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In Reply Refer To:  
Region 2/FWE/SE

Memorandum

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

FILE SE-91-F-241

From: Regional Director

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

This responds to your request of July 22, 1991, 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. As requested by memorandum dated September 18, 1991, the Bureau of Reclamation is a cooperating agency in this consultation, with the Bureau of Indian Affairs assuming lead responsibilities as action agency. The species of concern for this consultation are the threatened Mesa Verde cactus (Sclerocactus mesae-verdae), and endangered Mancos milkvetch (Astragalus humillimus), peregrine falcon (Falco peregrinus), bald eagle (Haliaeetus leucocephalus), and Colorado squawfish (Ptychocheilus lucius). Appended to this biological opinion is the conference report requested on September 27, 1991, for the proposed razorback sucker (Xyrauchen texanus).

The following biological opinion is based on information provided in the Biological Assessment furnished with the July 22, 1991, request for consultation; the three supplements to that assessment provided on September 13, 1991, September 21, 1991, and September 30, 1991; the Final Environmental Impact Statement issued for NIIP on October 12, 1976; the March 21, 1991, draft biological opinion prepared for the proposed Animas-La Plata Project; data in our files; and discussions with various people familiar with NIIP and the threatened and endangered species.

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 not

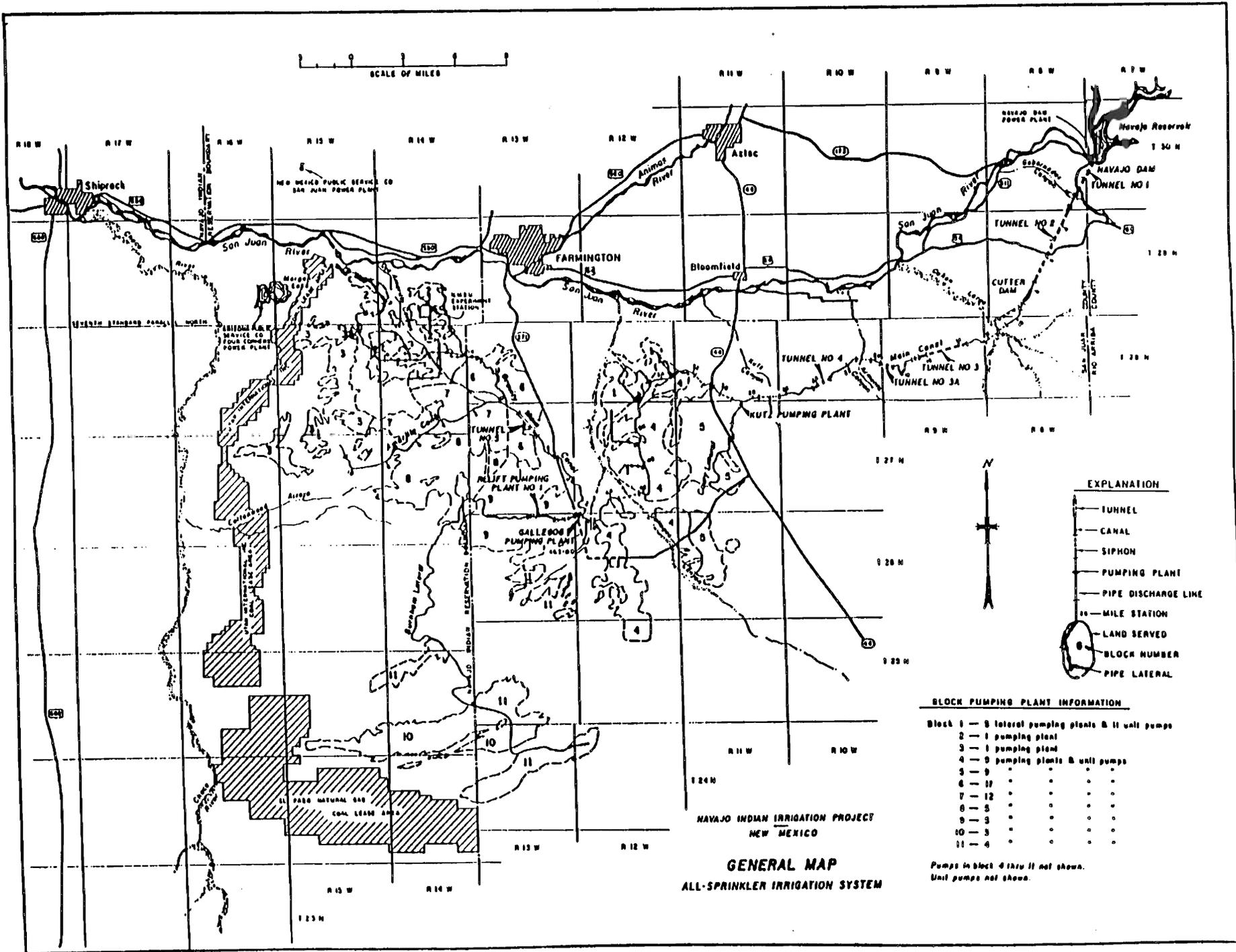
likely to jeopardize the continued existence of the Mesa Verde cactus, the Mancos milkvetch, the peregrine falcon, nor the bald eagle. It is, however, the biological opinion of the Service that the proposed action will jeopardize the continued existence of the Colorado squawfish by reducing the likelihood of both survival and recovery of this species through depletion of flows in the San Juan River and by increasing concentrations of contaminants in its habitat. A reasonable and prudent alternative that avoids the likelihood of jeopardy has been formulated.

