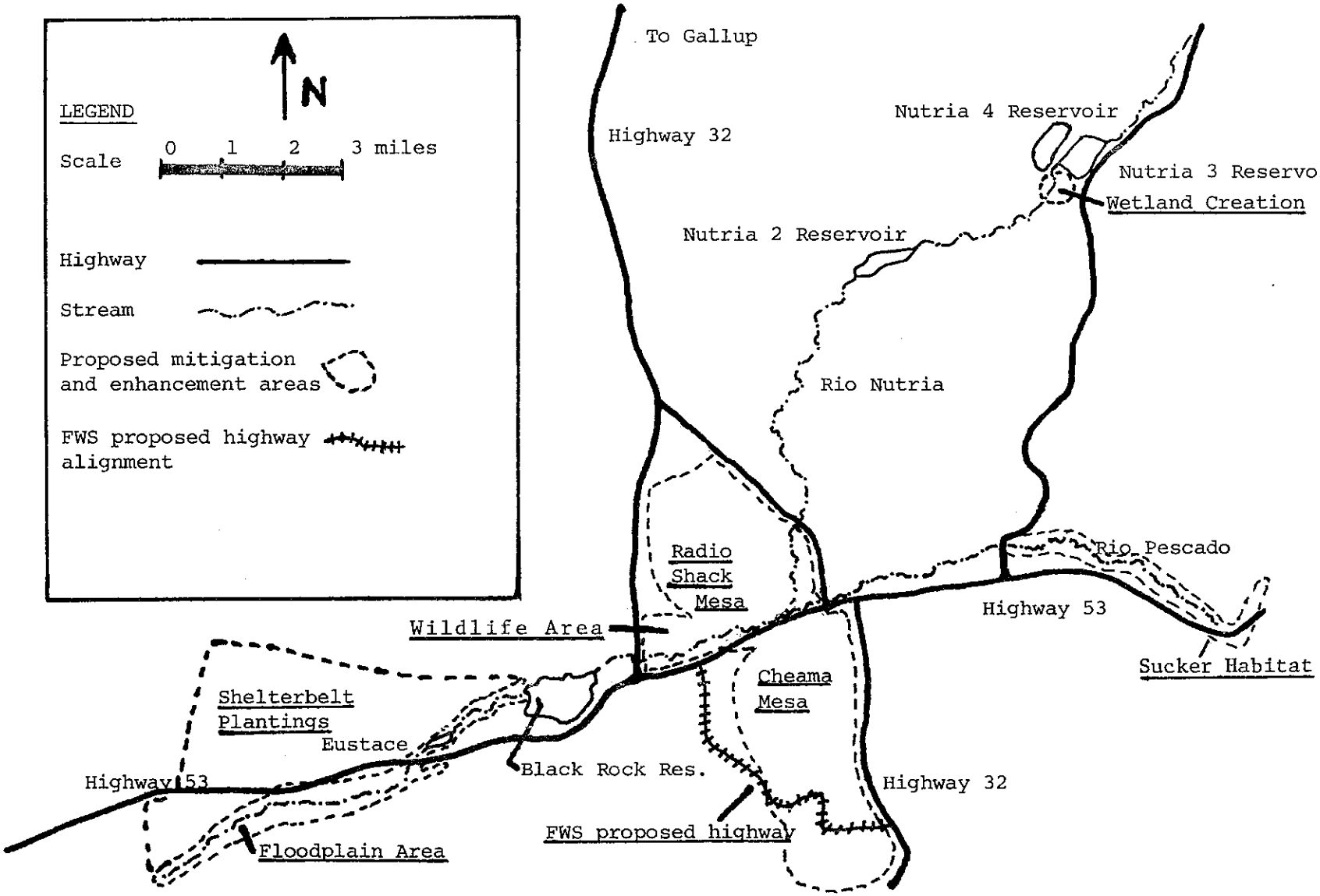


Figure 12. Mitigation and Enhancement Areas for the Floodplain Management and Yellowhouse Reservoir Alternatives.

Conclusions

Floodplain Management is the only alternative presented by the Bureau of Reclamation which would result in beneficial fish and wildlife impacts. We oppose the Channelization Alternative because of the many adverse and unmitigatable habitat impacts.

Our proposed mitigation plan for Yellowhouse Reservoir would cost $237,500 for the wildlife area, $438,000 for creation of Zuni mountain sucker habitat and $52,500 to fence the cottonwood/willow area for a total of $728,000. Our proposed enhancement measure for the Floodplain Management Alternative area would cost $275,000 for the cottonwood planting. Our proposed enhancement measures for the Yellowhouse Reservoir Alternative area would cost $70,000 for shelterbelt planting in the agriculture habitat and $560,000 for wetland creation.

The Bureau of Reclamation should determine if any of the listed threatened and endangered species would be effected as required by Inter-agency Cooperative Regulation (January 4, 1978; 43 FR 870-876). Without mitigation, the Yellowhouse Reservoir Alternative would eliminate one of three remaining areas where the State endangered fish, the Zuni mountain sucker still exists.

