



**UNITED STATES DEPARTMENT OF THE INTERIOR  
FISH AND WILDLIFE SERVICE**

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November 16, 1994

Cons. #2-22-91-F-241

Memorandum

To: Assistant Regional Director, Ecological Services, Region 2

From: State Supervisor, New Mexico Ecological Services State Office,  
Albuquerque, New Mexico

Subject: Formal Section 7 Consultation - Biological Opinion for the Navajo Indian  
Irrigation Project, Blocks 1 through 8

Attached for your review and transmittal to the Regional Director for signature is the biological opinion concerning Blocks 1 through 8 of the Navajo Indian Irrigation Projects. This office provided a draft biological opinion to the Bureau of Indian Affairs on October 17, 1994. That agency, through its consulting firm, Keller-Bliesner Engineering, concurred with the findings of the opinion and made only minor editorial changes. Those changes have been incorporated in this document.

Although the Bureau of Indian Affairs has agreed with the opinion, it is still jeopardy and, therefore, an early alert has been attached for your use in notifying the Washington Office.

Please contact me at (505) 761-4525 if you have any questions.



Jennifer Fowler-Propst

Attachment

**KELLER-BLIESNER ENGINEERING**  
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October 28, 1994

Jennifer Fowler-Propst  
U.S. Fish and Wildlife Service  
Ecological Services  
3530 Pan American Highway  
Suite D  
Albuquerque, New Mexico 87107

RE: Navajo Indian Irrigation Project - Draft Biological Opinion for Critical Habitat (2-22-91-F-241)

Dear Jennifer:

I am writing in behalf of the Bureau of Indian Affairs, Navajo Indian Irrigation Project Office in response to the above referenced draft biological opinion. We appreciate your promptness in preparing the biological opinion. In general, the opinion is in line with the items discussed at our last meeting and we have no substantive concerns. There are, however, a few areas where minor wording change would more accurately state conditions as they exist. Our specific comments follow:

Page 5. The following sentence is not quite accurate: "Dilution flows in Gallegos Canyon have also been linked to observed spikes in levels of contaminants in sampled fish immediately below the confluence with the San Juan River." The one spike that was recorded only indicates that there may be a relationship. The linkage has not been made. The 1994 sample did not show the same pattern (we have just received this data). I would suggest wording similar to the following: "An increase in selenium levels in one fish sample collected below the confluence of Gallegos Canyon and the San Juan River in the Spring of 1993 indicates a possible link to dilution flows in Gallegos Canyon."

Page 7. The discussion on flows is a little misleading. The language sounds as if you are discussing extremes, while the comparison is actually on the basis of monthly mean data. The actual minimum daily flow pre-dam at Shiprock was 8 cfs in August of 1939 and the maximum was 33,300 in October of 1941. Post-dam the minimum was 51 cfs in August of 1963 (70 cfs in August of 1972 to get further from the influence of dam construction) and the high was 13,700 cfs in May of 1979. If you use the numbers you show, they should be referenced as mean monthly flows. Also, there has not been an average decrease of 45% in spring flows. The average decrease in May-June flows is 40% for the post dam period compared to pre-dam conditions. The reference in the Biological Opinion for ALP indicates a 45% decrease in spring peak flow (comparison of maximum monthly means for the two periods), not a 45% average decrease in spring peaks. Also, this is not entirely induced by the Dam. If the decrease at Archuleta is applied to the Bluff pre-dam flows, the effects of lower basin hydrologic changes are taken out of the equation and the result is a 38% average decrease in spring flows. This may be splitting hairs, but it is best not to leave false impressions about the meaning of the hydrologic differences pre- and post-dam. Some minor wording changes with your reported numbers would solve the problem.

BRIEFING STATEMENT FOR ADVERSE BIOLOGICAL OPINION  
ON  
NAVAJO INDIAN IRRIGATION PROJECT - BLOCKS 1 THROUGH 8

Project Description: The Navajo Indian Irrigation Project (NIIP) under formal consultation consists of six farming blocks (54,500 acres) that are currently under cultivation and Blocks 7 and 8 (23,300 acres) that are under development and scheduled for completion by 1999. The San Juan River of northern New Mexico is the source of irrigation water for NIIP. Selenium contamination of this river would be increased as a result of irrigation runoff. This project underwent formal consultation in 1991. A jeopardy biological opinion for the Colorado squawfish and a jeopardy conference report for the proposed razorback sucker were issued by Region 2 on October 25, 1991. This is a reinitiation of formal consultation to address impacts of the ongoing and proposed project on the designated critical habitat for the Colorado squawfish and razorback sucker in the San Juan River.

Consultation Agency and Applicant: The Bureau of Indian Affairs

Biological Opinion Due Date: December 20, 1994

Regional Contact: James A. Young, Assistant Regional Director, Ecological Services, (505) 766-2324.

Field Contact: Jennifer Fowler-Propst, State Supervisor, New Mexico Ecological Services Office. (505) 761-4525.