### Background

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, peregrine falcon, 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, has prompted the reinitiation of consultation and the initiation of a conference for NIIP.

### 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. The construction schedule of completed blocks plus the projected schedule through Block 8 are presented in Table 1.



**Table 1. NIIP Development Schedule.**

Block	1st Year Irrigated	Current Delivery Acres	Current On-farm Acres	Current Cumulative On-farm ac.	Depletion AF (2.44 AF/A)	Full Dev. On-farm Acres	Cumulative On-farm Acres	Depletion AF (2.44 AF/A)
Block 1	1976	8,872	8,404	8,404	20,506	8,872	8,872	21,648
Block 2	1977	9,516	8,813	17,217	42,009	9,516	18,388	44,867
Block 3	1978	8,455	8,196	25,413	62,008	8,455	26,843	65,497
Block 4	1980	9,894	8,955	34,368	83,858	9,894	36,737	89,638
Block 5	1982	9,662	8,545	42,913	104,708	9,662	46,399	113,214
Block 6	1985	8,095	7,238	50,151	122,368	8,095	54,494	132,965
Block 7-1	1991	2,657	2,657	52,808	128,852	2,657	57,151	139,448
Future Development								
Block 7-2	1992	1,186	1,186	53,994	131,745	1,186	58,337	142,342
Block 7-3	1993	2,408	2,408	56,402	137,621	2,408	60,745	148,218
Block 7-4	1994	3,051	3,051	59,453	145,065	3,051	63,796	155,662
Block 8-1	1997	5,146	5,146	64,599	157,622	5,146	68,942	168,218
Block 8-2	1999	8,882	8,882	73,481	179,294	8,882	77,824	189,891

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 siederoll, 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 based on an estimated return flow to the river through surface and deep ground transport of 52,320 af. The addition of Blocks 7 and

8 to NIIP would require an additional depletion of 56,926 af for a total depletion of 189,891 af with development of all eight blocks (Keller-Bliesner Engineering and Ecosystems Research Institute 1991). A return flow of 22,396 af has been estimated by the Bureau of Indian Affairs for Blocks 7 and 8 after equilibrium conditions are reached; this return credit has been accounted for in the 56,926 af depletion figure.

### Species Descriptions

#### Mancos Milkvetch

The Mancos milkvetch was listed by the Service as an endangered species on June 27, 1985 (50 FR 26568). The diminutive, tufted perennial is known only from northwestern New Mexico and extreme southwestern Colorado. It is most commonly found in scattered populations between the town of Towaoc, Colorado, and the Chaco River in New Mexico. It occurs on Cretaceous Point Lookout and Cliff House sandstones of the Mesa Verde series, at approximately 5000-5400 feet elevation. Individual plants can form clumps up to 12 inches across; they are usually found on large, nearly flat sheets of sandstone, clustered along the margins of bowl-like depressions that dot the bedrock.

The primary threats to the plant are habitat destruction through surface disturbance associated with energy development and conversion to other uses such as road and utility rights-of-way, and by illegal collecting. Agricultural pesticides may affect the pollinators of the Mancos milkvetch.

Twelve of the thirteen extant populations are primarily on lands of the Navajo Nation and Ute Mountain Ute Tribe. The total area of the thirteen sites is about 140 acres. Field counts of four of the populations found 10,407 plants on 44.5 acres with an average density of 233 plants per acre (U.S. Fish and Wildlife Service 1989).

#### Mesa Verde Cactus

The Mesa Verde cactus was listed as threatened on October 30, 1979 (44 FR 62471). Threats to the cactus are principally collection of plants by commercial and private collectors and destruction or modification of its habitat through surface disturbance from energy development and unregulated off-road vehicle use (U.S. Fish and Wildlife Service 1984). Application of agricultural herbicides and pesticides may also harm the species and its pollinators.