Recommendations

Based on our evaluation of fish and wildlife impacts of the proposed alternatives provided by the Bureau of Reclamation December 1980 the Fish and Wildlife Service recommends that:

1. The Floodplain Management Alternative be adopted.

2. Channelization of the Zuni River be dropped from further consideration.

3. Mitigation and enhancement of fish and wildlife be included in the authorizing legislation as project purposes.

4. Watershed treatment and range management be included in every alternative.

5. If Floodplain Management is adopted the following enhancement measures be included:

   a) restrict livestock grazing and vehicle access in the floodplain
   b) plant cottonwood trees in the floodplain.

6. If Yellowhouse Reservoir is adopted the following mitigation measures be included at project costs:

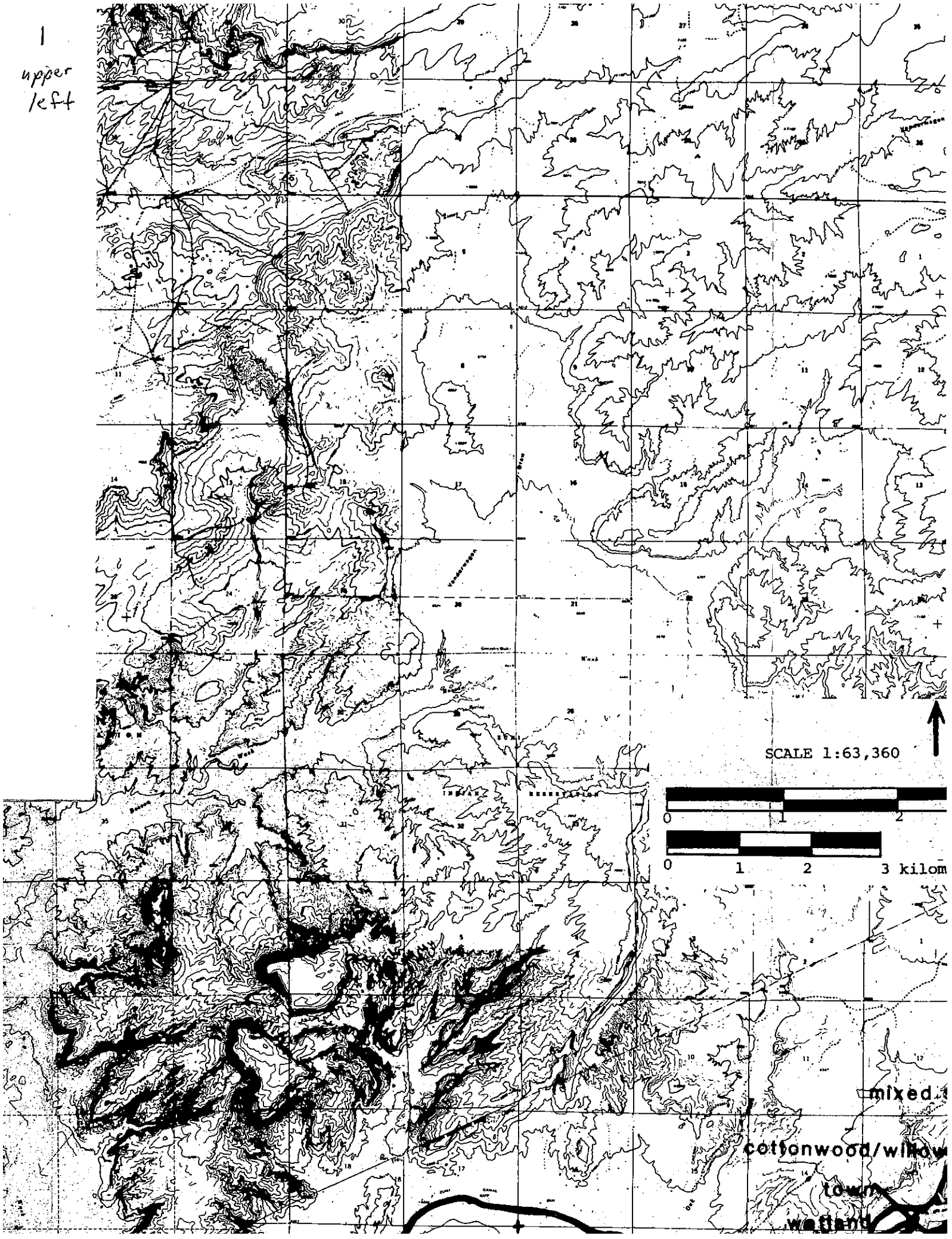
   a) store a minimum of 100 acre-feet of water in Black Rock Reservoir in the winter
   b) create Zuni mountain sucker habitat upstream of Yellowhouse Reservoir as presented in Appendix 2
   c) trees and shrubs should not be removed from the reservoir basin
   d) release large flows from Yellowhouse Reservoir, a minimum of 800 acre-feet of water, in the spring every five years to flood the cottonwood/willow habitat for several weeks
   e) fence off the cottonwood/willow area and prevent livestock trespass
   f) establish a wildlife area on Cheama and Radio Shack Mesas and the juniper area below Yellowhouse Dam
   g) a different alignment of Highway 53 south of Cheama Mesa.

7. If Yellowhouse Reservoir is adopted the following enhancement measures be included:

   a) creation of wetlands directly below Nutria 3 and 4 Reservoirs
   b) establish a fishery in Yellowhouse Reservoir by maintaining a minimum pool of 3,000 acre-feet during the first 15 years of dam operation
   c) plantings of shelterbelts in the agriculture habitat.

