

**NARROWS PROJECT  
SUPPLEMENTAL DRAFT  
ENVIRONMENTAL IMPACT STATEMENT**

**APPENDIX D**

**FISH AND WILDLIFE  
COORDINATION ACT REPORT**



United States Department of the Interior  
FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE  
LINCOLN PLAZA  
145 EAST 1300 SOUTH, SUITE 404  
SALT LAKE CITY, UTAH 84115

PRO OFFICIAL FILE CO  
RECEIVED

8-25 '97

Reply Date	Date	Initials	CC
			96
			10
			44
			46

In Reply Refer To  
(CO/KS/NE/UT)

August 21, 1997

MEMORANDUM

TO: Manager, Resource Management Division, Bureau of Reclamation, Colorado Region, Provo Area Office, 302 East 1860 South, Provo, Utah 84606-7317

FROM: Field Supervisor, Ecological Services, Fish and Wildlife Service, Utah Field Office, 145 East 1300 South, Ste. 404, Salt Lake City, Utah 84115

SUBJECT: Formal Section 7 Consultation for the Proposed Narrows Project and Request for Updated Fish and Wildlife Coordination Act Report

Action:  
Classification: E-11-1  
Project: 116  
Control No.: 10749748  
UTAH 84606

On March 10, 1997, the Fish and Wildlife Service reinitiated and entered into formal Section 7 consultation on the proposed Narrows Project, a small reclamation project act loan. The 135-day consultation period expired on July 24, 1997. Due to personnel shortages and the complexities involved with this consultation, we are requesting a 60-day extension of the consultation period in accordance with 50 CFR Part 402.14(e).

The Service is currently in consultation with the Bureau of Reclamation on two projects involving water depletions in the Price River drainage. New information has revealed the presence of the endangered Colorado squawfish in the Price River. The significance of the Price River to the conservation and recovery of the Colorado squawfish has not been addressed as yet. However, it is the Services intention to evaluate the significance of the Price River and to develop a RIPRAP item for Recovery of Colorado squawfish in the Price River. This will be done as expeditiously as possible, however, a new RIPRAP item must be coordinated with the Management Committee of the Colorado River Fishes Recovery Program and will delay the Service's completion of formal Section 7 consultation on the Narrows Project.

In addition, the Service was requested to complete an updated Coordination Act Report by the 1st of June, 1997. At this time we are attempting to update this Report, however, we do not anticipate that an updated Coordination Act Report will be finalized until the issues involved with Section 7 consultation have been resolved.



# United States Department of the Interior

## BUREAU OF RECLAMATION

Upper Colorado Region  
Provo Area Office  
302 East 1860 South  
Provo, Utah 84606-7317

IN REPLY REFER TO:

PRO-751  
ENV-6.00

MAY 09 1997

Mr. Reed Harris  
Ecological Services  
U.S. Fish and Wildlife Service  
145 East 1300 South, Suite 404  
Salt Lake City UT 84115

Subject: Request for Completion of Updated Fish and Wildlife Coordination Act Report for the Narrows Project

Dear Mr. Harris:

The Bureau of Reclamation completed an Environmental Impact Statement for the proposed Narrows Project in January 1995. A Record of Decision (ROD) was signed by Reclamations' Upper Colorado Regional Director. However, the ROD was later rescinded and a notice of intent to prepare a new draft EIS was published in the Federal Register in February 1996.

A Coordination Act Report (dated October 1994) was prepared by your office, with assistance from Utah Division of Wildlife Resources, for the original EIS. The report evaluates the impacts of the proposed Narrows Project on fish and wildlife resources, and recommends appropriate mitigation in accord with the Fish and Wildlife Coordination Act and the U.S. Fish and Wildlife Service's mitigation policy.

Because it has been almost three years since the Coordination Act Report was prepared, Reclamation believes it is necessary for the Service to review and update, if needed, the 1994 report for inclusion with the revised EIS being prepared. We request that the Coordination Act Report review and update, if needed, be completed by June 1, 1997, so that it can be included with the Draft EIS. Kerry Schwartz of my staff discussed this issue with Janet Mizzi of your staff on April 30, 1997.

If you have any further questions regarding this matter, please contact Kerry Schwartz at (801) 379-1167.

Sincerely,

LEE G. BAXTER

ACTING FOR

Larry Fluharty

Manager, Resource Management Division

cc: Mr. Richard Noble  
6 South 100 West  
American Fork UT 84003

Mr. John Anderson  
Pruitt, Gushee, and Bachtell  
Suite 1850, Beneficial Life Tower  
36 South State Street  
Salt Lake City UT 84111

Mr. David Peterson  
President, Sanpete Water Conservancy District  
1484 South 70 West  
Mount Pleasant UT 84647

Mr. Leland Matheson  
Manti-LaSal National Forest  
599 West Price River Drive  
Price UT 84501

Mr. Bill Bates  
Habitat Manager, Utah Division of Wildlife Resources  
Southeastern Regional Office  
455 West Railroad Avenue  
Price UT 84501

bc: Manager, Resources Management Division, Salt Lake City UT, Attention: UC-320  
Field Solicitor, Salt Lake City UT, Attention: Scott Loveless

bcc: PRO-750, PRO-751, and PRO-752

GOOSEBERRY NARROWS DAM PROJECT  
SANPETE COUNTY, UTAH

A FISH AND WILDLIFE COORDINATION ACT REPORT

PREPARED BY

UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE  
UTAH FIELD OFFICE  
SALT LAKE CITY, UTAH

WITH ASSISTANCE FROM

UTAH DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF WILDLIFE RESOURCES  
SALT LAKE CITY, UTAH  
SPRINGVILLE, UTAH  
PRICE, UTAH

OCTOBER, 1994

## CONTENTS

	<u>Page</u>
INTRODUCTION	1
DESCRIPTION OF THE STUDY AREA	1
DESCRIPTION OF THE PROJECT	2
EVALUATION METHODOLOGY	4
<u>Terrestrial Resources</u>	4
<u>Aquatic Resources</u>	5
FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT	5
<u>Terrestrial Resources</u>	5
<u>Aquatic Resources</u>	7
<u>Stream Fisheries</u>	7
<u>Reservoir Fisheries</u>	9
FISH AND WILDLIFE RESOURCES WITH THE PROJECT	9
<u>Terrestrial Resources</u>	9
<u>Aquatic Resources</u>	11
<u>Stream Fisheries</u>	11
<u>Reservoir Fisheries</u>	13
<u>Endangered Species</u>	14
DISCUSSION/PROPOSED MITIGATION	14
RECOMMENDATIONS	17
LITERATURE CITED	20
APPENDIX A - Preliminary Mitigation Costs	21
APPENDIX B - UDWR September 21, 1994 Letter	23

## FIGURES

<u>Figure</u>		<u>Page</u>
1	General Project Location Map	24
2	Narrows Project Area and Water Distribution System	25
3	Streams and Reservoirs in the Narrows Project Area	26
4	Alternative Wetlands Mitigation Sites	27

## TABLES

<u>Table</u>		<u>Page</u>
1	Wildlife Feeding Guilds for the Narrows Basin Study	28
2	Wildlife Reproductive Guilds for the Narrows Basin Study	29
3	Baseline Conditions within the Narrows Reservoir Basin for (A) affected areas; and (B) evaluation species	30
4	Average Existing and Projected Flows	31
5	Weighted Usable Area for Cutthroat Life Stages in Upper Gooseberry Creek with Existing Flows	33
6	Monthly Pre- and Post-Project Cutthroat Trout Habitat in Middle and Lower Gooseberry Creek During Average Water Year	34
7	Monthly Pre- and Post-Project Rainbow Trout Habitat in Lower Gooseberry Creek During Average Water Year	35
8	Monthly Pre- and Post-Project Cutthroat Trout Habitat in Fish Creek During Average Water Year	36
9	Monthly Pre- and Post-Project Rainbow Trout Habitat in Fish Creek During Average Water Year	37
10	Aquatic Impacts and Mitigation Measures, Recommended Plan	38

## INTRODUCTION

This Coordination Act Report has been developed in concert with the Environmental Impact Statement being prepared by the Bureau of Reclamation (Reclamation) for the proposed Narrows Dam Project (Narrows). The report evaluates the impacts of the proposed Narrows Project on fish and wildlife resources, and recommends appropriate mitigation in concert with The Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and the U.S. Fish and Wildlife Service Mitigation Policy (Federal Register, Vol. 46, No. 15, January 23, 1981 (as modified February 4, 1981)). Endangered Species Act (16 U.S.C. 1531 as amended) requirements have been addressed in a separate Biological Opinion from the U.S. Fish and Wildlife Service (Service) to Reclamation, dated March 25, 1992. National Environmental Policy Act (NEPA) documentation is being prepared by the Sanpete Water Conservancy District (District) for Reclamation.

The Narrows project is proposed by the District. It would develop a supplemental irrigation water supply for presently irrigated lands and provide municipal water to project communities in northern Sanpete County, Utah. The project would include a transbasin diversion of  $6.7 \times 10^6$  cubic meters ( $m^3$ ) (5,400 acre-feet {af}) per year from the Price River (Colorado River drainage) to the San Pitch River drainage (Great Basin). The District plans to apply to Reclamation for a Small Reclamation Project Act Loan. The District also needs a 404 permit for the project from the U.S. Army Corps of Engineers (Corps).

In January of 1991 two teams of specialists from various State and Federal agencies were formed to review plans for the Narrows and assist in the identification of impacts and the development of mitigation plans. A fisheries team was formed to look at aquatic impacts and fisheries issues. This team consisted of a consultant for the District and members from the Service, Reclamation, Corps, U.S. Forest Service (USFS), and Utah Division of Wildlife Resources (UDWR). A wetlands/wildlife team was formed to evaluate impacts to wetlands and wildlife habitat. The team consisted of a consultant for the District and members from the Service, Reclamation, Corps, USFS, and UDWR. Agency representatives on both teams were not necessarily the same.

Information in this report is based on preliminary documents prepared for the District in coordination with the two teams. These include draft reports on Aquatic Ecology (Woodward - Clyde Consultants, December 1991), Vegetation and Wildlife Impacts (Mt. Nebo Scientific, February 1992), the Preliminary Draft Environmental Impact Statement (Reclamation, August 1993), and other information in Service files.

## DESCRIPTION OF THE STUDY AREA

The basin which would be inundated by the proposed reservoir lies in a high elevation, shallow valley in the Wasatch Plateau. The basin, isolated by several ridges, is 2,646 meters (m) (8,680 feet {ft}) above sea level. Vegetation consists of plant communities common to high elevation mountain meadow areas, including Vasey sagebrush, Silver sagebrush, and

various wetland community types. The majority of the reservoir basin is privately owned, although the actual dam site is in the Manti-LaSal National Forest.

Historically the area has been used for livestock grazing. Cattle and sheep were introduced into the area in the late 1800's and subsequently overgrazed the area so that rangeland restoration became necessary. The USFS established a controlled grazing plan for the Manti National Forest in 1908. Sheep still graze in the area.

The Sanpete Valley, which will receive water from the proposed project, lies at an elevation of 1,676-1,890 m (5,500-6,200 ft). It is bordered on the east by the Wasatch Plateau and on the west by the San Pitch Mountains. U.S. Highway 89 extends through the project area, connecting Fairview, Mt. Pleasant, Ephraim, and Manti (the county seat) with Salt Lake City, approximately 209 kilometers (km) (130 miles {mi}) to the north (Figure 1). The estimated population of Sanpete County in 1990 was 16,259. Government, agriculture, services, manufacturing and retail trade are the leading economic sectors. Approximately 44 percent of the land in Sanpete County is in agricultural use, with 36 percent of the total agricultural land developed for crops.

## DESCRIPTION OF THE PROJECT

The Narrows project is designed to bring supplemental irrigation water to the Sanpete Valley and to provide supplemental municipal water for irrigation of lawns and gardens. The District also cites the need for honoring long-standing water rights contracts and agreements, for improving water conveyance facilities, and improving recreation and fishery opportunities. The project area consists of the Sanpete Valley and the headwaters area of the Price River (Figure 2). Sanpete Valley contains approximately 68,800 hectares (ha) (170,000 acres {ac}) of land, of which 24,280 ha (60,000 ac) are currently irrigated. About 6,230 ha (15,400 ac) of currently irrigated land would be eligible to receive project water. Currently these lands experience moderate to severe late season irrigation water shortages, averaging  $2.3 \times 10^7$  m<sup>3</sup> (19,000 af) per year. The project would provide  $6.7 \times 10^6$  m<sup>3</sup> (5,400 af) of water per year, of which  $6.07 \times 10^6$  m<sup>3</sup> (4,920 af) would go to irrigation and  $5.9 \times 10^5$  m<sup>3</sup> (480 af) to municipal supplies.

The proposed action includes construction of a dam on Gooseberry Creek, a tributary of the Price River, approximately 14.5 km (9 mi) east of Fairview, Utah. The proposed dam would be a zoned earthfill embankment, 37 m (120 ft) high, with a crest length of 168 m (550 ft) and a crest width of 9 m (30 ft). The dam would have 3:1 horizontal to vertical slopes upstream and downstream. The dam would impound a reservoir with a capacity of  $2.1 \times 10^7$  m<sup>3</sup> (17,000 af), with  $1.8 \times 10^7$  m<sup>3</sup> (14,500 af) of active storage and  $3.1 \times 10^6$  m<sup>3</sup> (2,500 af) of dead storage. The maximum reservoir surface area is approximately 244 ha (604 ac). At an average water surface during the recreation season (June through September) the reservoir would cover 184 ha (454 ac). The water surface will fluctuate an average of about 3.7 m (12 ft) vertically each year, with a maximum fluctuation of 5.5 m (18 ft) per year.