Critical Habitat Adversely Affected:

Critical habitat for the Colorado squawfish (Ptychocheilus lucius)

Critical habitat for the razorback sucker (Xyrauchen texanus)

Nature of the Impacts/Basis for Adverse Finding: The declines of the Colorado squawfish and razorback sucker have been attributed to the modification of habitat through alterations of flow volumes and periodicities, water temperatures, and habitat fragmentation caused by the construction and operation of dams within their historic ranges in the Colorado River Basin. Decreases in habitat quality through the introduction of industrial and agricultural contaminants have also been identified as potential causes for the endangerment of these species. The designation of critical habitat for the Colorado squawfish and razorback sucker was effective on April 21, 1994. In considering the biological basis for designating critical habitat, the Service focused on the primary physical and biological elements that are essential to the conservation of both species. The Service has identified water, physical habitat, and biological environment as the primary constituent elements. This includes a quantity of water of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage of each species.

The farming operations supported by the NIIP development and expansion would introduce, either through surface runoff or through deep groundwater percolation to the river, additional concentrations of selenium to the San Juan River. Although data have not been gathered to identify those selenium levels that would constitute degradation of critical habitat, the current judgement is that levels of 5-6 ug/g will harm



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

Post Office Box 1306  
Albuquerque, N.M. 87103

Cons. # 2-22-91-F-241

### Memorandum

To: Area Director, Bureau of Indian Affairs, Navajo Area Office, Window Rock, Arizona

From: Regional Director, Fish and Wildlife Service, Southwestern Region, Albuquerque, New Mexico

Subject: Formal Section 7 Consultation: Biological Opinion for the Navajo Indian Irrigation Project, Blocks 1 through 8

This responds to your request of August 2, 1994, for reinitiation of formal consultation under section 7 of the Endangered Species Act (Act) of 1973, as amended, with the U.S. Fish and Wildlife Service (Service) on your proposed action of construction and operation of Blocks 1 through 8 of the Navajo Indian Irrigation Project (NIIP), San Juan County, New Mexico. Your request was received on August 5, 1994, by the New Mexico Ecological Services State Office. This reinitiation has been requested to address the potential impacts of Blocks 1 through 8 of NIIP on the designated critical habitat for the Colorado squawfish (Ptychocheilus lucius) and the razorback sucker (Xyrauchen texanus) in the San Juan River.

The following biological opinion is based on information provided in the Biological Assessment furnished with the August 2, 1994, request for reinitiation; the data provided in the consultation for the project initiated on July 22, 1991, and concluded on October 28, 1991; the October 25, 1991, Biological Opinion prepared for the proposed Animas-La Plata Project which dealt in detail with the flows of the San Juan River and releases from Navajo Dam; the October 22, 1992, San Juan River Basin Recovery Implementation Program document; data on file in the New Mexico Ecological Services Office; and discussions with various people familiar with NIIP and the threatened and endangered species.

### Consultation History

The Navajo Indian Irrigation Project (NIIP), an element of the Upper Colorado River Storage Project, was authorized on June 13, 1962. The Final Environmental Impact Statement for the proposed project was submitted to the Council on Environmental Quality on October 12, 1976. In 1979, consultation under section 7 of the Act was completed and a biological opinion on the effects of the project on the bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus), and black-footed ferret (Mustela

nigripes), those endangered species known or likely to inhabit the area of the project, was furnished to the Bureau of Indian Affairs on April 26, 1979. That biological opinion found that the proposed project would not jeopardize the three endangered species listed above. The 1979 opinion issued for NIIP did not address the Colorado squawfish or the razorback sucker. The gathering of new information, i.e., the discovery of a small but reproducing population of Colorado squawfish in the San Juan River and the capture of a razorback sucker in the river, together with the proposed listing of the razorback sucker as Federally endangered, prompted the reinitiation of formal consultation and the initiation of a conference for NIIP. A Biological Opinion and appended Conference Report were provided to the Bureau of Indian Affairs on October 28, 1991, finding that the construction and operation of Blocks 1 through 8 of NIIP would be likely to jeopardize the continued existence of the listed Colorado squawfish and the then proposed razorback sucker through depletion of flows of the San Juan and degradation of water quality. A reasonable and prudent alternative to the proposed depletion of the San Juan River and the contamination of the water and aquatic fauna of the river through the introduction of selenium from the proposed farming program, was formulated to remove the likelihood of the action jeopardizing the continued existence of the Colorado squawfish and the razorback sucker. Implementation of this alternative was also determined to provide adequate conservation measures for the bald eagle and the peregrine falcon. The elements of that reasonable and prudent alternative are iterated below:

1. Limit development of Blocks 1 through 6 to the currently irrigated total of 50,151 acres.
2. Limit depletions on the Hogback and Fruitland Projects to 31,280 af per year, and transfer the remaining 16,420 af per year to NIIP, thereby allowing NIIP to deplete 149,420 af of the Navajo Nation's 180,700 af share of the established baseline for the San Juan River.
3. Maintain a minimum of 8,000 acres of conservation reserve acreage for which the average depletion is 0.8 af per acre per year rather than 2.44 af per acre per year for full cropped acreage.
4. The resulting baseline depletion of 149,420 af will not be exceeded and non-irrigation season flows will not be diminished. This will be accomplished by: modification of the crop mix to include more conservation acreage and/or less high water use crops while maintaining the rotational requirements necessary for good agronomics; and/or further limitation of depletions in the Fruitland and Hogback Projects; and/or any other alternatives available to the Bureau of Indian Affairs. The additional depletion of 16,754 af for Blocks 7 and 8, or any further depletions considered necessary for the operation of NIIP, will be evaluated based on the results of the 7-year research program as stipulated in the March 21, 1991, draft Animas-La Plata Biological Opinion.
5. Dilution flows of 18 cfs will be provided From March 1 through October 31 each year through Ojo Amarillo and Gallegos Canyon drainages. For any pond with a mean selenium concentration in the water of more that 5 ug/l, dilution water will be provided from the irrigation system to reduce the mean concentration below 5 ug/l

during the time water is available. Since the system cannot be operated from November through February due to freezing conditions, during October extra dilution water will be released to bring the concentration below 3 ug/l. Water will also be released from the canal down Gallegos Canyon and Ojo Amarillo to maintain the selenium concentration below 5 ug/l at the confluence with the San Juan River from March through October.

6. A program will be established to monitor physical and biological components of the San Juan River as well as ponds and wetlands located on NIIP to provide long-term data on selenium levels in the water and biota of those systems.

Water samples will be collected at the following stations on the San Juan River drainage:

Mainstem San Juan River

- ° Archuleta
- ° Bloomfield
- ° Farmington
- ° Hogback
- ° Shiprock
- ° Aneth (above McElmo Creek)
- ° Bluff

Tributaries

- ° Animas River
- ° La Plata River

Parameters will include total selenium and dissolved selenium. Flow will be determined from the nearest U.S. Geological Survey gaging stations. The detection level shall not be greater than 0.002 mg/l. One of the water samples shall be a duplicate. Frequency of collection shall be monthly during the same week of each month.

7. Whole fish shall be sampled at 11 locations within the following reaches of the river (designated by River Mile (RM)):

- RM 245-238
- RM 225-221
- RM 221-216
- RM 216-212
- RM 212-209
- RM 209-205
- RM 205-201
- RM 201-194
- RM 194-190
- RM 190-182
- RM 182-166

In each reach, three individual fish shall be sampled for whole body determinations

for total selenium. Species shall include only adult bluehead suckers (Catostomus discobolus) or adult flannelmouth suckers. Sampling frequency shall be once per year. Samples shall be collected in the spring prior to irrigation season. Detection levels shall be 0.1 mg/kg dry weight.

8. Within the NIIP area, several ecosystem types will be monitored. Parameters include water and a biological component of the system after an inventory has been completed and target areas defined. Ponds that are identified during the inventory as requiring remediation of dilution flows shall be sampled monthly for selenium levels in the water. Parameters shall include total selenium, dissolved selenium and discharge from the pond. During the dilution period (March through October), if selenium levels exceed 5 ug/l, the dilution water shall be adjusted to bring the levels to that standard. Monitoring shall continue through the winter months as long as water is in the pond. Detection limits shall be not less than 2 ug/l. Tiger salamanders shall be collected twice each year (March and October). Four specimens from each pond shall be collected and whole body selenium determined. Detection levels of not less than 0.1 mg/kg will be attained.

Sampling of amphibians will continue until one full year (two samplings) show the whole body concentrations to be below 5 mg/kg dry weight. Once two consecutive samples have been below this level, a synoptic survey of waterfowl ducklings will be undertaken. If the livers of the ducklings are below the criterion level of 10 mg/kg, sampling will revert to water sampling only. If the criteria are not met, full sampling will continue. If selenium levels are not declining, a plan will be submitted to the Service for removal of the contaminated site or modification of the dilution plan.

9. Drainages will be sampled monthly for surface flows at their confluence with the San Juan River. These drainages shall include Gallegos Canyon and Ojo Amarillo. Parameters measured shall be flow, total selenium and dissolved selenium. Detection levels shall not be less than 2 ug/l. If any new surface water discharges are noted, they will be added to the monitoring plan at their confluence with the San Juan River or major drainage other than Ojo Amarillo or Gallegos Canyon. Selenium levels during the dilution months shall not exceed 5 ug/l. If a sample exceeds this limit during the dilution months, the dilution flow shall be increased sufficiently to reduce the concentration below the limit.

10. Since a large portion of the return flow from NIIP is through the deep groundwater system, an on-going monitoring plan will be required to determine the impact, both in terms of water quality (primarily selenium) and water table elevation. The monitoring plan will be accomplished with the following existing wells:

- Well 1-39 (Ojo Alamo and Nacimiento)
- Sheep Camp Well ( Ojo Alamo)
- Windmill near Block 6 (Ojo Alamo)
- Blackwater Well (Ojo Alamo or Farmington Sandstone)
- Well 13R-109 (Farmington Sandstone)

These wells will be monitored quarterly for water surface elevation and semi-annually for selenium concentration. Selenium concentration and elevation data will be tabulated and plotted with time to allow projections of change.