8. The Bureau of Reclamation determine if the project would affect Federally listed endangered species which might be found in the area: bald eagle, peregrine falcon and black-footed ferret.

Distribution:
Director, New Mexico Department of Game and Fish, Santa Fe, New Mexico
Governor, Zuni Indian Tribe, Zuni, New Mexico
Chief Tribal Ranger, Zuni Fish and Wildlife Department, Zuni, New Mexico
Bureau of Indian Affairs, Natural Resources Department, Zuni, New Mexico
Area Director, Albuquerque Area Office, Bureau of Indian Affairs, Albuquerque, New Mexico
New Mexico Representative's Office, Bureau of Reclamation, Albuquerque, New Mexico
State Conservationist, Soil Conservation Service, Albuquerque, New Mexico
District Conservationist, Soil Conservation Service, Gallup, New Mexico
Forest Supervisor, Forest Service, Cibola National Forest, Albuquerque, New Mexico
Mr. Joe Jojola, Wildlife Biologist, Bureau of Indian Affairs, Division of Fish, Wildlife, and Recreation, Washington, D.C.
Mr. Norman Jojola, Range Conservationist, Bureau of Indian Affairs, Southern Pueblos Agency, Albuquerque, New Mexico
Project Leader, Fisheries Assistance Office, FWS, Gallup, New Mexico
Regional Director, FWS, ES and SE, Albuquerque, New Mexico