An alternative, smaller reservoir, would consist of a dam at the same location that would be 30.5 m (100 ft) high, with a crest length of 129.5 m (425 ft) and a crest width of 9 m (30 ft). The impounded smaller reservoir would have a capacity of  $9.7 \times 10^6$  m<sup>3</sup> (7,900 af), with  $6.7 \times 10^6$  m<sup>3</sup> (5,400 af) of active storage and  $3.1 \times 10^6$  m<sup>3</sup> (2,500 af) of dead storage. The maximum reservoir surface area would be 146 ha (362 ac), with an average of 96.3 ha (238 ac) during the recreation season. The water surface would fluctuate an average of 4.9 m (16 ft) vertically per year, with a maximum fluctuation of 6.7 m (22 ft) per year.

An existing tunnel, which currently conveys water from Fairview Lakes into Cottonwood Creek, would be rehabilitated to carry releases from Narrows Reservoir into Cottonwood Creek. The water would be carried in a pipeline for the upper 1.3 km (0.8 mi) of Cottonwood Creek to prevent degradation of the stream channel. At the mouth of Fairview Canyon some of the flow would be diverted into two pipelines, which would convey project water north to Oak Creek and south to Spring City (Figure 2). Project water would also be diverted into Cottonwood-Gooseberry Irrigation Company's existing pressurized irrigation system for use in the Fairview area. The remainder of the project water would flow into the San Pitch River where it could be diverted into existing canals and ditches. A stream-level emergency outlet would also be constructed through the dam to provide downstream releases into Gooseberry Creek for fisheries and emergency evacuation of the reservoir.

The Narrows Reservoir would inundate about 1.3 km (0.8 mi) of the Skyline Coal Mine Road, which provides access between Fairview and Scofield. Under the project, 4.2 km (2.6 mi) of new road would be constructed across the Narrows Dam. Asphalt surfacing would also occur on 0.5 km (0.3 mi) of existing gravel road to Lower Gooseberry Reservoir.

The District studied several other alternatives to meet project needs, but found them to be nonviable. These included using an alternative dam site, providing year-round releases from the new reservoir, additional groundwater development within Sanpete County, using Central Utah Project water, and direct diversion without a reservoir. The District was hampered by the fact that a 1984 water rights settlement agreement dictates the dam location and storage capacity and because the State Engineer has closed the Sanpete Valley to further ground water development due to downstream water rights interests. Other alternatives were eliminated because of economics, including construction of a storage reservoir in the Sanpete Valley and developing a conveyance system to deliver Central Utah Project water to the area.

On-farm conservation measures, including improved irrigation methods such as canal lining, sprinklers, and gated pipe will be required for participants to be eligible for project water. For the most part, due to existing irrigation water shortages, these measures have already been implemented. Without these conservation measures, the supplemental irrigation demand would be  $2.8 \times 10^7$  m<sup>3</sup> (23,000 af) per year, versus the  $1.5 \times 10^7$  m<sup>3</sup> (12,300 af) per year that the project is based on.

## EVALUATION METHODOLOGY

## Terrestrial Resources

Evaluation of terrestrial resources included baseline vegetation mapping and identification of plant and animal species occurring in the potentially affected area. A "Habitat Evaluation Procedures" (HEP) analysis was then used to assess pre-project conditions and impacts to wildlife and their habitats from project development.

Vegetation mapping was achieved by using aerial photography and contour maps on the ground. Plant species lists were compiled from previous reports and verified by District employees on the ground. Wildlife species lists were generated by UDWR, then verified by the District through field observation and animal live-trapping studies.

Use of HEP analysis was chosen by the Wetlands and Wildlife Team biologists as the best tool to quantify project impacts to wetlands, wildlife and their habitats. This is a process developed by the Service and is based on the assumption that habitat quality and quantity can be numerically described on a nonmonetary basis (USFWS, 1980). This species-habitat approach to impact assessment uses selected species as indicators to evaluate habitat for a representative group of species. It is assumed that impacts to indicator species represent impacts to the broader groups as functioning ecosystem units. The HEP process evaluates habitat quality for the selected species and allows for the development of Habitat Suitability Indices (HSI). These indices range from 0.0 to 1.0, with the values being related linearly to the habitat carrying capacity for the species. An HSI value of 1.0 represents optimum habitat for the species, while 0.0 represents unsuitable habitat. Comparison of pre- and post-project HSI values allows for a quantitative determination of impacts to the evaluation species and the groups they represent.

The Wetlands and Wildlife Team determined the species to be evaluated based on the habitat types and wildlife species lists prepared by the District. An attempt was made to identify species which were important or common to the impacted areas. These species were then put into feeding and reproductive guilds, and representative species for which HSI models were available were chosen from these guilds for evaluation. The guilds used are shown in Tables 1 and 2, with chosen indicator species bolded. Indicator species chosen were the montane vole (*Microtus montanus*) (to represent the closely related Richardson's vole, *Microtus richardsoni*), yellow warbler (*Dendroica petechia*), beaver (*Castor canadensis*), mule deer (*Odocoileus hemionus*), and Brewer's sparrow (*Spizella breweri*). It should be noted that, while the mule deer was considered an important species, application of the mule deer model in this situation was not totally appropriate since it is primarily based on winter habitat variables, whereas the reservoir basin is primarily used as summer habitat. Therefore the Brewer's sparrow model was used to evaluate habitat used by mule deer.

District personnel collected data, including quantitative and qualitative habitat variables, and analyzed the HSI models to determine HSI indices. All field parameters were obtained by multiple samplings. Means and standard deviations were calculated for each parameter and an attempt was made to obtain statistically adequate samples for each parameter. Average

Annual Habitat Units were determined for each species by multiplying the determined HSI by the acreage of the cover type(s) used in the evaluation area. The models used and raw data collected are available from the Service.

### Aquatic Resources

Analysis of impacts to aquatic resources included evaluating the effects of reservoir inundation, flow alterations on streams, and the effects of the project on reservoir fisheries.

Effects of reservoir inundation were evaluated by assessing the number of stream kilometers (miles) and trout biomass (kilograms {pounds}) and numbers that would be lost to direct inundation by the Narrows project. Standing crop estimates prepared by UDWR provided biomass estimates.

Flow alteration effects will include flow reductions in Middle and Lower Gooseberry and Fish Creeks and a flow increase in Cottonwood Creek. The Instream Flow Incremental Methodology (IFIM) (Bovee, 1982) was chosen by the Fisheries Team to determine the effects flow alterations would have on weighted usable area (WUA) of aquatic habitats. WUA is a measure of usable microhabitat present in a stream reach. It is determined for each life stage of each species evaluated in an analysis and is defined as the microhabitat area per unit length of stream, most often expressed as ft<sup>2</sup> WUA/1,000 ft stream. This procedure uses computer models which combine stream hydraulic characteristics and habitat utilization characteristics for various life stages of a species (Physical Habitat Simulation System (PHABSIM)) (Milhous et al., 1984) to predict changes in WUA with changes in flow. The UDWR used the Habitat Quality Index method to compare project impacts and project-induced mitigation improvements and to provide recommendations for mitigation for stream impacts. The number of Habitat Units present in stream segments which would be impacted by the Narrows project and those which could be used as potential mitigation sites were estimated and compared (Appendix B).

Data on stream channel characteristics was collected in the field by District representatives and Fisheries Team members and the analysis was performed by the District. Five to nine transects were taken across the stream channel at several locations in five different stream reaches (stations) which could be affected. Field measurements were compared with model predictions for calibration. Good calibration was achieved for all stations. The models used and raw data collected are available from the Service.

Reservoir fishery effects were determined by evaluating the number of angler days per year that could be affected by the Narrows project on reservoirs in the Gooseberry and Fish Creek watersheds, including the proposed reservoir.

## FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

### Terrestrial Resources

Vegetation in the reservoir basin area consists mainly of Vasey sagebrush (Artemisia tridentata v. vaseyana) and silver sagebrush (Artemisia cana) communities. The Vasey sagebrush is the driest plant community in the basin, existing on well-drained soils on upland slopes. Other dominant species include low rabbitbrush (Chrysothamnus viscidiflorus), snowberry (Symphoricarpos oreophilis), Pacific aster (Aster chilensis), slender wheatgrass (Elymus trachycaulus), and Letterman needlegrass (Stipa lettermanii). It encompasses approximately 134 ha (331 ac) of the basin.

The silver sagebrush community type lies downslope of the Vasey sagebrush community and comprises approximately 63.1 ha (156 ac) of the basin. The topography is generally flatter and the soils less well drained than with the Vasey sagebrush type. More mesic species, including shrubby cinquefoil (Potentilla fruticosa), Penstemon spp., orchardgrass (Dactylis glomerata), and Kentucky bluegrass (Poa pratensis) are found in this community.

The majority of the rest of the basin (40.5 ha {100 ac}) is in wetland vegetation types. These include wet meadows, riparian sedge wetlands, and willow thickets. Wet meadows are formed in topographic depressions adjacent to some of the streamside vegetation and seeps. Plant species include rushes (Juncus spp.) and sedges (Carex spp.) and grass species. Riparian sedge wetlands are similar in species and composition, including various rush, sedge, and grass species. They usually form 0.9-1.8 m-wide (3-6 ft-wide) bands of vegetation adjacent to streams. Willow thickets are less common, along stream channels in the basin and along Gooseberry and Cottonwood Creeks. Species include Drummond's (Salix drummondiana), Booth (Salix boothii) and Wolf (Salix wolfii) willows.

Approximately 6.9 ha (17 ac) in the reservoir basin have been previously disturbed by the water diversion tunnel to Cottonwood Creek, and the State road that crosses the north end of the basin.

Plant communities in the Sanpete Valley area which could be temporarily disturbed by pipeline construction include Valley sagebrush, Scrub oak, Grassland and Mountain Brush types.

Approximately 88 bird and 33 mammal species were found to utilize habitats that could be disturbed by the proposed project and adjacent areas. The reservoir basin provides summer habitat for mule deer and elk (Cervus canadensis). Elk use the aspen forests surrounding the reservoir basin for calving. The aspen forest also provides nesting habitat for a variety of passerine and raptorial birds. The linear riparian corridors are important wildlife habitats, providing nesting habitat for a variety of nongame birds, hiding cover for larger animals, and movement corridors for many species. UDWR estimates that up to 70 percent of species in Utah utilize riparian habitats, with some species being dependent on them.

The species picked for HEP analysis were chosen because they were known to use the different vegetation communities in the reservoir basin which will be affected if the project is constructed. Richardson's (meadow) vole uses wet meadow and sedge habitats, which

comprise many of the wetlands in the basin. Beaver also use this type of habitat, damming natural streams and creating additional wetlands. The yellow warbler utilizes the deciduous shrub/scrub wetland habitat. Mule deer range throughout the reservoir basin in summer using a variety of habitat types. The Brewer's sparrow which nests and forages in the sagebrush habitats was chosen as a HEP representative species for the habitat types found in the basin, including summer range for mule deer, that are not wetlands habitat. Table 3 gives acreages of the various vegetation and habitat types in the basin to be disturbed and details the habitat units (HUs) of each of the indicator species which were found to occur in the reservoir basin.

Because the land use of the reservoir basin consists primarily of some sheep grazing activities and light recreation, little change is expected to occur in the existing habitat and wildlife resources in the future without the project.

## Aquatic Resources

### **Stream Fisheries**

Stream segments in the area of the project which could be impacted include Gooseberry Creek along with its upper tributaries, Fish Creek and Cottonwood Creek (Figure 3). All three of these provide important recreational fisheries use and contain naturally reproducing game fish populations. Gooseberry and Fish Creeks have characteristics which are unique in the State. Fishery values must be maintained.

*Gooseberry Creek* and its tributaries are categorized by UDWR as a Class 3B-Unique stream. Class 3 streams are important from the standpoint of supporting fishing pressure, and fisheries should be considered a primary use. The B indicates that the stream provides important spawning and nursery habitat. Unique identifies streams that provide unique physical, chemical and biological values to the fishery. Gooseberry Creek has been divided into three segments (Upper, Middle, and Lower), which are 1.6, 4.8 and 11.4 km (1.0, 3.0, and 7.1 mi) in length, respectively. Three unnamed tributaries combine to form the Upper Gooseberry segment.

*Upper Gooseberry Creek* supports a naturally reproducing cutthroat trout (*Oncorhynchus clarki*) population, comprised of adult, juvenile, and young-of-the-year (YOY) fish. Numerous riffle areas provide cutthroat trout spawning habitat. UDWR estimates indicate that the standing crop of cutthroat trout in this segment averages about 42.5 kilograms (kg) per ha (38 pounds {lbs} per ac). This stream segment provides important rearing habitat for cutthroat, with over 720 fish per km (450 fish per mi) (mostly YOY) counted by UDWR. This segment provides only marginal overwinter habitat for cutthroat trout due to low winter flows and limited pool habitat.