Water table elevations will continue to be monitored monthly in existing observation wells. Water samples will be collected semi-annually (March and October) for selenium analysis.

11. The Bureau of Indian Affairs will assist in the protection of flows of the San Juan River through occupied habitat of the Colorado squawfish.

12. The Bureau of Indian Affairs will participate and assist in funding the 7-year research program.

Since the acceptance of that reasonable and prudent alternative, the Bureau of Indian Affairs has participated fully in the San Juan Recovery Implementation Program and has conducted the required steps of the investigations noted above. Dilution flows required in the Gallegos and Ojo Amarillo drainages have been initiated but have been inadequate in Ojo Amarillo due to limited outlet capacity. An increase in selenium levels in one fish sample collected below the confluence of Gallegos Canyon and the San Juan River in the spring of 1993 indicates a possible link to dilution flows in Gallegos Canyon. Water sampling has not yet yielded information upon which analysis of impacts caused by the project can be made. Therefore, concerns about any increase in contaminant levels, regardless of how small, persist. Similarly, additional sampling is needed of biota in project ponds to determine valid trends and, if necessary, amend remediation requirements.

#### Biological Opinion

Based upon the best scientific and commercial information available, it is the Service's biological opinion that the proposed construction and operation of Blocks 1 through 8 of NIIP are likely to adversely modify the critical habitat of both the Colorado squawfish and razorback sucker by increasing concentrations of contaminants in the aquatic habitat of the San Juan River.

#### Project Description

As originally proposed, and at full development, NIIP would irrigate 110,630 acres of Navajo-owned lands in northwestern New Mexico (Figure 1). In addition to the irrigated lands, the project encompasses an additional 106,219 acres, the majority of which are utilized for livestock grazing and as demonstration areas for range improvement and soil conservation efforts. The entire 216,843-acre project is operated as a tribal enterprise by

the Navajo Agricultural Products Industry (NAPI). Sequential development of 11 blocks of about 10,000 acres each would comprise the full agricultural project. To date, six blocks, comprising an aggregate of 54,500 acres are developed with 50,151 acres under cultivation. The proposed action would bring Blocks 7 and 8 (23,300 acres) into development for a total of 77,800 acres. It is anticipated that Block 7 will be fully developed and operational by spring 1996, with Block 8 following at some time after that date.

Irrigation water for NIIP farming is stored in Navajo Reservoir on the San Juan River about 39 miles east of Farmington, New Mexico. The water is taken from the reservoir at the dam and conveyed through a series of canals, a holding reservoir, a pumping plant, open laterals and pressure pipelines to the NIIP fields. The entire project is sprinkler irrigated, predominantly by center-pivots. The sprinkler systems vary in length, irrigating circular fields ranging in size from about 60 acres to over 200 acres. Early blocks were originally irrigated by sideroll, handmove, and solid set laterals, but were replaced by center pivots to increase efficiency and precision of irrigation and reduce management problems. New blocks are planned to be mainly center-pivot irrigated, with solid-set or trickle irrigation on minor acreages of orchard crops.

The drainage system includes about 200 miles of channels to collect storm runoff, overland irrigation return flow, and groundwater seepage from irrigated land. Several ponds intended for livestock watering have been created on project lands by damming small drainages. These ponds are filled by seepage, irrigation runoff, storm runoff, or diversion of irrigation water. Other ponds have been created by diversion of irrigation water to small enclosed drainages. A total of 10 to 15 ponds are located on NIIP. Gallegos Canyon and Ojo Amarillo Canyon washes flow perennially to the San Juan River and serve as major drainages for irrigation return flows.

Development of Block 7 requires construction of pipe laterals from the main gravity canal and ancillary on-farm facilities (including turn-outs with outdoor-type booster pumps to transfer irrigation water from the closed-pressure pipeline to irrigation lines) and sprinkler irrigation systems in the farm fields. Construction of the Gallegos Pumping Plant is necessary for implementation of farming operations on Block 8. The Gallegos pipeline, supplied by the Gallegos Pumping Plant will initially serve Block 8. At full development, this pipeline would also serve Block 9 directly and feed the Moncisco Pumping Plant, which is proposed to lift irrigation water to Blocks 10 and 11. Blocks 9, 10, and 11, if proposed for development, will be subject to consultation under section 7 of the Act and are not considered in this action.

Water requirements for NIIP depend upon crop mix for the acreages under cultivation and have varied between years since the inception of the farming operations. Legislation for the project authorized an average annual peak diversion of 508,000 acre-feet (af) of water for the irrigation of 110,630 acres. The conversion to sprinkler irrigation has reduced the per acre water demand. Within the environmental baseline conditions determined for the Animas La-Plata Project consultation, the depletion figure from the San Juan River for Blocks 1 through 6 was determined to total 133,000 af. With implementation of the elements of the reasonable and prudent alternative provided in the October 28, 1991, Biological Opinion, total depletion of Blocks 1 through 8 will not exceed 149,420 af.