Field Supervisor, FWS, ES, Albuquerque, New Mexico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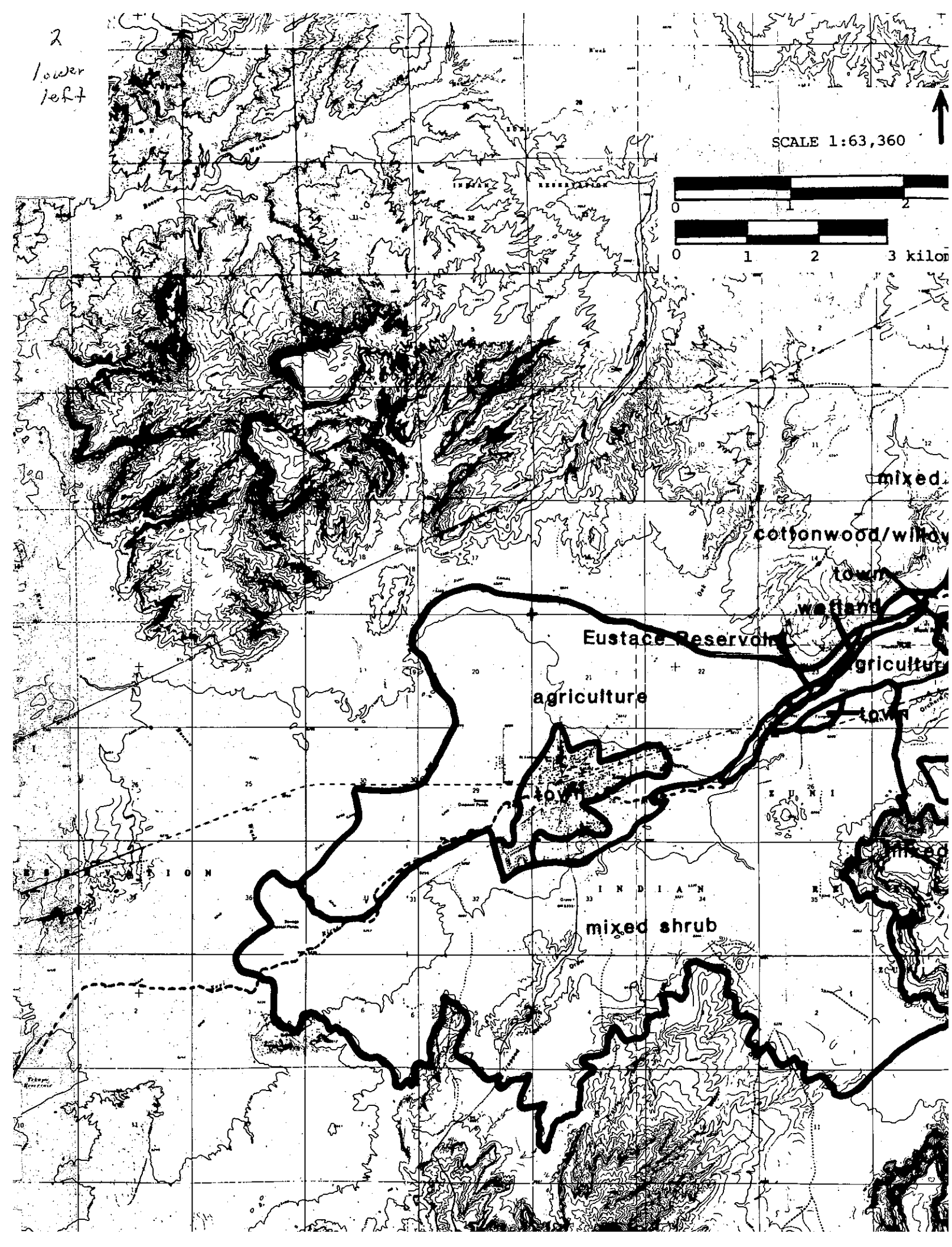
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cottonwood/willo
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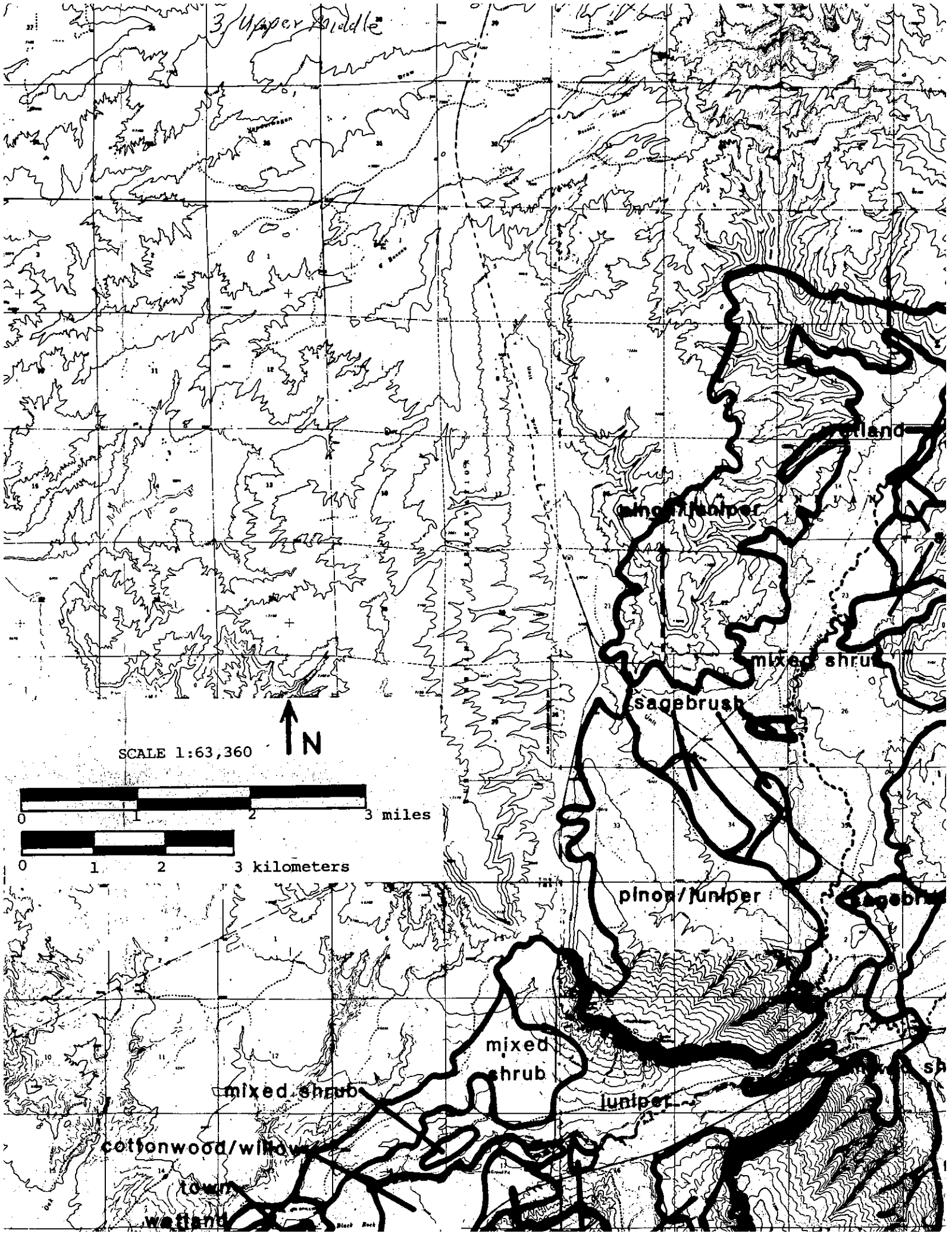
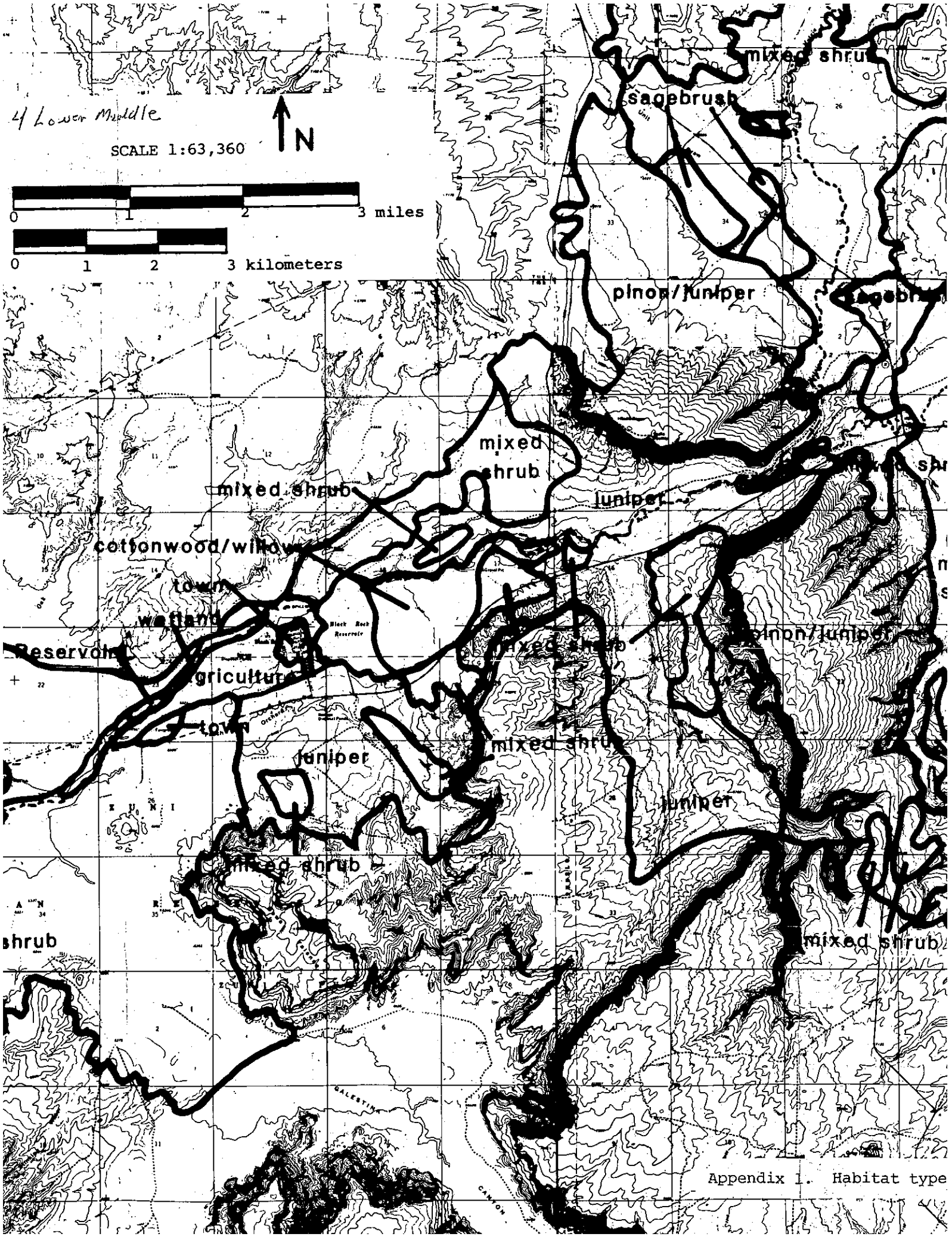
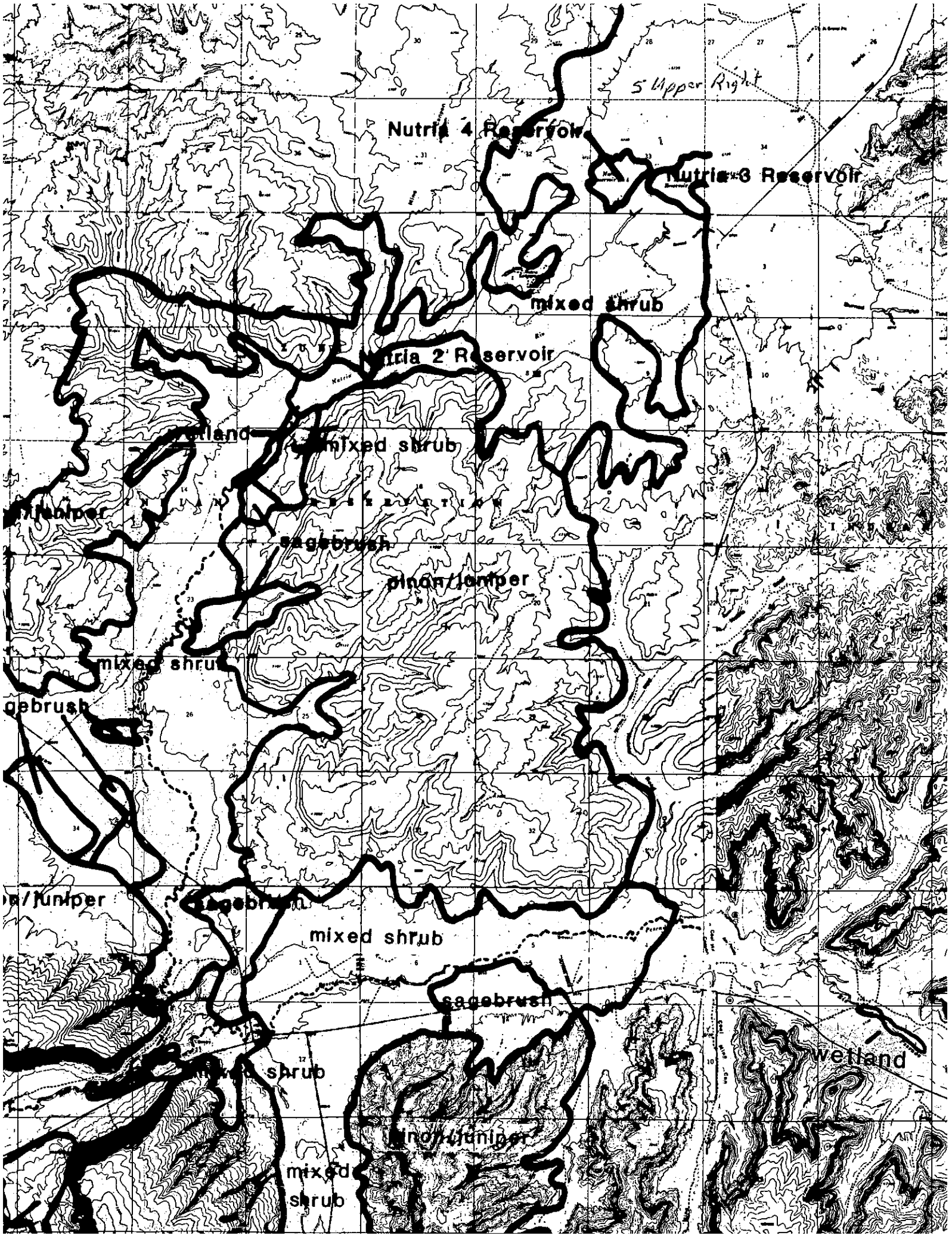
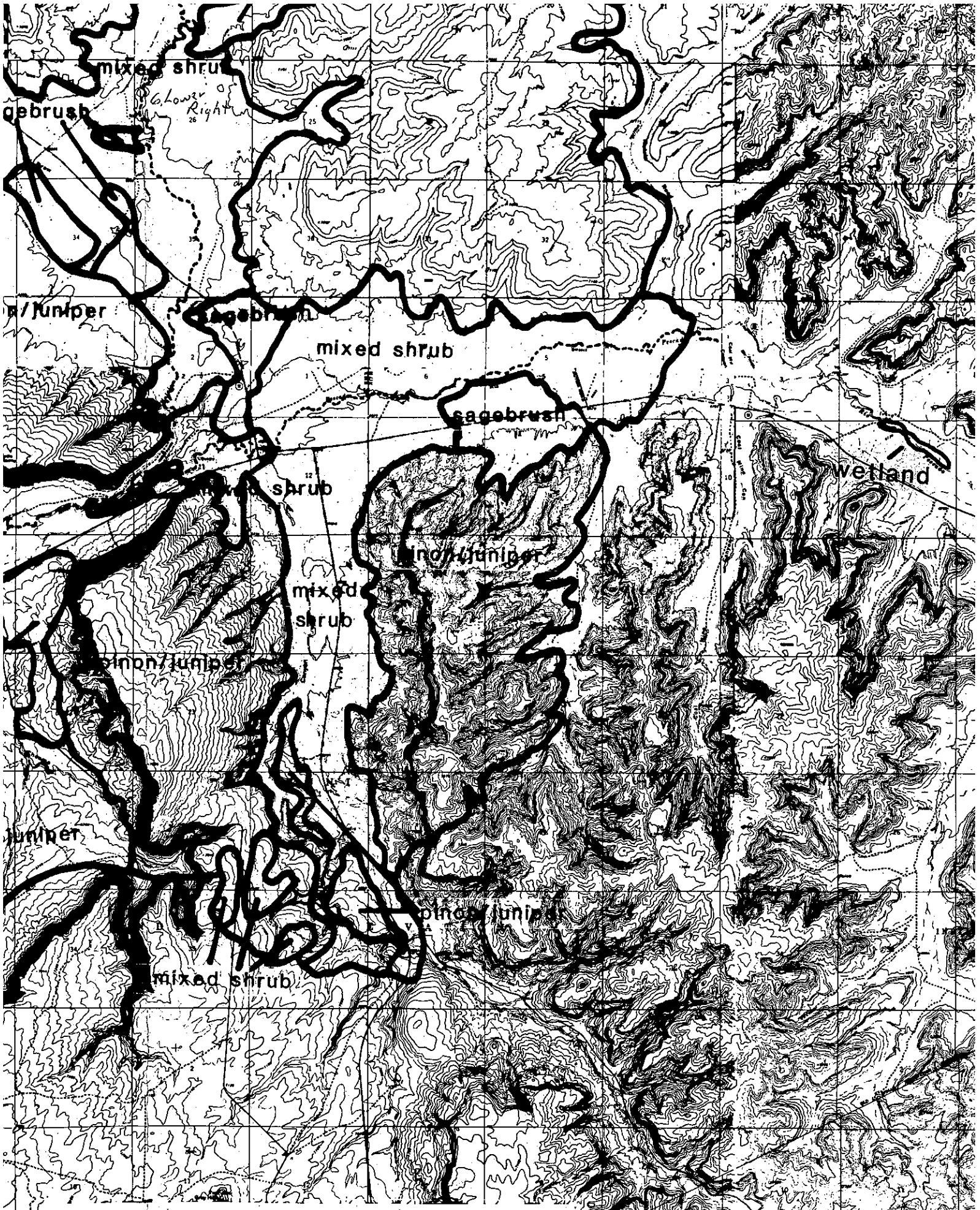
wetland
Eustace Reservoir
agriculture
town
town
mixed shrub