The *Middle Gooseberry Creek* segment receives inflow from numerous springs and seeps, as well as several tributary streams. Average flows are consequently higher than in the Upper segment. This segment also supports a reproducing population of cutthroat trout.

The *Lower Gooseberry Creek* segment is downstream from the existing Lower Gooseberry Reservoir. Flow in this segment is double the flow of the Upper and Middle segments. Both cutthroat and rainbow (*Oncorhynchus mykiss*) trout use this segment. Rainbow trout apparently use this section for spawning a few weeks each year, while cutthroats are year-round residents. Spawning habitat for both species is not abundant in this segment, although YOY have been found to be plentiful, so this does not appear to be a limiting factor. More habitat is available for adult and juvenile trout from April through August than during the rest of the year. UDWR has found that the cutthroat standing crop averages 45- 57.5 kg per ha (40-50 lbs per ac). No estimate of standing crop for rainbows has been made, but both adults and juveniles have been collected in this stream segment.

The three *Gooseberry headwater tributaries* contain 12 stream km (7.5 stream mi). During late summer and early fall major portions of these streams have low flow or are dry. The flowing reaches have high value as cutthroat trout spawning and rearing of YOY habitat. Standing crop in these tributaries averages approximately 97.5 kg per ha (86 lbs per ac), with most being YOY or yearling fish.

*Fish Creek* is rated by UDWR as Class 2-Unique. Class 2 waters are of great importance to the state fishery, indicating productive streams with high aesthetic value. This segment of Fish Creek extends from the confluence with Gooseberry Creek to Scofield Reservoir. In addition to a self-reproducing cutthroat trout population, this segment also provides spawning and rearing habitat for rainbow trout that migrate upstream from Scofield Reservoir. Thus this stream segment provides habitat for adult, juvenile, spawning, and fry life stages of both species. The UDWR surveys have shown a wide range of standing crop values, with an average of almost 57.5 kg of trout per ha (50 lbs per ac).

The 16 km (10 mi) segment of *Lower Fish Creek* (sometimes considered the upper segment of the Price River) between Scofield Dam and its confluence with the White River forming the Price River, is heavily used as a fishery. It is stocked mainly with brown trout (*Salmo trutta*), but also contains rainbow and cutthroat trout. UDWR is working to make this stretch a blue ribbon brown trout fishery. At present, the standing crop of all trout species in this segment averages 278 kg per ha (244 lbs per ac).

*Cottonwood Creek* is rated Class 3B by UDWR, indicating that this segment supports natural reproduction. This segment extends from the Narrows tunnel outlet to the mouth of the canyon. Presently the upper part of the segment doesn't support a self-sustaining trout population due to low or intermittent flows during much of the year. A rainbow trout fishery is maintained by stocking catchable-sized fish during the period in which there is adequate water. Flows in the lower portion of this segment are higher year-round and support a standing crop of approximately 237 kg per ha (210 lbs per ac) of rainbow and brown trout.

Nongame fish in the upper sections of Gooseberry Creek include redbside shiner (Richardsonius balteatus) and mountain sucker (Catostomus platyrhynchus). Lower Gooseberry Creek below Gooseberry Reservoir and portions of Fish Creek were poisoned in 1991 to kill nongame fish which were causing problems with the fishery in Scofield Reservoir.

### Reservoir Fisheries

Reservoirs in the project vicinity are shown on Figure 3. *Lower Gooseberry Reservoir* has a surface area of approximately 109 ha (270 ac) and is managed as a catchable rainbow trout fishery. It also supports a resident cutthroat trout population. It is estimated that 25,000 trout were harvested in 1982, with 31 percent being cutthroat and the remainder rainbows. A large portion of the reservoir is shallow, which has led to problems with low dissolved oxygen (DO) concentrations and resultant fish kills. Recent steps have been taken by the USFS to improve water quality by releasing water from the bottom of the reservoir.

*Fairview Lakes* are owned and operated by the Cottonwood-Gooseberry Irrigation Company, with water being delivered via the Narrows Tunnel to Cottonwood Creek. The lakes are managed as a catchable rainbow trout fishery, with approximately 12,000 fish stocked every year, and 8,700 harvested. Stocked trout do not generally survive the winter due to the low level of the lakes during this period.

*Scofield Reservoir* has a storage capacity of  $8.1 \times 10^7$  m<sup>3</sup> (65,800 af) and an annual surface area averaging 923 ha (2,282 ac). Approximately  $9.9 \times 10^6$  m<sup>3</sup> (8,000 af) of the reservoir is available as a conservation pool as the reservoir cannot be further drawn down. It provides water for irrigation, culinary and industrial uses to the Price River Valley. The reservoir supports naturally reproducing cutthroat trout and natural and stocked rainbow trout. UDWR stocks approximately 600,000 3-inch rainbows into the reservoir each year. Approximately 250,000 rainbow and cutthroats were caught in 1986. The reservoir has experienced periodic fish kills resulting from low DO levels. The occurrence of fish kills is increasing due to declining water quality.

No changes in stream segment or reservoir management are predicted in the future without the project.

## FISH AND WILDLIFE RESOURCES WITH THE PROJECT

### Terrestrial Resources

Approximately 244 ha (604 ac) of wildlife habitat, including 40.5 wetland ha (100 ac), in the reservoir basin will be inundated by dam construction under the proposed project. Under the smaller alternative, 147 ha (363 ac) would be inundated. Also inundated will be 6.9 km (4.3 mi) (6.1 km {3.8 mi} under the smaller reservoir alternative) of linear stream channel riparian corridors. This habitat will be lost over a 2-5 year period after dam closure while

the reservoir fills. All HUs for indicator species in the reservoir basin will eventually be lost. In addition to habitat inundated by the reservoir, an additional 13 ha (32 ac) would be lost to highway relocation and recreational construction, including campground, boat ramp, picnic site, and restroom facilities.

Riparian vegetation in affected downstream segments will be impacted by the change in water regime. It could be killed by the lowering of the water table and narrowing of stream channels, or flooded by large increases in flow. Hydraulic analyses were performed on Gooseberry and Cottonwood Creeks by the District (Barnes, September 12 and 27, 1991). The maximum reduction in depth of flow for Gooseberry Creek was projected to be 0.15-0.27 m (0.5-0.9 ft), which would occur in May, during normal spring runoff. Since Gooseberry Creek is a gaining stream, the depth of the ground water table adjacent to the stream is directly linked with the water surface of the stream. In Cottonwood Creek 0.6 ha (1.5 ac) of riparian habitat, mostly willows, throughout the affected stream segments will be lost to channel widening due to higher flows. The linear riparian corridors lost to reservoir development may be replaced by wetland vegetation surrounding the reservoir which will not provide the same critical wildlife values. Due to fluctuating reservoir levels it will be hard to reestablish trees around the reservoir.

Wildlife in the area will be directly impacted by loss of habitat to the reservoir and associated activities such as roadbuilding, or indirectly impacted through increased human activities, including recreational uses such as fishing, boating and off-road vehicle use, constructing cabins and increasing traffic throughout the area. A small area of aspen (Populus tremuloides) forest will be disturbed when the road is rerouted over the new dam. Bisection of the aspen grove by the rerouted road and increased traffic through the area may cause elk to desert their calving areas. Although less than 0.4 ha (one ac) of actual disturbance to the aspen habitat is proposed, the road will divide and fragment the existing unbroken block of forest, which could create passage problems for big game and will give interior forest-nesting birds smaller areas of suitable nesting habitat. Nesting raptors may be subject to harassment in addition to loss of prey base from the flooded meadows. Loss of hiding cover may cause many medium- and large-sized animals to discontinue traveling through the basin.

Construction of a water distribution system in the Sanpete Valley will temporarily disturb plant communities including Valley sagebrush/grass, scrub oak, grassland and mountain brush. These disturbances will be temporary as the pipelines will be buried underground and the linear nature of the disturbance will cause relatively small areas to be disturbed per unit area. A total of 12.1 ha (30 ac) along the 27.4 km (17 mi) pipeline alignment would be disturbed. These disturbed areas will be reseeded following completion of construction and wildlife impacts should be minimal.

UDWR has identified a potential impact of the project on an existing crop depredation program in northern Sanpete County. They have determined that increasing alfalfa production through use of project water will encourage mule deer to remain at low elevations

during summer to feed on agricultural fields, exacerbating an existing problem. Crop depredations could increase, requiring UDWR to spend additional time removing problem deer and to pay additional damages for crop depredations. UDWR will also have to pay for fencing for any new haystacks developed due to greater alfalfa production. It estimates that additional depredation expenses could increase by as much as \$2,000 over the existing program costs of approximately \$20,000. No mitigation for this project impact has been identified by UDWR at this time.

## Aquatic Resources

### **Stream Fisheries**

Operation of the dam will affect flows in Gooseberry, Fish and Cottonwood Creeks. The Upper Gooseberry Creek segment (1.6 km {one mi}) and 6.9 km (4.3 mi) of the tributary streams will be inundated. Under the smaller reservoir alternative 6.1 km (3.8 mi) of the Gooseberry Creek tributaries would be inundated. All other aquatic impacts should be the same under both alternatives.

Flows in the Middle Gooseberry Creek segment will be reduced by an average of 91 percent. The State Engineer has stipulated that a minimum of 0.03 cubic meters per second (cms) (one cubic foot per second {cfs}) be released from the Narrows Dam so that the segment will not be totally dewatered. If the flow at the Gooseberry Campground (approximately one mile below the dam site) is not 0.04 cms (1.5 cfs), then 0.035 cms (1.25 cfs) must be released from the dam. Flows in Lower Gooseberry Creek are expected to be reduced by as much as 62 percent, with an average flow reduction of 51 percent. Fish Creek flows will be reduced by an average of 18 percent, and up to 24 percent. Flows in the upper part of Cottonwood Creek would be increased by up to 1000 percent through the diversion of project water. Flows in the lower section would increase by up to 550 percent.

Table 4 shows the pre- and post-project flows for Gooseberry Creek, Fish Creek, the Price River, and Cottonwood Creek. Tables 5-9 show changes in WUA for cutthroat and rainbow trout in Gooseberry and Fish Creeks with the implementation of the project. Changes range from a monthly decrease of less than one percent to 100 percent.

In general, the decrease in flow in the *Middle Gooseberry segment* will have the greatest impacts during the spring and summer when flow is normally the highest. This is the time when cutthroat spawning occurs. Flow will be reduced to 0.03 cms (one cfs) from average flows of 1.27 and 1.76 cms (45 and 62 cfs) in May and June, respectively. Spawning and fry habitat will be seriously reduced (by 94 and 45 percent, respectively). Fry will also be prevented from being carried downstream by the dam. Adult (-72 percent) and juvenile (-81.6 percent) habitat will also be reduced during this period. Without flushing flows the width of the stream will reduce and more fine materials will accumulate in the substrate, which could eliminate any remaining spawning habitat. Fifty to 75 percent of trout biomass could be lost from this segment.

*Lower Gooseberry Creek* will also suffer the largest flow reduction from April to August. However, due to tributary inflow, reductions will not be as severe. Flows will be reduced from approximately 2.29 to 1.05 cms (81 to 37 cfs) in May and from 2.78 to 1.05 cms (98 to 37 cfs) in June. The low flow period, from October through March, is considered to be the most restrictive for providing trout habitat. Flows would be reduced from 8-32 percent at this time. During this period adult and juvenile cutthroat trout habitat would be reduced by 10.5 and 29.5 percent respectively. Reductions of adult and juvenile habitat of less than 10 percent will occur during other times of the year. Rainbow trout adult and juvenile habitat is projected to be reduced by 6.5 and 5.4 percent, respectively, during the low flow period. Implementation of the proposed project is expected to slightly increase rainbow spawning and fry habitat.

During the low flow period average flow will be reduced between 5 and 8 percent in *Fish Creek*. Habitat is expected to be reduced by up to 7.3 and 3.3 percent, respectively, for adult and juvenile cutthroat trout. For rainbow trout habitat may be reduced by up to 2.7 and 1.3 percent, for adults and juveniles, respectively. Spawning habitat could decrease by 16 percent for rainbows and increase by approximately the same amount for cutthroats. Fry habitat would change by less than 3 percent for both species.

Flows in *Lower Fish Creek* will not be directly affected by construction of the Narrows, but will be indirectly affected by changes in operation of Scofield Reservoir. Because the Narrows will capture runoff during spring high flows that would otherwise have gone to Scofield Reservoir, Scofield will spill less frequently and for shorter durations, lowering the volume of peak flows in Lower Fish Creek, and consequently in the Price and Green Rivers downstream. Controlled releases from Scofield Reservoir would remain unaltered during most years. However, under prolonged drought conditions, irrigation releases would be reduced due to lack of water in the reservoir. In simulations using data for the years 1960-1992, reductions would have occurred in 5 of the 33 years if the Narrows Project had been in place.