### Background Information

Water depletions in the San Juan River Basin have been recognized as a major source of impact to native and endangered fish species. Continued water withdrawal has restricted the ability of the San Juan River system to produce flow conditions required by various life stages of the fishes. Historically, flows in the San Juan River prior to the closure of Navajo Dam were highly variable and ranged from a mean monthly low of 44 cubic feet per second (cfs) in September 1956 to a high of 19,790 cfs in May 1941 at the U.S. Geological Survey Station 93680000, Shiprock, New Mexico. With Navajo Dam in place and operating, flows in the San Juan River have ranged from a mean monthly flow of 185 cfs in July 1963, while the reservoir was filling, to a high of 9,508 cfs in June 1979. Since its closure, Navajo Dam has significantly altered flow of the San Juan River by typically storing spring peak flows and releasing water in summer, fall, and winter months. This pattern has resulted in an average decrease of 45 per cent in spring peak flows, while doubling winter base flows at the Bluff gauge in Utah. Similar pattern changes are evidenced at the upstream gauges at Shiprock and Farmington, New Mexico. Significant depletions and redistribution of flows of the San Juan River also have occurred as a result of other major water development projects, including Navajo Indian Irrigation Project and the San Juan-Chama Project. These depletions, together with a number of other factors, have resulted in reductions in the populations of Colorado squawfish and razorback sucker throughout their ranges.

The Colorado squawfish was listed as endangered on March 11, 1967; critical habitat was designated on March 21, 1994, effective April 21, 1994. Habitat alteration, fragmentation, and degradation arising from dam construction; and competition and predation from introduced nonnative fishes have been cited as the major threats endangering the species (U.S. Fish and Wildlife Service 1991). As a top level predator, the Colorado squawfish may be exposed to bioaccumulation of contaminants from its prey.

Endemic to the Colorado River basin, the squawfish has historically been found in the San Juan and Animas rivers (Koster 1957, 1960; Platania 1990). The species is adapted to rivers with seasonally variable flow, high silt loads, and turbulence. Young-of-the-year and subadults inhabit shallow backwater areas, with little or no current over silt and sand bottoms. Larger adults have been found to select deeper water of at least some velocity. Changes in water volumes, temperatures and flow periodicities resulting from dam construction and flow manipulation have been considered the major factors affecting the species throughout the Colorado River basin. Recent (1987) collections have produced a total of 18 young-of-the-year squawfish in backwaters of the San Juan River at various locations downstream of Shiprock, New Mexico. The San Juan's squawfish population is considered necessary to achieve recovery of the species (U.S. Fish and Wildlife Service, 1991).

Research conducted under the aegis of the San Juan River Basin Recovery Implementation Program in 1991 and 1992 monitored use of the San Juan River by Colorado squawfish. Nine Colorado squawfish were surgically implanted with radio tags and tracked year-round from the air and ground. One hundred and thirteen radio contacts were made with these fish between June 1991 and January 1993. All radio contacts occurred between River

Mile (RM) 142.0 and RM 117.0. During pre-spawn periods, May and early June, Colorado squawfish demonstrate an affinity for the section of river in and around the Mancos River confluence (RM 122.6). During estimated spawning periods, 79 percent of radio contacts with Colorado squawfish were made within the "Mixer" area (RM 133.4 to 129.8). The highest percentage of ground contacts (34.3%) were made with Colorado squawfish using run habitat. All of the above information suggests that the river reach between Hogback Diversion Dam and Four Corners Bridge (RM 158.6-119.2) is important to the species (U.S. Fish and Wildlife Service 1993).

The razorback sucker was listed as endangered on October 23, 1991, with critical habitat designated concurrently with that for the Colorado squawfish (effective April 21, 1994). Causes for the decline of the razorback sucker have been identified as fragmentation of its habitat by construction of dams, manipulation of flows with attendant alterations of temperature and water quality, and the introduction of non-native fishes. Once abundant throughout the mainstem of the Colorado River and its major tributaries, the species now occupies only an estimated 25 per cent of its historic range, and where it does occur, its numbers are extremely low.

Platania and Young (1989) reported the capture of two adult razorback suckers by VTN Consolidated, Inc. in 1976 from an irrigation pond adjacent to the San Juan River near Bluff, Utah. In 1988, a single reproductively mature male razorback sucker was captured in the San Juan River near the reported 1976 capture site (Platania 1990). All recent captures of razorback suckers in the upper Colorado River basin have been adults. Significant recruitment to any population of the species in the entire Colorado River system has not been documented (Platania 1990).

The limited nature of historic and more recent ichthyofaunal surveys of the San Juan River drainage do not allow for accurate quantitative estimates of relative abundance for any of its native fishes, including the razorback sucker at this time. However, the existing scientific literature and historic accounts strongly suggest that razorback suckers were once a viable, reproducing element of the native fish community in the San Juan River Basin.