3/Upper Middle
N
SCALE 1:63,360
0 1 2 3 miles
0 1 2 3 kilometers
pinon/juniper
sagebrush
mixed shrub
juniper
cottonwood/willow
town
wetland



Appendix 1. Habitat type


5' Upper Right
Nutria 4 Reservoir
Nutria 3 Reservoir
mixed shrub
Nutria 2 Reservoir
wetland
mixed shrub
sagebrush
pinon/juniper
mixed shrub
sagebrush
mixed shrub
sagebrush
wetland
pinon/juniper
mixed
shrub



Appendix 1. Habitat types in the Zuni Project Area.

Appendix 2. Zuni Mountain Sucker Mitigation Plan

Yellowhouse Reservoir would eliminate Zuni mountain sucker habitat due to water inundation and siltation. Creation of habitat in the Rio Pescado upstream of the maximum pool of Yellowhouse Reservoir would mitigate the loss of the suckers. This mitigation plan was developed with the New Mexico Department of Game and Fish (NMDG&F), Zuni Fish and Wildlife Department and the Bureau of Reclamation. The NMDG&F has agreed to participate in this plan if Yellowhouse Reservoir is the selected alternative.

Creating habitat for the Zuni mountain sucker would require:

1. Control of the water which originates from the two Pescado Springs;

2. Construction of spawning beds between the Lower Pescado Springs and the Rio Pescado;

3. Removal of barriers to fish movement in the Rio Pescado;

4. Streambank stabilization.

Control of the water from the springs is necessary to increase the flow in the Rio Pescado. Currently, the Rio Pescado below the springs has very little flow and consequently is dominated by willows and cattails. Water is diverted for irrigation directly below the springs. If all the water can flow year round in the Rio Pescado, pools and gravel riffles should form which will create sucker habitat.

A spawning bed should be created in the ditch between Lower Pescado Springs and the Rio Pescado, a distance of .4 miles. An irrigation ditch now exists, Figure 1, and a spawning bed could be created by placing different size gravels in the ditch. All of the flow from both Pescado Springs would be routed through this ditch. Contouring of the ditch and the Rio Pescado would be necessary to insure that Zuni mountain suckers can migrate from the Rio Pescado to the spawning bed.

Three fish barriers to upstream movement are located in the mitigation area, Figure 1. The lower most barrier is a road crossing which contains a large culvert. There is a water drop of about five feet below the crossing. The next barrier is a rock outcrop with a water drop of about three feet. The third barrier is a concrete diversion structure which crosses the Rio Pescado at Highway 51. All of these barriers should be removed and the channel reconstructed to allow movement of Zuni mountain suckers.

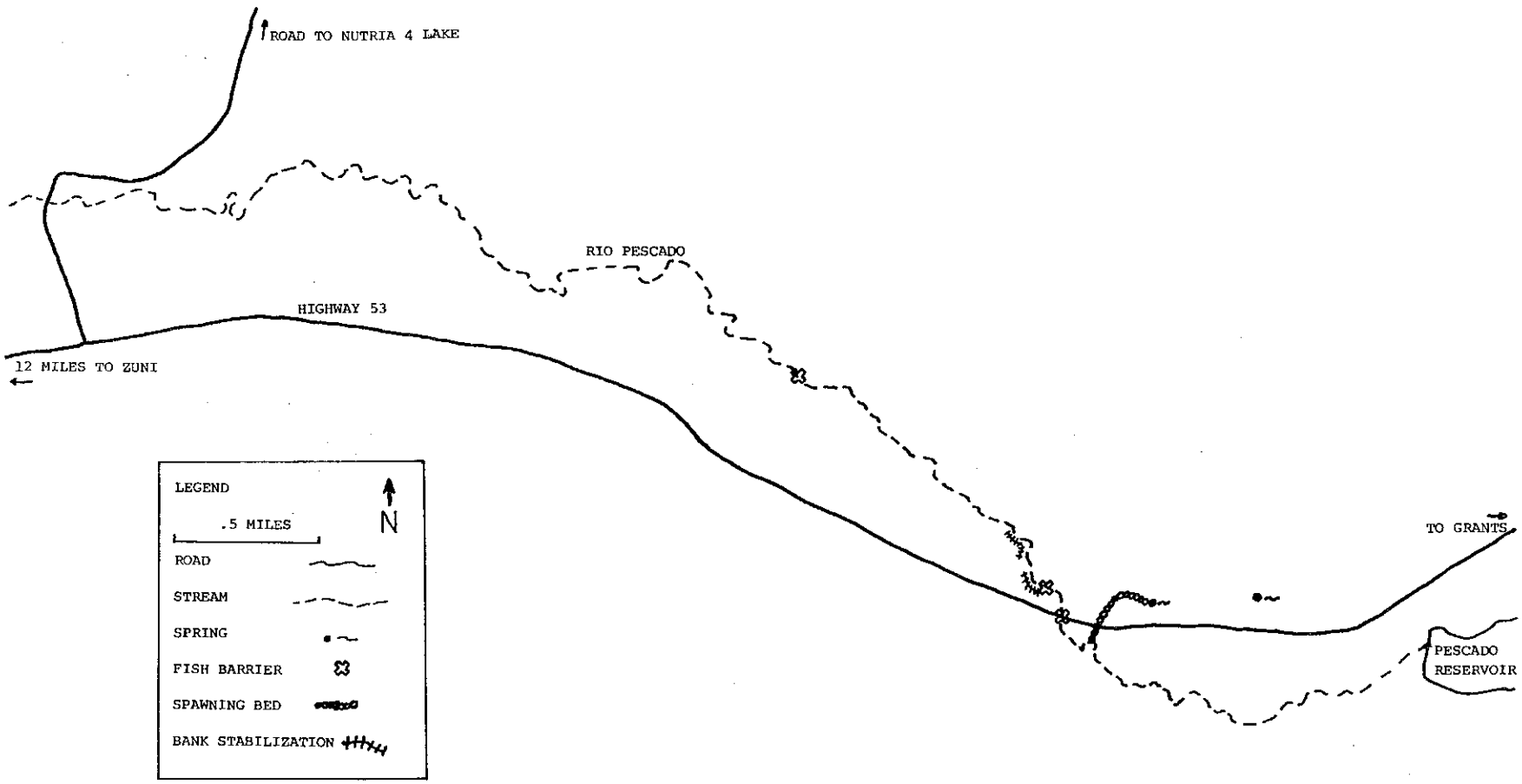


Figure 1. Zuni mountain sucker Mitigation Area.