Flows in *Cottonwood Creek* will increase dramatically during water delivery, from July to October (Table 4). Because flows will not be increased during the low flow period the upper portion will still support a catch and release fishery. However, fishing will be more difficult due to higher flows. The self-sustaining fishery in the lower portion of the creek could be affected by impacts to riparian vegetation or streambank sloughing due to high flows. An engineering stability report (Barnes, September 12, 1991) was prepared for the District, which showed that the increased flows will degrade the channel by up to 0.1 m (0.36 ft) in certain segments. The District has committed to place a pipe in the upper 1.3 km (0.8 mi) of the stream to convey irrigation releases during the summer season. Thus, project impacts in this segment will be avoided. Change in flows could affect the lower 7.9 km (4.9 mi) of Cottonwood Creek. An IFIM analysis has not been done on Cottonwood Creek, so exact reductions in habitat for fish life stages, due to the project are unknown.

## Reservoir Fisheries

Flow of Gooseberry Creek into *Lower Gooseberry Reservoir* will be substantially reduced, particularly during spring and summer months. Flow reduction during this period may reduce the exchange rate in the reservoir, affecting water quality and leading to more severe fish kill problems. The project could also affect the cutthroat trout population in the reservoir by decreasing recruitment from upstream.

*Fairview Lakes* will not be directly affected by the project, but changes in management and fishing pressure may occur due to coordination of operation with the Narrows. Effects on the fishery could be beneficial due to reduced fishing pressure and greater availability of water due to operational changes.

A study prepared for the District (Cloward, Madden & Associates, November 1991) has shown that probability of eutrophication of *Scofield Reservoir* is slightly lower with the project conditions (from 79.3 to 78.0 percent). This is due to reduced sediment entering Scofield. However, sediments currently existing in the reservoir will continue to act as a nutrient sink, and reduction of incoming sediments due to the project will not improve the situation. After project construction, sediments would be intercepted in the Narrows Reservoir or build up in the contributing stream channels as discussed above.

Another concern is that decreased inflow may degrade water quality and increase the number of periodic fish kills. A comparison of Scofield Reservoir flushing rates under future without-project and project conditions showed an increase in projected fish kills from four in 30 years to five in 30 years. This is based on the assumption that fish kills occur 80 percent of the time when the annual flushing rate is less than 0.85 (Stephens, 1985). Decreased inflow will also result in a lower average surface area for the reservoir which will reduce the standing crop of fish in the reservoir. This loss of fish biomass would result in the loss of approximately 4,500 angler days per year.

The loss of spawning habitat for rainbow trout in Fish Creek could affect the fishery in Scofield Reservoir by reducing the number of rainbows entering the Scofield population from natural reproduction. It is not known what proportion of the rainbow trout existing in Scofield Reservoir come from natural production.

The *Narrows Reservoir* will be operated so that it will be at its highest level following spring runoff and water would be released so that most of the  $6.7 \times 10^6 \text{ m}^3$  (5,400 af) would be delivered by the end of September. It is expected that UDWR will manage the reservoir for a cutthroat trout fishery, though sterile rainbows may also be stocked. Natural cutthroat reproduction is expected under the proposed project alternative in the remaining segments of the three tributary streams, but this may need to be supplemented by stocking of fingerling cutthroats and rainbows. UDWR has expressed concern that, due to existing demand, there may not be enough hatchery stock available to meet demand in the new reservoir. The reservoir may support approximately 13,700 angler days of fishing annually (7,200 days

under the smaller reservoir alternative), if managed similarly to other reservoirs in the area.

### Endangered Species

The Service determined that the endangered bald eagle (Haliaeetus leucocephalus) and the endangered Colorado squawfish (Ptychocheilus lucius), razorback sucker (Xyrauchen texanus), humpback chub (Gila cypha) and bonytail chub (Gila elegans) could occur in the area of the project. Reclamation prepared a Biological Assessment (BA) with a determination that the project "may affect" the four endangered Colorado River fish through the  $6.7 \times 10^6$  m<sup>3</sup> (5,400 af) depletion. The Service prepared a Biological Opinion (March 25, 1992) based on the BA which concluded that the Narrows project would not jeopardize the continued existence of the fish species with the implementation of a designated Conservation Measure. The Conservation Measure requires the payment of a depletion charge into the Recovery Implementation Program (RIP) established by the Service to recover the endangered Colorado River fish. If sufficient progress is not made in the RIP through the ongoing reoperation of Flaming Gorge Dam, additional steps may need to be taken by the District to offset the Narrows depletion. Since the Biological Opinion was prepared the District has changed its estimate of average annual water depletion to  $6.85 \times 10^6$  m<sup>3</sup> (5,557 af). The Service is preparing a revised Biological Opinion at this time. Additional mitigation measures may be required under the RIP in the amended Biological Opinion. These measures are not included in this document, but would need to be added to the District's final mitigation plan.

A category 2 candidate species, the spotted frog (Rana pretiosa) could also occur in the project vicinity. The District conducted a survey for this species in historic habit in the Sanpete Valley. Two frogs were found near Oak Creek at the northern terminus of the proposed water delivery pipeline. It is not expected that the project will have an adverse effect on this species (Hovingh, 1992).

Since the Biological Assessment was prepared the roundtail chub (Gila robusta), a fish which occurs in the lower Price River, has been added to the list of species which are candidates for threatened or endangered species listing. It is not known how this species could be impacted by lowered flows in the Price River.

### DISCUSSION/PROPOSED MITIGATION

The main impacts of the Narrows project will occur on fish and wildlife resources in the reservoir basin and adjacent downstream segments of Gooseberry Creek and Cottonwood Creek. Proposed fish and wildlife mitigation measures as detailed in the Draft Environmental Impact Statement are described below. These measures were developed through coordination of the two technical teams and adopted by the District. They are referenced in the following text as the District's proposed mitigation, but it should be understood that these measures were developed with input from all interested agencies. Where there are differences between the project proposal and the small reservoir alternative,

information pertaining to the small reservoir alternative is shown in parentheses. The District's intention is to totally mitigate all impacts, where possible. To the extent possible, the District attempted to find mitigation measures which could be implemented "in place" and "in kind".

Flooding of the reservoir basin will destroy all HUs of indicator species present, as shown in Table 3. Wetland areas to be destroyed, including 6.9 km (4.3 mi) of the Gooseberry Creek tributaries (6.1 km {3.8 mi}) and the 1.6 km (one mi) Upper Gooseberry Creek segment, provide habitat units for the Richardson's vole, yellow warbler, mule deer and beaver. The District has proposed two alternatives to mitigate for wetlands losses. One alternative would involve enlarging existing wetlands and creating new wetlands adjacent to the Narrows Reservoir. Under this proposal approximately 44.5 ha (110 ac) of new wetlands will replace the hectares (acres) lost, including riparian habitat lost to flooding along Cottonwood Creek. Habitat units lost for all wetland habitat types will be replaced onsite adjacent to the reservoir according to the District's plan. However, the Corps has not accepted this plan as mitigation for wetland losses at this time. The District has proposed another alternative for full or partial mitigation that consists of purchase and restoration of wetlands adjacent to Mud Creek, a tributary to Scofield Reservoir. Approximately 89 ha (220 ac) of private lands containing degraded wetlands would be purchased. Most of the degradation has been caused by cattle which would be removed to facilitate enhancement of the wetlands. Figure 4 shows the location of the alternative wetland mitigation sites.

Conversion of upland habitat adjacent to the reservoir for wetland replacement would remove additional HUs for mule deer and Brewer's sparrow. This is reflected in the acreage of impacted HUs shown in Table 3 and will need to be mitigated if this alternative is chosen for wetlands mitigation. If the Mud Creek alternative wetland mitigation is chosen, these additional HUs would not be required.

The District has proposed mitigation measures to replace lost upland shrub HUs for mule deer and Brewer's sparrow. Proposed measures include acquiring 60.7 ha (150 ac) of conservation easements with land use restrictions adjacent to the reservoir basin, which would avoid future adverse impacts, but would not mitigate for project impacts. Offsite mitigation through participating in other projects in the Manti-LaSal National Forest such as reclaiming areas infested with tarweed (*Media glomerata*) to native shrub/grass habitats is also proposed. It is not known if these rehabilitated areas would meet the specific habitat needs of mule deer and Brewer's sparrow lost due to the project. Specific projects have not been committed to as yet. The District has also committed to acquire 259 ha (640 ac) of private land adjacent to Lower Fish Creek (Price River) below Scofield Reservoir. The sections also contain some upland sagebrush habitats whose protection could compensate somewhat for upland habitats including elk calving and mule deer fawning areas lost to the project. Wildlife values would be enhanced by fencing.

Other project impacts include impacts to stream fisheries, stream channels and riparian habitat corridors in downstream segments of Gooseberry and Cottonwood Creeks.

The 4.8 km (3 mi) Middle Gooseberry segment will be largely dewatered. The channel will become narrower and shallower. Sediments will also accumulate due to low flow conditions. The District proposes to mitigate riparian habitat losses onsite by placing constrictions in the channel to prevent the water surface from dropping and modifying stream banks so that overbank flooding will still be possible. Riparian plantings will be used in areas where vegetation has been damaged or destroyed. Buildup of fine sediments in the stream channel will be minimized by providing flushing flow releases from the Narrows Dam when necessary. The District has proposed to acquire a 16.2 ha (40 ac) parcel of private land that this segment of the creek runs through.

Impacts to stream fisheries in the inundated segments in Upper Gooseberry will be total, and they will be severe in the Middle Gooseberry segment. Other impacted stream segments will not be as directly affected. To mitigate onsite for lost fisheries the District will restore year-round flows in two of the Gooseberry Creek tributaries through releases from Fairview Lakes. This will result in the creation of approximately 3.7 km (2.3 mi) of spawning and rearing habitat for cutthroat trout, which will partially mitigate for the 8.5 km (5.3 mi) lost in the Upper Gooseberry segments. Under the smaller reservoir alternative, this mitigation measure will not be available and the District will need to provide an additional stream segments for cutthroat spawning habitat elsewhere.

The District has proposed to release water from the Narrows Dam for flushing sediments and for fish habitat during critical periods to avoid some fishery losses in the Middle Gooseberry segment. An average of  $3.7 \times 10^5$  m<sup>3</sup> (300 af) would be available for release each year. UDWR has also suggested that the water might be used as an instream flow supplement during the winter period to help prevent fish kills in Lower Gooseberry Reservoir. The District and UDWR would determine the timing and amount of water to be released.

Through these measures, spawning and rearing habitat for cutthroat trout will be able to be maintained in the Middle Gooseberry segment. However, habitat for adult and juvenile trout will be lost throughout 6.4 km (4 mi) of stream in the Upper and Middle segments. The District has proposed to acquire stream segments in a 1:1 ratio with the mileage of impacted streams. The District proposed to acquire approximately 20.2 ha (50 ac) of private land containing live fishery streams. A corridor, approximately 61 m (200 ft) wide, would be acquired along a total of 6.4 km (4 mi) of stream. The project might include parcels from several different streams. In the DEIS, the District identified five stream segments that may be available for purchase. The acquired stream corridors would be fenced with a pole top fence to exclude grazing. These stream segments would provide habitat for all life stages of cutthroat trout.

The purchase of the State section in the Lower Fish Creek area could also contribute to mitigation of fishery impacts associated with the project, particularly to stream segments suitable for adult and juvenile occupancy. This section of Fish Creek currently provides habitat for adult and juvenile cutthroat, rainbow and brown trout.

The District has proposed to prevent stream degradation from increased flows in Upper Cottonwood Creek by construction of a 1.3 km (0.8 mi) pipeline to convey reservoir releases. A winter release of 0.056 cms (2 cfs) would also be made from the Narrows Reservoir to Cottonwood Creek during the winter months (October through March) to increase fish habitat during that period and to provide mitigation for stream channel widening that would occur due to high summer flows. No mitigation was proposed for loss of fishery habitat in Lower Cottonwood Creek.

Lower stream flows and their impacts on fisheries in Gooseberry and Fish Creeks may affect reproduction and recruitment into the Lower Gooseberry and Scofield Reservoir populations. This could impact recreational use of the two reservoirs. The District calculates that 4,500 angler days per year will be lost at Scofield Reservoir but does not calculate potential losses at Lower Gooseberry Reservoir. Creation of a new fishery on the Narrows Reservoir would provide approximately 13,700 angler days of use, according to the District, offsetting losses at other reservoirs. The smaller reservoir alternative would provide approximately 7,200 days of angler user.

The District has committed to a monitoring program to evaluate the progress of wildlife and wetlands mitigation plans, both qualitatively and quantitatively to ensure that lost HUs and wetland acreages are replaced. Statistical comparisons will be made and additional mitigation measures would be required if full mitigation standards are not achieved. A similar monitoring program for aquatic mitigation measures was not included in the Draft EIS.

The Service and UDWR believe that the types of mitigation proposed in the DEIS are appropriate. However, the two agencies were concerned about inadequacies in the amount of mitigation proposed, as not all impacts were proposed to be totally mitigated. The Corps will determine whether the amount of mitigation proposed for wetland resource losses is appropriate. Mitigation for upland wildlife species will be total replacement of lost HUs. The main concern of the Service and UDWR was the adequacy of proposed aquatic mitigation measures, particularly for losses of stream segments that support fisheries. In a letter dated September 21, 1994 (see Appendix B), the UDWR has recommended measures, including some already committed to by the District, to be taken to totally mitigate for these losses in both the Price River Basin and the Sanpitch River Basin. The Service concurs with the recommendations of UDWR. The District voted on September 7, 1994 to incorporate those additional measures not contained in the DEIS into their mitigation plan in the Final EIS. Therefore the cost estimate (Appendix A) and the Aquatic Impacts and Mitigation Measures (Table 10) include these additional measures, as described below.