In March and November 1994, a total of 30 radio-tagged F1 progeny from eight razorback suckers that were captured in 1992 from the San Juan River arm of Lake Powell and spawned at Ouray National Fish Hatchery were experimentally stocked in the San Juan River at three sites between Shiprock, New Mexico, and Bluff, Utah. Monitoring of these fish will enable researchers to determine habitat use, possible spawning areas, survival, and growth rates for hatchery-reared razorback sucker in the wild.

Background and current status information on the Colorado squawfish and razorback sucker in the San Juan River Basin has been presented in the research reports generated by the cooperative San Juan River Basin Recovery Implementation Program (Fish and Wildlife Service 1993), in the Draft Biological Support Document prepared for the designation of critical habitat (Fish and Wildlife Service 1994), and in previous biological opinions provided to the Bureau of Reclamation on water sale contracts. The information provided in those documents is included herein by reference.

Critical habitat for the Colorado squawfish is designated as the San Juan River and its 100-year flood plain from the State route 371 Bridge in T. 29 N., R. 13 W., Section 17 (New Mexico Meridian) to Neskahai Canyon in the San Juan arm of Lake Powell in T. 41 S., R. 11 E., Section 26 (Salt Lake Meridian) up to the full pool elevation. Critical habitat for the razorback sucker has been designated on the San Juan River and its 100-year flood plain from the Hogback Diversion Dam in T. 29 N., R. 16 W., Section 9 (New Mexico Meridian) to the full pool elevation at the mouth of Neskahai Canyon on the San Juan arm of Lake Powell in T. 41 S., R. 11 E., Section 26 (Salt Lake Meridian). In considering the biological basis for designating critical habitat, the Service focused on the primary physical and biological elements that are essential to the conservation of the species. The Service has identified water, physical habitat, and biological environment as the primary constituent elements. This includes a quantity of water of sufficient quality that is delivered to a specific location in accordance with a hydrologic regime that is required for the particular life stage for each species.

For wide-ranging species such as the Colorado squawfish and razorback sucker, where multiple critical habitat reaches are designated, each reach has a local and a rangewide role in contributing to the conservation of the species. The loss of a single piece of habitat may not jeopardize the continued existence of the species, but it may reduce the ability of critical habitat to contribute to recovery. In some cases, the loss of a site containing a primary constituent element could result in local population instability. This could have a detrimental effect on the reach or that portion of the reach where the loss occurred and could preclude recovery or reduce the likelihood of survival of the species. Each critical habitat reach is dependent upon conditions in adjacent reaches, whether or not those reaches were designated critical habitat.

As the southernmost tributary of the Upper Colorado River Basin (Upper Basin), the San Juan River peaks earlier in the year and attains warmer water temperatures than other Upper Basin streams and is conducive to longer and better growth potential for young Colorado squawfish and razorback sucker. Any additional large loss of water or further degradation of remaining habitats of the San Juan River will exacerbate problems the Colorado squawfish and razorback sucker are currently experiencing in the San Juan and other subbasins throughout the Upper Basin.

Destruction or adverse modification of critical habitat is defined in 50 CFR 402.02 as a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of listed species. Water depletions reduce the ability of the river system to provide the required water quantity and hydrologic regime necessary for recovery of the fishes. Degradation of water quality also appreciably lessens the value of the habitat to support the endangered species. The physical habitat includes areas of the San Juan River system below Farmington, New Mexico, that are inhabited or potentially habitable for use in spawning and feeding, as a nursery, or serve as corridors between these areas. In addition, oxbows, backwaters, and other areas in the 100-year floodplain, when inundated, provide access to spawning, feeding, and nursery habitats. Water depletions reduce the ability of the river to create and maintain these habitats; degradation of water quality lessens the ability of these habitats to support the endangered fish species. Food supply, predation, and competition are important elements of the biological environment. Food supply is a function of nutrient supply and productivity, which could

be limited by the presence of contaminants. Predation and competition from non-native fishes has been identified as a factor in the decline of the endangered fishes. Depending upon species-specific tolerance levels, non-native fishes may have competitive advantages in habitats damaged by the presence of contaminants. The Service concludes that degradation of water quality affects the primary constituent elements and can cause destruction or adverse modification to critical habitat.

### Effects of the Action

#### Environmental Baseline

Baseline conditions describing flows and depletions in the San Juan River that were set forth and agreed upon in the October 22, 1991, biological opinion for the Animas-La Plata Project, and adopted during the October 28, 1991, re-consultation for NIIP are utilized herein. Those baseline conditions and the effects of the proposed full development of the Animas La-Plata (a net average annual depletion of 154,800 af) formed the basis for the jeopardy opinion on that project and for the reasonable and prudent alternative of limiting depletion to only 57,100 af. That depletion was only considered possible by the use of storage in Navajo Reservoir to mimic the natural hydrograph of the river through the re-operation of Navajo Dam. Although empirical data delineating specific and quantifiable effects of the removal of water from the San Juan River system on the aquatic biota of the river were lacking for that consultation, depletion of the flow of the San Juan River beyond the amount of 57,100 af was determined to jeopardize the continued existence of the Colorado squawfish, and in an appended Conference Opinion, to jeopardize the continued existence of the razorback sucker.