Stabilization of about .25 miles of the arroyo walls, Figure 1, on the south side of the Rio Pescado would be necessary. These walls are about 30 feet high and erode very easily. Without stabilization erosion would continue to destroy sucker habitat in the Rio Pescado. Placing large gabions would stabilize the arroyo walls.

The four activities mentioned above would take about three months at an estimated cost of $175,000. Construction of the pipes and valves necessary to control the water flow from the springs would cost $10,000. The spawning bed would require about 1,000 tons of gravel with a resulting cost of $13,000. Removal of the three fish barriers would cost $48,000. Stream bank stabilization would require about 6,500 tons of rock with a resulting cost of $104,000. In addition, annual maintenance, $2,000 per year, would be required to ensure proper water flow and habitat for the sucker. For example, if a barrier was naturally created during the 100-year life of the project, it would have to be removed. Current estimates run $16,000 to remove one barrier. If erosion continues then more bank stabilization may be required.

Biologists from the NMDG&F should be present during construction and should monitor the progress of the mitigation plan. The fish populations should be monitored every year for the first six years to ensure success. Suckers should be transplanted from the lower Rio Pescado to the mitigation area one year after the area has been prepared. After the suckers have been confirmed to reproduce in the spawning bed, then the population need only be checked every five years. We estimate 315 biological mandays would be required to complete this plan. Supervision, construction, conducting transplants and monitoring suckers for the first seven years of the project would require 225 mandays. After the first seven years an additional 90 mandays would be required to check the progress of the mitigation plan. At a cost of $200 per manday the cost of the biological time is $63,000.

The total cost of this mitigation plan is $438,000. The cost of this mitigation plan should be provided by the project.

Initial construction	$ 175,000
Annual maintenance	$ 200,000
Biologist Salary & Expenses	$ 63,000
Total	$ 438,000

State of New Mexico

DEPARTMENT OF GAME AND FISH

STATE CAPITOL
SANTA FE
87503

April 21, 1982

Mr. Richard A. Hoppe
Field Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
Ecological Services, USFWS
Suite C, 3530 Pan American Highway, NE
Albuquerque, New Mexico 87107

Dear Mr. Hoppe:

Thank you for your letter of March 19, 1982, and the copy of your draft coordination Act Report for the Zuni Project. We have studied the latter in some detail, and the only significant problem that we have is with the potential impacts of the Yellowhouse Dam alternative on the Zuni mountain sucker (Pantosteus discobolus yarrowi).

As indicated in your draft, construction of that dam would negatively impact on sucker habitat on the Rio Pescado. In fact, the combination of siltation, change in habitat, and a game fishery could lead to the extirpation of suckers in that area, which houses the most important of the three populations.

In view of this threat, plus the increased likelihood that the sucker would be federally listable under the Endangered Species Act if that population is lost, I feel that we should reexamine the issue of mitigation. While your current position is that no mitigation is possible, I still hold out hope that something can be done to maintain the Rio Pescado population.

With this in mind, I would like to suggest that a meeting be held as soon as possible to address all potential means of mitigation, should the Yellowhouse Dam alternative be selected. I believe that it would be appropriate for all interested parties to be represented, including the Pueblo of Zuni, the Bureau of Reclamation, and the Cibola National Forest. If you are interested, please advise Mike Hatch (827-2945) of this office and he can help coordinate the meeting.

Sincerely,

Harold

Harold F. Olson
Director

ls

cc: M.D. Hatch

State of New Mexico

DEPARTMENT OF GAME AND FISH

STATE CAPITOL
SANTA FE
87503

July 21, 1982

Mr. Richard A. Hoppe
Field Supervisor
U.S. Department of Interior
Fish and Wildlife Service
Ecological Services, U.S.F.W.S.
Suite C, 3530 Pan American Highway, NE
Albuquerque, New Mexico 87107

Dear Dick:

Thank you for your letter of July 7, 1982. I appreciate the opportunity to review the mitigation plan for the Zuni mountain sucker. The steps outlined in your plan seem appropriate; however, we do have one reservation, as spelled out below.

Removal of the concrete diversion on the Rio Pescado at Highway 51 will lower the elevation of the river channel above this point. This will create a waterfall at the point where the ditch from Lower Pescado Springs enters the Rio Pescado, which may act as a barrier to sucker movement into the ditch. It is essential that no barrier to sucker movement be allowed to develop, because construction of spawning beds are planned for this ditch. This can be accomplished by ensuring that the elevations of the ditch and the Rio Pescado match at their confluence, and that elevations in the ditch gradually increase to meet the spring outlet.

Additional construction costs required for the ditch renovation should be incorporated in the mitigation plan.

I hope these comments have been helpful. If you have questions concerning this, please contact Mr. Mike Hatch (827-2945).

Sincerely,

Harold F. Olson
Director

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