Affected streams in the **Price River Basin** (Gooseberry Creek, and Fish Creek) will suffer losses to fishery values; in some segments the losses will be complete. The UDWR recommended the following measures to offset project impacts. Acquisition and fencing of 4.0 miles of Mud Creek would complement the proposed wetland mitigation project in this area. These projects together would mitigate for both wetlands and stream impacts, as well as potentially benefitting water quality in Scofield Reservoir by reducing nutrients entering

the reservoir from the Mud Creek drainage. UDWR recommended that two miles of Lower Fish Creek be acquired, fenced and enhanced. This would be done in conjunction with the acquisition of a section of State School trust lands which is proposed as mitigation for upland impacts. It is also recommended that 2.5 miles of Winterquarters Creek, and one mile of Pondtown Creek within the USFS boundary, be acquired, fenced, and/or enhanced for improvement of stream and riparian habitat conditions.

Recommendations for the **Sanpitch River Basin** include piping the irrigation flows in the upper 0.8 miles of Cottonwood Creek and providing a minimum 2 cfs instream flow for this stretch during the winter season. For enhancement of the segment of Cottonwood Creek from the canyon mouth to the confluence with the Sanpitch River, UDWR recommended a 2 cfs minimum instream flow during the irrigation season. This will provide year-round flows for fish habitat and enhance the riparian corridor. Currently, this stream segment is dewatered during the irrigation season. UDWR also recommended enhancement of 4 miles of Starvation Creek, from the confluence of Bennion Creek to the confluence with Soldier Creek in Spanish Fork Canyon to improve water quality and riparian habitat. Enhancement may include bank stabilization, revegetation, or other measures.

## RECOMMENDATIONS

Properties acquired for mitigation, whether for upland wildlife, wetlands, or aquatic wildlife, could be managed under the following strategies: acquisition for protection, acquisition for enhancement, conservation easements for protection, conservation easements for enhancement, enhancement of USFS property and enhancement of UDWR property. Mitigation for this project will probably includes a combination of several or all of these strategies.

The following recommendations also need to be addressed in the Final EIS to complete the mitigation plan:

1. The above recommendations apply to the preferred (large reservoir) alternative. If the small reservoir alternative is chosen, additional mitigation will be required for the loss of cutthroat trout spawning habitat which could not be replaced by restoration of headwater streams from Fairview Lakes. At the time this alternative is chosen, additional mitigation measures will be developed in coordination with the Service and UDWR.
2. Acquisition of private lands should preferably be made by fee title. In areas adjacent to the reservoir basin easements would be appropriate. In the Final EIS the District should identify the appropriate management entities for specific properties being considered for acquisition. Conditions of easements should also be specified in the Final EIS.

3. As part of the mitigation plan the District must develop a comprehensive monitoring and maintenance program to ensure that aquatic and wildlife habitat replacement values are being met. This program will address monitoring procedures, responsible parties, and steps to be taken if mitigation efforts do not prove successful. It should also include an Operation and Maintenance account with adequate funding to ensure that mitigation requirements are met. This plan should be included as part of the Final EIS.
4. Reclamation will ensure that language in the Small Reclamation Project Loan repayment contract stipulates that mitigation will be concurrent with project construction.
5. Any additional measures for wetland mitigation required by the Corps should be included in the Final mitigation plan.
6. Any additional measures for impacts to listed fish species required by the Amended Biological Opinion should be included in the Final mitigation plan.
7. The Final EIS should list detailed mitigation commitments for all project impacts. Specifics such as management entities for the various stream segments, and specific enhancement measures to be taken in each area should be listed. If there are any areas where a specific final mitigation strategy has yet to be determined a timetable for development should be included, along with a list of agencies to be consulted for concurrence.

Appendix A includes a preliminary cost analysis of the mitigation plan including costs for mitigation as proposed by the District in the DEIS as well as costs for additional mitigation measures approved by the District as discussed above. Costs are estimated since property acquisition costs may vary.

## LITERATURE CITED

- Barnes, F.R. September 12, 1991. Cottonwood Creek Channel Degradation. Memorandum prepared for Cottonwood Canyon Slope Stability Team Members - Narrows Project. 2 pp. + tables.
- Barnes, F.R. September 27, 1991. Comparison of Gooseberry Creek Preproject and Project Flow Depths - Narrows Project Environmental Analysis. Memorandum to Narrows Project Files. 2 pp. + tables.
- Bovee, K.D. 1982. A guide to stream habitat analysis using the Instream Flow Incremental Methodology. Instream Flow Inf. Paper No. 12, FWS/OBS - 82/26. U.S. Fish and Wildlife Service, Office of Biological Services. Ft. Collins, CO. 248 pp.
- Cloward, Madden & Associates. November 1991. Schofield (sic) Eutrophication Study. 28 pp.
- Franson - Noble & Associates. February 1992. Preliminary Narrows Project Proposed Fish and Wildlife Mitigation Measures. 3 pp. + figure.
- Hovingh, P. November 1991. Spotted Frog Survey of San Pitch River System. Summary of Findings. 14 pp. + tables.
- Milhous, R.T., D.L. Wegner, and T. Waddle. 1984. User's guide to the Physical Habitat Simulation System. Instream Flow Inf. Paper No. 11, FWS/OBS - 81/43. U.S. Fish and Wildlife Service, Office of Biological Services. Ft. Collins, CO. 465 pp.
- Mt. Nebo Scientific. February 1992. Vegetation and Wildlife Impacts from the Narrows Project. Draft Report. 28 pp. + tables.
- Stephens, D.W. 1985. Why Scofield Reservoir is eutrophic - Effects of nonpoint source pollutants on a water supply reservoir in Utah. Pages 142-146 in Perspectives on nonpoint source pollution. U.S. Environmental Protection Agency report 440/5-85-001.
- U.S. Fish and Wildlife Service. 1980. Habitat Evaluation Procedures (HEP). Ecological Services Manual, Part 102.
- Woodward - Clyde Consultants. December 1991. Aquatic Ecology Section. 22 pp. + tables.
- C:\WP51\BR\NARROWS.FCR

APPENDIX A

MITIGATION COST ESTIMATE (PREFERRED ALTERNATIVE)

<u>Mitigation Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Cost</u>
Wetland Mitigation Area (adjacent to reservoir)	110	acre	500	55,000
Plantings for Wetland Mitigation Area	lump sum	lump sum	10,000	10,000
or				
Wetland Mitigation Area *(Mud Creek)	220	acre	500	110,000
Fencing on Mud Creek	2	mile	13,000	26,000
Wildlife Conservation Easement Adjacent to Reservoir	150	acre	400	60,000
Acquire State Section on Price River below Scofield Reservoir	640	acre	350	224,000
Fencing for State Section	4	mile	13,000	52,000
Acquire Middle Gooseberry land	40	acre	350	14,000
Fencing on Middle Gooseberry	0.25	mile	13,000	3,250
Middle Gooseberry Channel rehab	3	mile	10,000	30,000
Upper Gooseberry Tributaries Planting & Channel Improvements	lump sum	lump sum	10,000	10,000
Reseeding on Forest Service lands	900	acre	30	27,000
Monitoring Aquatic and Wildlife Mitigation	lump sum	lump sum	50,000	50,000
Endangered Fish Depletion Fee (1995 Cost)	5,557	acre-feet	12.71	70,629.47

APPENDIX A (CONT'D)

Acquire Stream Segments (2 mi *Mud Creek, 1 mi Lower Fish Creek, 1 mi Upper Fish Creek, 2.5 mi Winterquarters Creek, 2 mi Pond- town Creek, 4 mi Starvation Creek)	303	acre	500	151,500
Fence Fishery Segments	25	mile	13,000	325,000
Enhance Stream Segments	13.5	mile	15,000	202,500

TOTAL (Wetlands Alternative Adjacent to Reservoir) 1,284,879.47

TOTAL (Mud Creek Wetland Alternative) 1,355,879.47

\*2 miles of Mud Creek will be purchased for mitigation of aquatic impacts. If the Mud Creek wetlands mitigation alternative is chosen, an additional 2 miles of stream will be purchased and fenced.

## APPENDIX B



Wildlife Resources

1596 West North Temple • Salt Lake City, UT 84116-3195 • 801-533-9333

## memorandum

SEP 28 1994

September 21, 1994

Mr. Reed Harris  
U.S. Fish and Wildlife Service  
Lincoln Plaza  
145 East 1300 South, Suite 404  
Salt Lake City, Utah 84115

Subject: Final Comments, Fish and Wildlife Coordination Act  
Report, Narrows Project

Dear Reed:

We have reviewed the subject draft Fish and Wildlife Coordination Act Report dated June 1994 for the proposed Narrows Project in Utah. Contained herein are the Division of Wildlife Resources' (Division) final comments regarding the document. We have provided additional information and mitigation recommendations which have been derived since the draft report was issued.

Through previous consultation among our agencies, the Division had recommended that mitigation for stream impacts occur on a 3:1 or 2:1 linear basis whenever the project sponsor proposed improvement of existing stream segments as a mitigation method, by either fencing to protect riparian and stream bank areas, or through other unidentified methods. Since that time, Division staff have refined the recommendation to account for project impacts and project-induced mitigation improvements using the Habitat Quality Index method. For this analysis, Division staff used existing file data, published reports, and professional judgement to estimate the number of Habitat Units present in stream segments which would or could be affected by the Narrows project, either as impacted streams or as potential mitigation sites. Both pre- and post-project Habitat Units were estimated using those methods.

Table 1 presents the Division's recommended mitigation for impacts to stream fishery resources of the Proposed Large Dam Alternative of the Narrows Project which had previously been recommended in concept at 3:1 or 2:1 linear ratios. All other proposed mitigation recommendations in the draft report would

Mr. Reed Harris --  
September 21, 1994  
Page Two

remain unchanged, unless specifically modified herein. Also shown is the analysis of Habitat Units for each stream segment under existing and Post-Project conditions. Specific recommendations regarding the types of improvements which should be implemented follow.

#### Price River Basin

The recommendation to acquire and fence 4.0 miles of Mud Creek is intended to complement the proposed wetland mitigation project also along Mud Creek. Together these two projects would not only mitigate wetland and stream impacts, but could potentially benefit water quality in Scofield Reservoir by trapping and reducing nutrients entering Scofield Reservoir from the Mud Creek drainage. The recommendation regarding Lower Fish Creek is to acquire, fence and enhance two miles. Much of this would be accomplished in concert with the proposed mitigation for upland impacts of acquiring a section of State School Trust lands. Acquiring and fencing 2.5 miles of Winterquarters Creek would allow for improvement of stream and riparian conditions. One mile of Pondtown Creek within the U.S. Forest Service boundary is also recommended for acquisition and fencing or enhancement.

#### Sanpitch River Basin

Piping most of the irrigation flows from the tunnel outlet downstream 0.8 miles to discharge into Cottonwood Creek will avoid an impact from high project releases, and will allow for enhancement of summer flows in the upper 0.8 mile reach of Cottonwood Creek. Providing a 2 cfs minimum instream flow in the winter season to this same reach of stream will provide for establishment of year-round flows and a naturally reproducing complement of fish species. The enhancement measure proposed for the lower Cottonwood Creek, from the canyon mouth to the confluence of the San Pitch River, is to provide a 2 cfs minimum instream flow during the irrigation season. This will provide year-round flows in the stream, which will provide some fish habitat, will create a fishery for local residents, and enhance the riparian corridor. Presently this reach of stream is de-watered during the irrigation season.

Enhancement along the 4 miles of Starvation Creek, from the confluence of Bennion Creek down to the confluence with Soldier Creek (Utah County, Spanish Fork Canyon) will improve water quality and riparian habitat of the stream. Enhancement can

Mr. Reed Harris --  
September 21, 1994  
Page Three

include, but is not limited to, bank stabilization, especially where the road confines the stream channel and causes bank erosion, and revegetation in appropriate locations.

Mitigation recommendations for the Small Dam Alternative would be similar to the recommendations provided for the Large Dam Alternative, with the exception that additional mitigation for loss of cutthroat trout spawning habitat would need to be provided in lieu of the restoration of headwater streams from Fairview Lakes. The Division proposes that a final mitigation plan for that impact would be developed in consultation with the project sponsor at that time, if the Smaller Dam Alternative is selected.

The only other comment we have on the report is that the 2 cfs minimum streamflow release from the Narrows Tunnel to the headwaters of Cottonwood Creek during the "winter" should actually be a commitment to maintain the 2 cfs minimum flow in the stream from the end of one irrigation season to the beginning of the next. This should be noted in the report, rather than beginning and ending on a fixed date regardless of when irrigation deliveries equal to or greater than the 2cfs minimum begin and end.

We appreciate the efforts of your staff in working closely with Division staff during the past several years on this project. Please contact Mark Holden or Catherine Quinn at 538-4700 if you have any questions regarding these comments.