Information on existing water quality in the San Juan River and on-project waters has been derived from data gathered by the Department of the Interior as part of its National Irrigation Water Quality Program investigation of the San Juan River area in northwestern New Mexico (Blanchard et al, 1993) and from the results of investigations and monitoring efforts required by the October 28, 1991, Biological Opinion issued for NIIP. These data indicate little change from the conditions cited in that Biological Opinion.

The Bureau of Indian Affairs has monitored ground water quality on NIIP since 1985 and has reported concentrations of selenium in ground water as high as 180 ug/l (Robert Krakow, U.S. Bureau of Indian Affairs, written comm. 1990). Concentrations of selenium in samples collected from water on NIIP during the DOI Irrigation Drainwater investigation showed a median value of 42 ug/l. Elevated selenium levels are associated with ground water discharge resulting from irrigation, primarily along Gallegos and Ojo Amarillo Canyons.

Concentrations of selenium in water samples collected from the mainstem of the San Juan River exhibit a general increase in concentration levels with distance downstream from Archuleta, New Mexico, to Bluff, Utah, (< 1 ug/l to 4 ug/l). Tributaries to the San Juan carry higher concentrations of selenium than found in the mainstem river immediately upstream from their confluence with the San Juan; although these levels are diluted by the

flow of the San Juan, the net effect is a gradual accumulation of the element in the river's flow as it travels downstream. Increased selenium concentrations may also result from the introduction of groundwater to the mainstem of the river along its course.

Sediments and biota associated with wetlands on the proposed project area and with the mainstem of the San Juan River also showed elevated selenium levels. The DOI investigation analyzed (1) various plant and animal specimens from pond and backwater communities associated with NIIP irrigation activities, (2) fish from the San Juan River, and (3) birds from throughout the San Juan Basin.

Several criteria for selenium toxicity in fish, in food items consumed by waterfowl, and in food items consumed by fish have been empirically determined. A dietary threshold of 4 to 8 ug/g dry weight in food items was established by Heinz et al. (1989) as a concentration above which ingestion by waterfowl may impair reproduction. Lemly and Smith (1987) established 3 ug/g and 5 ug/g dry weight in animal food items as a concentration above which reproductive failure or mortality may occur in waterfowl and fish, respectively. Lemly and Smith (1987) also established 12 ug/g dry weight as a whole-body concentration in fish above which reproductive failure may occur. Lemly (A.D. Lemly, Columbia National Fisheries Contaminant Research Center, Columbia Missouri, pers. comm. 1991) estimates that although 12 ug/g is the level at which reproductive failure may occur, reproductive impairment may be experienced at much lower levels. Information to specifically determine those levels is lacking; however, based on the criteria listed above, levels of 5 ug/g dry weight in prey items, and/or 12 ug/g in whole body concentrations, are of concern for potentially severe impacts to the Colorado squawfish both in terms of survival of individual fish and of reproductive capability to sustain a viable population.

Analytical data, albeit limited to the short time period of the investigations, indicate that selenium levels in all media from some of the ponds located on NIIP lands have elevated selenium concentrations. These data indicate that bioaccumulation is occurring and that biota are being affected by irrigation drainage flows.

Composite fish samples were collected during the DOI study from six reaches of the San Juan River in spring 1990 and from seven reaches in fall 1990. Each composite sample typically consisted of five individuals of a single species. Composite samples of common carp (Cyprinus carpio) and flannelmouth sucker (Catostomus latipinnis) were collected from each reach during each sampling period. In addition, six channel catfish (Ictalurus punctatus) composite samples were collected during the two sampling periods in reaches where the species was encountered. The highest concentrations of selenium in common carp and flannelmouth sucker occurred in the river upstream from the irrigation project, and in the river from Bloomfield to immediately downstream from Lee Acres (Farmington), New Mexico (Blanchard et al, 1993).

### Effects of the Proposed Action

With the implementation of the reasonable and prudent alternative provided in the October 28, 1991, Biological Opinion, full development of Blocks 1 through 8 of NIIP would not result in further depletion of flows of the San Juan River above that allocated in the environmental baseline.

Once water is diverted from the river and transported to the NIIP croplands, amounts not utilized for plant growth (both farm crops and non-crop vegetation), lost in operational spills, sprinkler evaporation, canal evaporation, or conservation depletion return to the San Juan River. This remaining water presumably either flows back to the river by surface runoff or percolates to deep groundwater and eventually may reach the river. The time interval for the deep groundwater transport to the San Juan River has been assumed in the Biological Assessment to be from 10 to 50 year. Surface drainage, flowing to the San Juan through man-made and natural channels, carries contaminants accumulated from the farm fields to the river.