Sincerely,

  
Robert G. Valentine  
Director

RGV/MH/kj

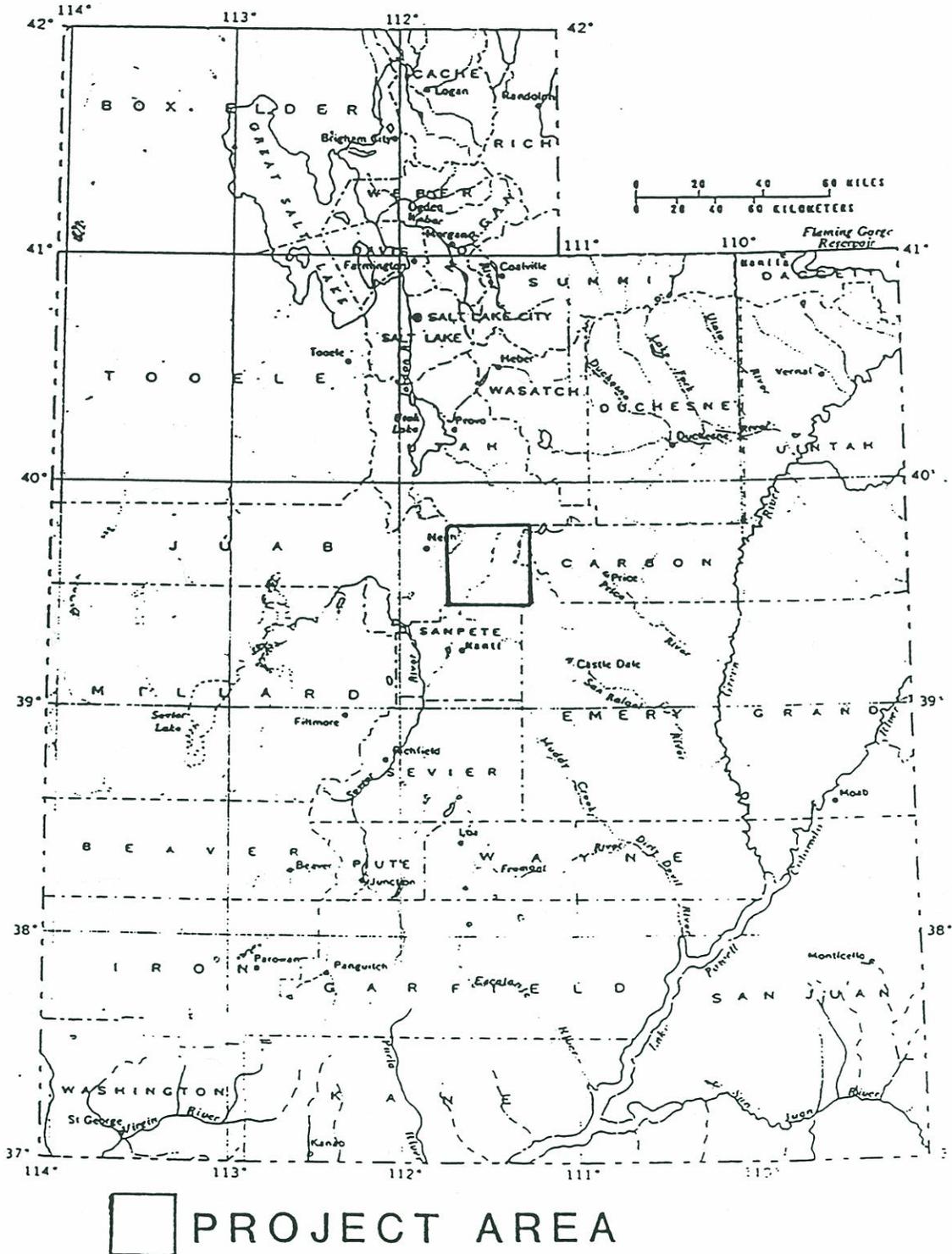
cc: Richard Noble, Franson-Noble Associates  
Manti-LaSal National Forest Supervisor

WMH\WP\MITRECC.FWS

TABLE 1  
ESTIMATION OF HABITAT QUALITY INDEX UNITS ON AFFECTED  
AND POTENTIAL MITIGATION REACHES, PREFERRED ALTERNATIVE

Stream	Miles Affected	Existing HUs/mi	HUS Post Project	Change in HUs/mi	HUS to Replace	Replacement HUS Gained
Price River Basin						
Middle Gooseberry C.	4	139	0	-139	556	-----
Lower Gooseberry Cr.	2	203	132	-71	142	-----
<b>Total HUS Lost</b>					<b>698</b>	
Mud Creek	4	79	160	81	-----	324
Lower Fish Creek	2	312	350	38	-----	76
Upper Fish Creek	1	432	517	85	-----	85
Winterquarters Creek	2.5	35	77	42	-----	105
Pondtown Creek	2	50	103	53	-----	106
<b>Total HUS Replaced</b>						<b>696</b>
Sanpitch River Basin						
Cottonwood Creek	4.9	79	13	-66	322	-----
<b>Total HUS Lost</b>					<b>322</b>	
Upper Cottonwood Cr.	0.8	4	202	198	-----	158
Lower Cottonwood Cr.	1.2	0	40	40	-----	48
Starvation Creek	4	82	111	29	-----	116
<b>Total HUS Replaced</b>						<b>322</b>

Figure 1 - General Project Location Map



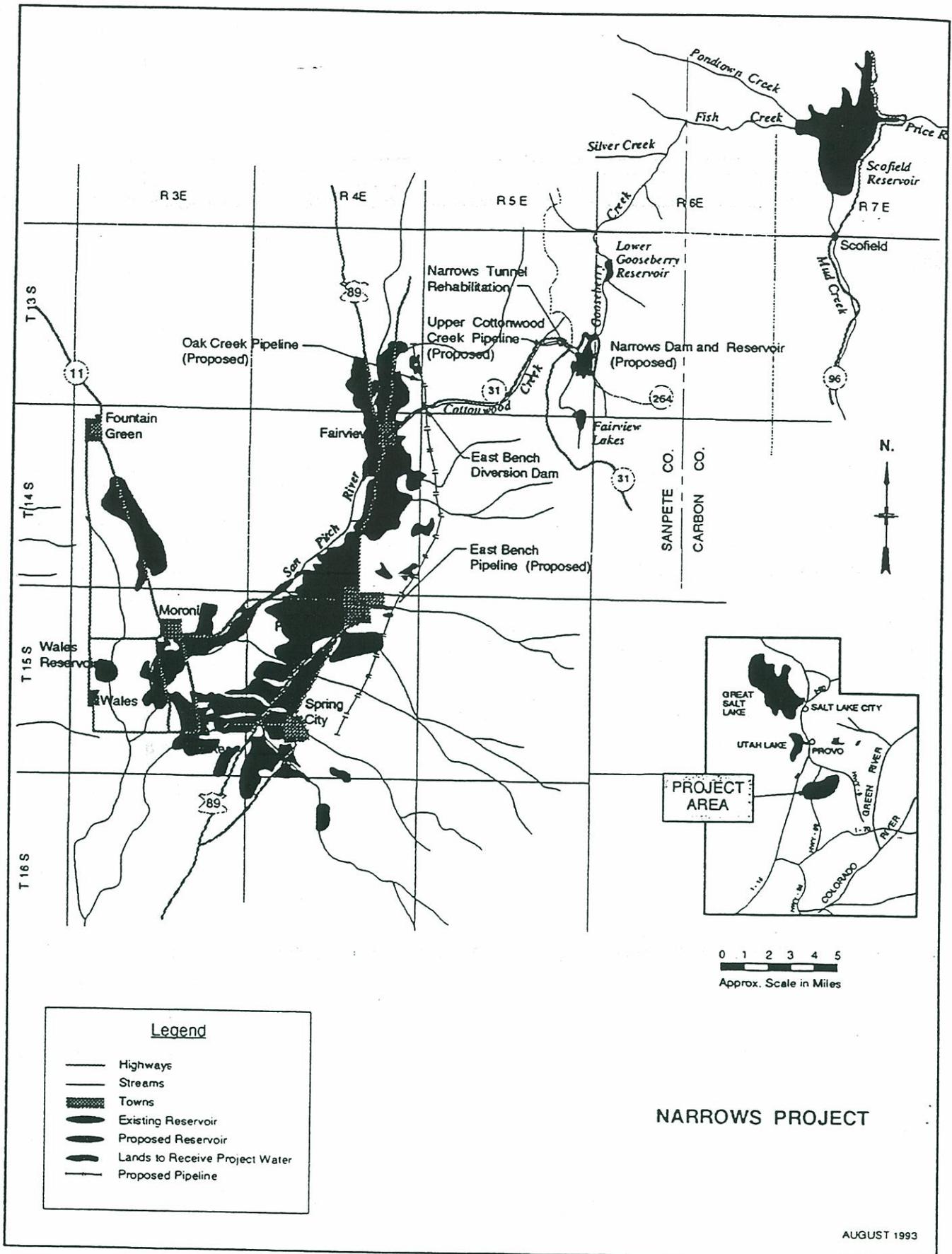


Figure 2. Narrows Project Area and Water Distribution System

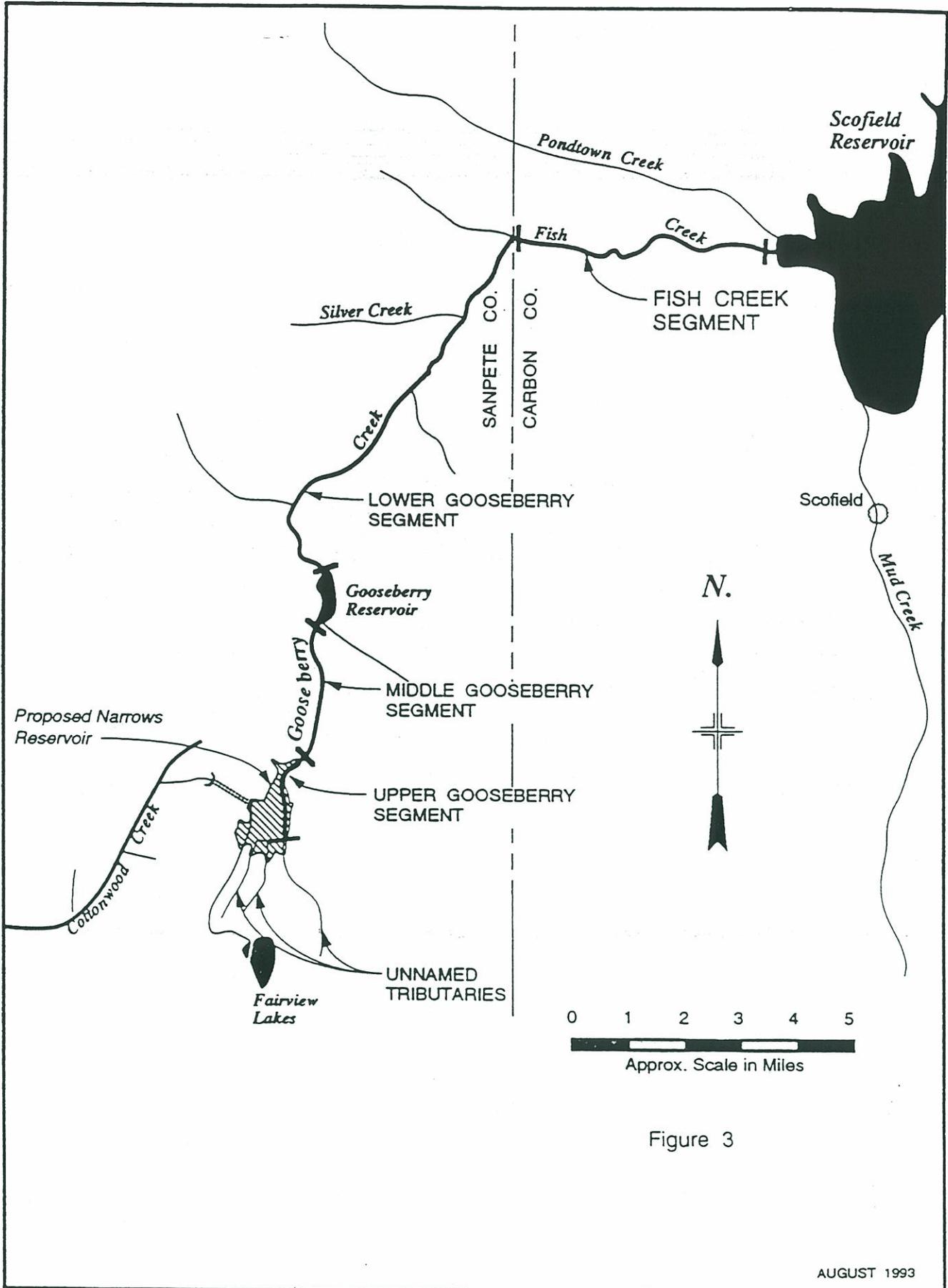


Figure 3

Figure 3. Streams and Reservoirs in the Narrows Project Area

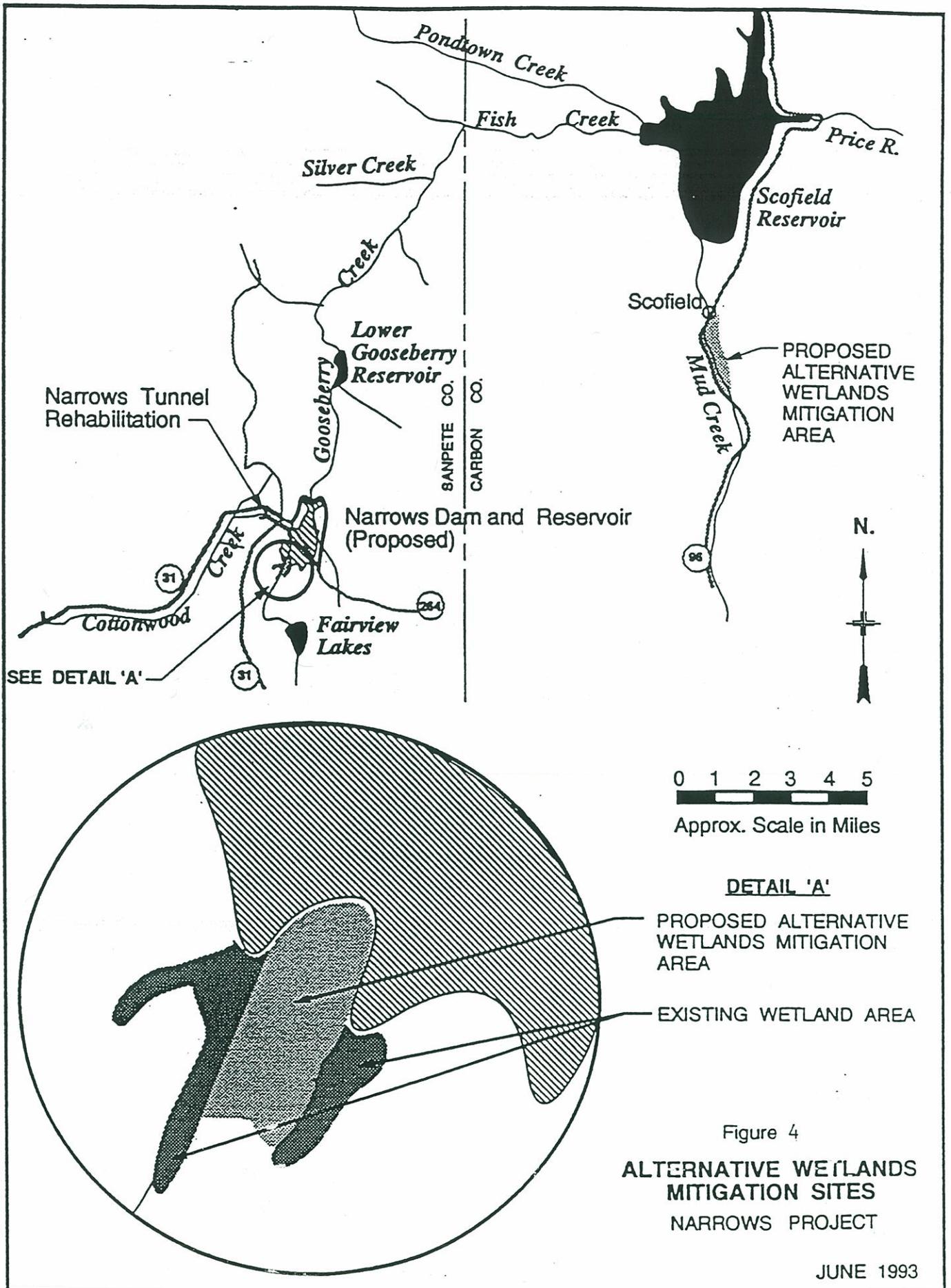


TABLE 1: Wildlife Feeding Guilds for the Narrows Basin Study.

F E E D I N G T Y P E S

C O V E R	CARNIVORE		INSECTIVORE		HERBIVORE		OMNIVORE
AERIAL			Common Nighthawk Poor-will Townsend's Solitaire Tree Swallow Small Footed Myotis Western Pipitrelle				
SHRUB LAYER			Willow Flycatcher				Mtn. Bluebird Greentailed Towhee Brewer's Sparrow Sage Sparrow
TERRESTRIAL SURFACE	Cooper's Hawk Gt. Horned Owl Northern Harrier	Killdeer Vagrant Shrew Northern Flicker Sagebrush Lizard Short-horned Lizard Western Garter Snake		Broadtail Hummingbird Montane Vole Jumping Mouse Deer Mouse Uinta Ground Squirrel Cottontail Rabbit Least Chipmunk Moose Elk Mule Deer			Magpie Raven Rock Wren Coyote
TERRESTRIAL SUBSURFACE	Badger				Pocket Gopher		
RIPARIAN/WETLAND	Belted Kingfisher	Tiger Salamander Northern Leopard Frog Water Shrew Common Snipe Yellow Warbler			Green-winged Teal Cinnamon Teal Mallard Canada Goose Sandhill Crane American Dipper Beaver Montane Vole		

**Bolded names were evaluation species.**

TABLE 2: Wildlife Reproductive Guilds for the Narrows Basin Study

COVER TYPES	REPRODUCTIVE GUILD SPECIES
<p>SHRUB</p> <p><u>Vegetation</u></p> <p><u>Bareground</u></p>	<p>Green-tailed Towhee, Brewer's Sparrow, Willow Flycatcher, Yellow Warbler</p> <p>Cottontail, Deer Mouse, Common Nighthawk, Poor-will, Sagebrush Lizard, Short-horned Lizard</p>
<p>RIPARIAN/WETLAND</p> <p><u>Vegetation</u></p> <p><u>Organic Litter</u></p> <p><u>Bareground</u></p> <p><u>Bank</u></p>	<p>Montane Vole, Harvest Mouse, Common Snipe, Vagrant Shrew, Water Shrew, Tiger Salamander, Northern Leopard Frog, Western Garder Snake, Green-winged Teal, Cinnamon Teal, Mallard</p> <p>Northern Harrier, Poor-will, Jumping Mouse, Beaver</p> <p>Killdeer</p> <p>Belted Kingfisher, Muskrat, Dipper</p>
<p>SUBSURFACE</p> <p><u>Borrow</u></p>	<p>Badger, Uinta Ground Squirrel, Least Chipmunk, Pocket Gopher</p>

Bolded names were evaluation species.

TABLE 3: Baseline Habitat Conditions Within the Narrows Reservoir Basin for (A) Affected Areas; and (B) Evaluation Species.

(A) AFFECTED AREAS

Vegetation type (HEP cover type)

<u>Reservoir inundation</u>	<u>Acres</u>
Vasey sagebrush (USHE)	331
Silver sagebrush (USHE)	156
Wetlands (PEM, PSS)	100
Aspen	0.19
Previously disturbed	17
Subtotal	604.19
<u>Potential Disturbance in wetland mitigation area</u>	
Vasey sagebrush	110.00
TOTAL	<u>714.19</u>

(B) EVALUATION SPECIES

(Smaller Reservoir Alternative in Parentheses)

<u>Species</u>	<u>Cover Type(s) Used</u>	<u>Acres</u>	<u>HSI</u>	<u>HUs</u>
Richardson's vole	PEM	63 (18)	1.00	63 (18)
Yellow warbler	PSS	37 (10)	0.70	26 (7)
Beaver	PEM,PSS	100 (28)	0.13	13 (4)
Mule deer	PEM,PSS, USHE	587 (246)	0.23	135 (57)
Brewer's sparrow	USHE	487 <sup>a</sup> (218)	0.98	624 (214)

HEP = Habitat Evaluation Procedures

PEM = Palustrine emergent wetland cover (herbaceous wetlands)

PSS = Palustrine scrub/shrub cover (shrubby wetlands)

USHE = Shrub cover (Vasey sagebrush; silver sagebrush)

HSI = Habitat Suitability Index

HUs = Habitat Units

a = all USHE habitat type areas, including area disturbed for mitigation

**TABLE 4**  
Average Existing and Projected Flows  
(unit—cfs)

Month	Recommended Plan			Smaller Reservoir Plan			No Action Plan		
	Average year (1968)	Wet year (1984)	Dry year (1977)	Average year (1968)	Wet year (1984)	Dry year (1977)	Average year (1968)	Wet year (1984)	Dry year (1977)

Gooseberry Creek at Proposed Narrows Damsite

October	1.0	1.0	1.0	1.0	1.0	1.0	2.0	4.7	1.6
November	1.0	1.0	1.0	1.0	1.0	1.0	1.5	3.3	1.4
December	1.0	1.0	1.0	1.0	1.0	1.0	1.4	4.2	0.7
January	1.0	1.0	1.0	1.0	1.0	1.0	1.3	2.4	1.0
February	1.0	1.0	1.0	1.0	1.0	1.0	1.3	2.4	1.2
March	1.0	1.0	1.0	1.0	1.0	1.0	1.4	2.4	1.2
April	1.0	1.0	1.0	1.0	1.0	1.0	3.5	5.3	5.5
May	5.9	79.3	5.9	1.0	87.2	1.0	45.3	102.9	15.1
June	10.5	100.0	1.0	37.7	102.0	1.0	61.8	92.8	6.5
July	1.0	1.0	1.0	1.0	1.0	1.0	7.2	12.8	3.0
August	1.0	1.0	1.0	1.0	1.0	1.0	4.9	6.0	1.5
September	1.0	1.0	1.0	1.0	1.0	1.0	3.2	4.3	0.9

Gooseberry Creek Below Lower Gooseberry Reservoir

October	2.9	5.8	2.4	2.9	5.8	2.4	4.1	10.2	3.0
November	3.1	5.9	2.2	3.1	5.9	2.2	3.8	8.8	2.7
December	3.2	5.4	2.1	3.2	5.4	2.1	3.8	9.0	1.9
January	3.6	6.2	2.1	3.6	6.2	2.1	4.0	7.8	2.1
February	3.7	6.1	2.2	3.7	6.1	2.2	4.1	7.6	2.4
March	3.7	5.2	2.3	3.7	5.2	2.3	4.2	7.0	2.6
April	4.6	6.4	6.5	4.6	6.4	6.5	7.5	11.2	10.9
May	38.2	172.5	0.9	33.3	180.5	0.9	82.1	199.3	12.9
June	34.8	156.9	3.9	62.0	159.0	3.9	92.1	162.0	9.8
July	5.9	9.9	1.5	5.9	9.9	1.5	12.8	24.1	3.8
August	5.6	4.9	1.3	5.6	4.9	1.3	10.0	10.7	2.0
September	3.9	3.6	1.9	3.9	3.6	1.9	6.4	7.4	1.9

Fish Creek Above Scofield Reservoir

October	9.4	18.9	7.6	9.4	18.9	7.6	10.6	23.3	8.2
November	9.5	17.3	7.9	9.5	17.3	7.9	10.2	20.2	8.4
December	8.4	15.6	7.5	8.4	15.6	7.5	9.1	19.2	7.3
January	9.1	16.3	5.5	9.1	16.3	5.5	9.5	17.9	5.6
February	10.6	19.0	5.3	10.6	19.0	5.3	11.1	20.6	5.5
March	14.1	17.3	5.4	14.1	17.3	5.4	14.6	19.1	5.7
April	17.8	43.7	24.5	17.8	43.7	24.5	20.7	48.5	29.0
May	211.7	614.5	11.4	206.8	622.5	6.5	255.6	641.3	23.5
June	173.5	360.8	8.5	200.7	362.8	8.5	230.8	365.8	14.4
July	29.6	51.4	4.6	29.6	51.4	4.6	36.5	65.7	6.8
August	17.6	21.6	3.5	17.6	21.6	3.5	22.0	27.4	4.1
September	12.2	17.3	3.5	12.2	17.3	3.5	14.7	21.0	3.5

TABLE 4 (continued)

Month	(unit-cfs)								
	Recommended Plan			Smaller Reservoir Plan			No Action Plan		
	Average year (1968)	Wet year (1984)	Dry year (1977)	Average year (1968)	Wet year (1984)	Dry year (1977)	Average year (1968)	Wet year (1984)	Dry year (1977)

Price River Below Scofield Dam

October	40.0	176.5	22.8	40.0	176.5	22.8	40.0	204.0	22.8
November	2.8	5.1	10.1	2.8	5.1	10.1	2.8	5.1	10.1
December	3.4	0.0	11.4	3.4	0.0	11.4	3.4	0.0	11.4
January	3.7	0.0	13.0	3.7	0.0	13.0	3.7	0.0	13.0
February	0.3	0.0	7.2	0.3	0.0	7.2	0.3	0.0	7.2
March	0.0	0.0	6.5	0.0	0.0	6.5	0.0	199.0	6.5
April	0.0	274.6	32.0	0.0	274.6	32.0	0.0	309.8	32.0
May	0.0	661.9	41.1	0.0	669.9	41.1	27.7	463.7	41.1
June	4.4	529.2	43.8	4.4	531.2	43.8	4.4	534.2	43.8
July	152.8	149.3	61.9	152.8	149.3	61.9	152.8	155.3	61.9
August	87.2	108.5	39.1	87.2	108.5	39.1	87.2	124.2	39.1
September	163.8	114.1	21.9	163.8	114.1	21.9	163.8	135.6	21.9