With full development through Block 8, agricultural runoff in the washes was predicted in the 1991 Biological Assessment to increase by about 3,100 af per year, or about 70 per cent greater than present conditions. There has been no change proposed for that estimate in the most recent, August 2, 1994, Biological Assessment. The surface contribution of selenium to the San Juan River would be approximately 165 pounds per year, or 1.7 per cent of the selenium load of the river at Bluff, Utah. Transport of selenium through percolation to the San Juan River via the deeper aquifer system has been predicted in the Biological Assessment to peak at 5.0 ug/l during the non-irrigation season when less dilution water is in the San Juan River. The average annual impact is 0.65 ug/l, yielding an average annual value at Bluff, Utah, of 3.4 ug/l (Keller-Bliesner Engineering and Ecosystems Research Institute 1991). Thus, the impact of the proposed project will be to increase the concentration of selenium within the San Juan River system. The baseline conditions range from < 1 to 4 ug/l. With full development of Blocks 1 through 8, these values have been projected to increase to 1.2 to 5 ug/l in the river (Keller-Bliesner Engineering and Ecosystems Research Institute 1991). No data exist to verify the assumptions provided in the Biological Assessment for specific quantifications of increases in selenium. Although increases in concentrations of the element are considered the reasonable result of additional farming operations on NIIP, the exact level(s) of those increases is as yet unconfirmed by the ongoing monitoring efforts of the Bureau of Indian Affairs.

During the 1989 and 1990 DOI Irrigation Drainwater investigations, external lesions were observed on both flannelmouth suckers and channel catfish. Fifty per cent of flannelmouth suckers and 37 per cent of channel catfish examined in the reach of the San Juan River from Shiprock to Mancos exhibited external lesions. The occurrence of such lesions is not considered linked to the presence of selenium, but to contamination by polycyclic aromatic hydrocarbon compounds (PAHs). Such compounds have been found to enter aquatic environments from a number of sources, one of which is oil and gas extraction and development. Water samples analyzed from NIIP sites did not show contamination from PAHs. Consequently, it is believed that the occurrence of lesions on fish taken from the San Juan River is not linked to the proposed action now under consultation. However, the physiological stress caused by the lesions may exacerbate or synergistically work with contamination by selenium to the detriment of the aquatic biota

of the San Juan River. Anecdotal observations of lesions, tumors, and malformations have continued during the ongoing research efforts of the San Juan River Recovery Implementation Program.

Hepato-histological examinations of flannelmouth suckers in the San Juan River revealed a 77 per cent incidence of eosinophilic foci. This condition has been found to occur in other fish species following exposure to carcinogenic compounds.

The increases in selenium concentration in the waters of the San Juan River caused by the proposed action are expected to adversely affect the aquatic biota of the system, including the Colorado squawfish. Based on several assumptions, the Biological Assessment predicts that whole body concentrations of selenium for Colorado squawfish will be approximately 3.87 ug/g dry weight. However, data are not available on existing whole body concentrations of the element in Colorado squawfish, specific effects of the element on the species, or exact levels at which discernible declines in reproduction or viability may be expected. Therefore, any increase in the concentration of selenium in the designated critical habitat for the Colorado squawfish and razorback sucker and, therefore, available for bioaccumulation in prey species or in whole body contamination of the endangered fish species is considered an adverse modification of the critical habitat for these fish.

#### Reasonable and Prudent Alternative to the Proposed Action

The section 7 regulations have defined reasonable and prudent alternatives as alternative actions, identified during formal consultation, that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that are economically and technologically feasible, and that the Service believes would avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

All elements of the reasonable and prudent alternative provided in the October 28, 1991, Biological Opinion are included herein by reference and made a requirement of this Biological Opinion except where modified as indicated below:

- A. Sampling of amphibians will continue at all ponds now monitored. If 1994 data indicate that selenium levels in ponds 1-18, 1-25, and 1-35 are influenced by subsurface groundwater inflow and dilution flows are ineffective in lowering selenium availability or accumulation, these ponds will be drained.
- B. Dilution flows in Ojo Amarillo Canyon will be sampled at points above and below the Fruitland Canal outlet to determine the best locations and methods for delivery of dilution flows.

- C. The turnout capacity for the dilution flow delivery to Ojo Amarillo Canyon will be reviewed and modified as necessary to provide adequate dilution in that drainage. Alternately, Fruitland Canal will be evaluated as a source to provide dilution flows.
- D. Based on examination of data gathered through sampling of fish in the San Juan River below Gallegos Canyon, assess impacts and evaluate alternatives to dilution flows in Gallegos Canyon. If delivery of dilution flows through Gallegos Canyon results in increased levels of selenium found in fish, alternatives to dilution flows in the Canyon will be reviewed in cooperation with the Service.

#### Incidental Take

Section 9 of the Act prohibits any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish and wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered taking within the bounds of the Act provided that such taking is in compliance with the incidental take statement.

The Service does not anticipate that the proposed action will result in any incidental take of the listed species under consultation. Accordingly, no incidental take is authorized. Should any take occur, the Bureau of Indian Affairs must reinitiate formal consultation with the Service and provide detailed information on the circumstances surrounding the take.

#### Conclusion

This concludes formal consultation on the proposed construction and operation of Blocks 1 through 8 of the Navajo Indian Irrigation Project. As required by 50 CFR 402.16, reinitiation of formal consultation is required if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

Regional Director

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