Fairview Tunnel at Outlet

October	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0	0.0
November	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0	0.0
December	2.0	2.0	2.0	2.0	2.0	2.0	0.0	0.0	0.0
January	2.0	2.0	2.0	2.0	2.0	1.3	0.0	0.0	0.0
February	2.0	2.0	2.0	2.0	2.0	0.2	0.0	0.0	0.0
March	2.0	2.0	2.0	2.0	2.0	0.2	0.0	0.0	0.0
April	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0
May	0.6	1.2	0.0	0.6	1.2	0.0	0.6	1.2	0.0
June	4.3	12.3	8.8	4.3	12.3	8.8	4.1	12.1	8.6
July	45.3	45.0	43.3	45.3	45.0	25.3	14.7	12.4	0.3
August	43.5	45.5	33.1	43.5	45.5	0.2	13.4	16.3	0.2
September	17.4	24.9	0.1	17.4	24.9	0.1	1.6	10.3	0.1

Cottonwood Creek at Mouth of Canyon

October	3.3	5.1	3.1	3.3	5.1	3.1	1.3	3.1	1.1
November	3.6	5.0	3.3	3.6	5.0	3.3	1.6	3.0	1.3
December	3.4	4.8	3.2	3.4	4.8	3.2	1.4	2.8	1.2
January	3.4	4.7	3.0	3.4	4.7	2.3	1.4	2.7	1.0
February	3.6	4.6	3.2	3.6	4.6	1.4	1.6	2.6	1.2
March	4.0	4.7	3.3	4.0	4.7	1.5	2.0	2.7	1.3
April	3.7	8.1	3.2	3.7	8.1	3.2	3.7	8.1	3.2
May	45.0	117.1	4.9	45.0	117.1	4.9	45.0	117.1	4.9
June	46.6	63.4	12.8	46.6	63.4	12.8	46.4	63.2	12.6
July	49.4	53.5	44.6	49.4	53.5	26.6	18.8	20.9	1.6
August	46.0	49.2	34.0	46.0	49.2	1.1	15.9	20.0	1.1
September	19.1	27.9	1.0	19.1	27.9	1.0	3.3	13.3	1.0

Table 5  
 Weighted Usable Area for  
 Cutthroat Life Stages in  
 Upper Gooseberry Creek with Existing Flows

Month	Life Stage	Average Weighted Usable Area (1,000 units)
January	Adult	8.4
	Juvenile	1.9
February	Adult	8.4
	Juvenile	1.9
March	Adult	8.7
	Juvenile	1.9
April	Adult	11.3
	Juvenile	3.3
May	Adult	11.7
	Juvenile	2.7
	Spawning	0.0
June	Adult	10.7
	Juvenile	2.5
	Spawning	0.0
July	Adult	13.2
	Juvenile	3.5
	Spawning	1.5
August	Adult	12.2
	Juvenile	3.7
	Spawning	1.3
	Fry	4.7
September	Adult	11.1
	Juvenile	3.0
	Fry	4.8
October	Adult	10.2
	Juvenile	2.0
November	Adult	8.9
	Juvenile	2.0
December	Adult	8.7
	Juvenile	1.9

**Table 6**  
**Monthly Pre- and Post-Project Cutthroat Trout Habitat**  
**In Middle and Lower Gooseberry Creek During Average Water Year<sup>1/</sup>**

Month	Life Stage	Middle Gooseberry Creek			Lower Gooseberry Creek		
		Pre-project	Post-project	Change (%)	Pre-project	Post-project	Change (%)
January	Adult	62.9	57.6	8.4	355.4	344.7	-3.0
	Juvenile	18.0	16.7	7.2	61.6	60.9	-1.1
February	Adult	62.9	57.6	-8.4	359.0	348.5	-2.9
	Juvenile	18.0	16.7	-7.2	63.0	61.1	-3.0
March	Adult	64.7	57.6	-11.0	359.0	344.7	-4.0
	Juvenile	18.3	16.7	-8.7	62.6	60.9	-2.7
April	Adult	106.2	57.6	-45.8	404.9	393.1	-2.9
	Juvenile	30.1	16.7	-44.5	73.2	68.7	-6.1
May	Adult	205.8	57.6	-72.0	562.1	548.3	-2.5
	Juvenile	91.0	16.7	-81.6	75.0	56.0	-25.3
	Spawning	1.5	0.1	-93.3	0.0	0.0	-
June	Adult	202.6	57.6	-71.6	553.2	548.1	-0.9
	Juvenile	88.7	16.7	-81.2	79.6	56.1	-29.5
	Spawning	0.4	0.1	-75.0	0.0	0.0	-
July	Adult	144.4	57.6	-60.1	430.6	405.3	-5.9
	Juvenile	42.7	16.7	-60.9	71.3	73.4	+2.9
	Spawning	0.9	0.1	-88.9	0.0	0.0	-
August	Adult	127.4	57.6	-54.8	413.9	398.7	-3.7
	Juvenile	36.6	16.7	-54.4	73.0	70.4	-3.6
	Spawning	2.8	0.1	-96.4	0.0	0.0	-
	Fry	57.3	28.1	-51.0	65.3	73.1	+11.9
September	Adult	100.2	57.6	-42.5	397.3	355.4	-10.5
	Juvenile	28.4	16.7	-41.2	69.8	61.6	-11.7
	Fry	44.5	28.1	-36.9	73.6	67.1	-8.8
October	Adult	75.4	57.6	-23.6	362.2	327.4	-9.6
	Juvenile	20.9	16.7	-20.1	63.2	58.0	-8.2
November	Adult	66.4	57.6	-13.3	341.5	323.9	-5.2
	Juvenile	18.8	16.7	-11.2	60.0	57.5	-4.2
December	Adult	64.7	57.6	-11.0	348.5	330.9	-5.1
	Juvenile	18.3	16.7	-8.7	61.1	58.5	-4.3

<sup>1/</sup> The amount of Weighted Usable Area is expressed in 1,000 units. Average water year is defined as 1968 flows.

Table 7  
 Monthly Pre- and Post-Project Rainbow Trout Habitat  
 In Lower Gooseberry Creek During Average Water Year<sup>1/</sup>

Month	Life Stage	Pre-project	Post-project	Change (%)
January	Adult	44.1	43.2	-2.0
	Juvenile	21.0	21.0	0.0
February	Adult	44.5	43.5	-2.2
	Juvenile	21.1	21.0	-0.5
March	Adult	44.5	43.2	-2.9
	Juvenile	21.1	21.0	-0.5
April	Adult	65.6	50.0	-23.8
	Juvenile	29.4	22.3	-24.1
May	Adult	142.1	133.0	-6.4
	Juvenile	49.7	51.9	+4.4
	Spawning	0.0	0.0	-
June	Adult	141.9	132.9	-6.3
	Juvenile	47.8	51.9	+8.6
	Spawning	0.3	0.0	-100.0
July	Adult	87.0	66.3	-23.8
	Juvenile	35.1	29.7	-15.4
	Spawning	0.0	0.0	-
August	Adult	79.4	56.3	-29.1
	Juvenile	35.3	25.2	-28.6
	Spawning	0.1	0.0	-100.0
	Fry	62.6	51.8	-17.3
September	Adult	54.4	44.2	-18.8
	Juvenile	24.3	21.0	-13.6
	Fry	49.7	48.8	-1.8
October	Adult	44.8	41.7	-6.9
	Juvenile	21.1	20.9	-0.9
November	Adult	42.9	41.4	-3.5
	Juvenile	21.0	20.9	-0.5
December	Adult	43.5	42.0	-3.4
	Juvenile	21.0	20.9	-0.5

<sup>1/</sup> The amount of Weighted Usable Area is expressed in 1,000 units.  
 Average water year is defined as 1968 flows.

**Table 8**  
**Monthly Pre- and Post-Project Cutthroat Trout Habitat**  
**In Fish Creek During Average Water Year<sup>1/</sup>**

Month	Life Stage	Pre-project	Post-project	Change (%)
January	Adult	362.7	363.0	+0.1
	Juvenile	85.3	85.5	+0.2
February	Adult	370.4	365.7	-1.3
	Juvenile	85.8	85.3	-0.6
March	Adult	414.2	406.6	-1.8
	Juvenile	88.3	88.3	0.0
April	Adult	476.9	456.1	-4.4
	Juvenile	87.5	87.8	+0.3
May	Adult	666.4	694.6	+4.2
	Juvenile	226.7	235.4	+3.8
	Spawning	0.8	6.0	+650.0
June	Adult	680.8	714.1	+5.0
	Juvenile Spawning	231.2	229.4	-0.7
July	Adult	603.4	575.2	-4.7
	Juvenile Spawning	91.3	88.3	-3.3
August	Adult	39.8	27.3	-31.4
	Juvenile	489.6	454.1	-7.3
	Spawning Fry	87.4	87.8	+0.5
September	Adult	17.8	14.2	-20.2
	Juvenile Fry	88.6	84.2	-5.0
October	Adult	415.2	387.8	-6.6
	Juvenile Fry	88.2	87.6	-0.7
November	Adult	82.2	81.3	-1.1
	Juvenile	369.2	362.5	-1.8
December	Adult	86.0	85.2	-0.9
	Juvenile	364.5	362.8	-0.5
December	Adult	82.1	85.3	+3.9
	Juvenile	363.1	363.9	+0.2
		85.5	85.9	+0.5

<sup>1/</sup> The amount of Weighted Usable Area is expressed in 1,000 units. Average water year is defined as 1968 flows.

Table 9  
 Monthly Pre- and Post-Project Rainbow Trout Habitat  
 In Fish Creek During Average Water Year<sup>1/</sup>

Month	Life Stage	Pre-project	Post-project	Change (%)
January	Juvenile	170.7	171.0	+0.2
February	Juvenile	173.1	171.5	-0.9
March	Juvenile	187.2	185.0	-1.1
April	Juvenile	203.1	198.4	-2.3
May	Juvenile Spawning	239.5	239.6	<0.1
		45.9	44.9	-2.2
June	Juvenile Spawning	240.2	238.8	-0.6
		48.4	36.9	-23.8
July	Juvenile Spawning	224.0	219.5	-2.0
		23.6	18.2	-22.9
August	Juvenile Spawning Fry	202.6	197.9	-2.3
		11.0	8.2	-25.5
		226.4	223.1	-1.5
September	Juvenile Fry	183.7	179.0	-2.6
		219.0	214.9	-1.9
October	Juvenile	172.7	170.5	-1.3
November	Juvenile	171.1	170.8	-0.2
December	Juvenile	171.0	171.6	+0.4

<sup>1/</sup> The amount of Weighted Usable Area is expressed in 1,000 units. Average water year is defined as 1968 flows.

Table 10

**Narrows Project**  
**Aquatic Impacts and Recommended Mitigation Measures**

Impacts	Mitigation Commitment	
<b>Stream Fisheries</b>		
Gooseberry Creek tributaries - Loss of 4.3 miles (spawning cutthroat).	Restore year-round flows in 2.3 miles of tributaries and stabilize 3.0 miles of middle Gooseberry Creek.	
Upper Gooseberry Creek - Loss of 1.0 mile (all life stages cutthroat);	Acquire, fence, and improve fishery habitat on the following stream segments:	
Middle Gooseberry Creek - 72% reduction in average annual flow for 3.0 miles (all life stages cutthroat);		Mud Creek 4.0 miles
Lower Gooseberry Creek - 47% flow reduction for 7.1 miles. (Decrease of 5% adult and 4% juvenile low-flow habitat for cutthroat);		Winterquarters Creek 2.5 miles
Fish Creek - Average 17% flow reduction of 6.0 miles. (Decrease of less than 1% adult and juvenile low-flow habitat for cutthroat. Overall increase of 15% spawning and 3% fry habitat for cutthroat. Decrease of 1.3% adult and 0.5% juvenile low-flow habitat for rainbow. Overall decrease of 16% spawning and 2% fry habitat for rainbow.)		Upper Fish Creek 1.0 mile
		Pondtown Creek 2.0 miles
	Price River below Scofield Reservoir 2.0 miles	
Upper Cottonwood Creek - No summer flow increase, 2 cfs winter flow provided.	Construct Upper Cottonwood Creek Pipeline and provide 2 cfs winter release.	
Lower Cottonwood Creek - Average 162% annual flow increase. Average 300% summer flow increase. Loss of 4.9 miles of habitat for all life stages for Rainbow, Cutthroat, and Brown Trout.	Provide 2 cfs minimum flow during irrigation season in lower Cottonwood Creek, Acquire (as necessary), fence, and improve fishery habitat on 4.0 miles of Starvation Creek.	
<b>Reservoir Fisheries</b>		
Scofield Reservoir - Increased potential for poor water quality resulting in fish kills, loss of some natural reproduction in rainbows. Reduced surface area resulting in reduced standing crop of fish and loss of 4,500 angler days per year.	Reduce external phosphorus loading by improving riparian areas along Mud Creek, Winterquarters Creek, Upper Fish Creek, and Pondtown Creek. These measures will also improve habitat for all life stages of cutthroat and rainbow trout including spawning. Lost angler days would be replaced by fishery in Narrows Reservoir.	
Lower Gooseberry Reservoir - Increased potential for poor water quality resulting in fish kills.	Provide 300 acre-feet of water from Narrows Reservoir to be used for instream flow augmentation in consultation with UDWR.	
Fairview Lakes - Lower fishing pressure, less severe drawdown during fishing season.	Beneficial impact. No mitigation required.	
Narrows Reservoir - New reservoir fishery.	Would provide approximately 13,700 angler days use.	