The Mesa Verde cactus typically has a single stem but may form clusters of up to 15 stems, 1 to 1.66 inches tall and of equal diameter. The cactus produces cream to yellow flowers 0.25 inches in diameter.

Mesa Verde cactus is known from only five isolated populations of northwestern New Mexico and southwestern Colorado; one in southwestern Colorado and four in northwestern New Mexico. Three of the New Mexico populations occur on the Navajo Indian Reservation. It is restricted to the Mancos and Fruitland shale formations, most frequently growing on the tops of hills or benches, slopes of hills, and very rarely on level ground between hills or benches. The total population of the cactus is about 5,000-10,000 plants. The number of individuals of Mesa Verde cactus per unit area varies greatly; as many as 20 plants have been found within 50 square yards and as few as a single specimen with no other individuals within several hundred square yards of apparently suitable habitat.

### Bald Eagle

The bald eagle was listed on February 14, 1978 (43 FR 6233), as endangered in the conterminous United States, except for Washington, Oregon, Minnesota, Wisconsin, and Michigan where its status is threatened. No critical habitat has been designated. The reasons for its decline and subsequent listing included chemical contamination, chiefly by organochlorine pesticides, causing severe population declines and local extirpation throughout the species' range, through reproductive failure and direct toxicity; other contributing factors included degradation and loss of habitat, killing, and human disturbance.

Bald eagles enter New Mexico in October and November and leave in March or early April. While in the state, most tend to congregate around reservoirs and other sizeable bodies of water, including larger rivers. The predominantly piscivorous bald eagle utilizes fish and waterfowl for up to 90 per cent of its diet. Since wintering bald eagle surveys were initiated by the New Mexico Department of Game and Fish in 1982, a gradual upward trend in abundance has been observed. Mirroring the state-wide trend, abundance of bald eagles wintering along the San Juan River and around Navajo Reservoir have also increased. Recent findings of contaminants in the San Juan River and in areas adjacent to the river have focused attention on the concerns of heavy metal, hydrocarbon, and selenium contamination and subsequent impacts upon the predatory and scavenging bald eagle.

### Peregrine Falcon

The peregrine falcon was listed as endangered by the Service in 1970 (35 FR 16047) because of pesticide-induced reproductive failure. The peregrine falcon historically bred in almost every state of the union; in the Rocky Mountain/Southwest Region, about 180 historical nests were documented (U.S. Fish and Wildlife Service 1977). In 1977, however, fewer than 30 pairs were found (U.S. Fish and Wildlife Service 1977). Peregrine falcons feed almost exclusively on avifauna; pigeons, medium-sized passerines,

shorebirds, and medium to small waterfowl constitute the bulk of their diet (Evans 1982).

Although no peregrine aeries are currently known within the San Juan River Valley affected by the proposed action, the species may utilize the area during migration and prey upon avian species feeding in ponds located on project lands that receive project return flows.

### Colorado Squawfish

The Colorado squawfish was listed as endangered on March 11, 1967 (32 FR 40001); no critical habitat was designated for the species. Habitat alteration, fragmentation, and degradation arising from dam construction; and competition and predation from introduced non-native fishes have been cited as the major factors responsible for the decline of the species (U.S. Fish and Wildlife Service 1991). As a top level predator, the Colorado squawfish may experience 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; Platania et al. 1991). 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. Adults have been found to select deeper water of at least some velocity. Recent collections have yielded a total of 18 young-of-the-year squawfish in backwaters of the San Juan River at various locations downstream of Shiprock, New Mexico. In 1991, four adult Colorado squawfish were captured downstream of Shiprock and one was observed in the river between the Hogback and Shiprock (D.L. Propst, New Mexico Department of Game and Fish, pers. comm.). The rediscovery of adult Colorado squawfish, presence of several age classes, and documentation of its successful spawning in the San Juan River reconfirmed the species as a viable component of the ichthyofauna of the San Juan River (Platania et al. 1991). The San Juan's small but reproducing Colorado squawfish population is considered necessary to achieve recovery of the species (U.S. Fish and Wildlife Service 1991).

### 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 March 21, 1991, draft biological opinion for the Animas-La Plata Project are utilized herein (Table 2). 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

Table 2. San Juan Section 7 Baseline for NIIP<sup>1</sup>.

New Mexico Depletions	Depletions - KAF	Totals - KAF
San Juan-Chama	104.0 <sup>2</sup>	
NIIP Blocks 1-6	133.0	
Navajo Reservoir Evaporation	26.0	
Hammond Canal	10.0	
Hogback Extension	10.0	
Utah International	39.0	
Existing Private Rights		
Citizen's Ditch	15.0	
Industrial Diversion	3.0	
Fruitland	7.0	
Jewitt Valley	2.0	
M&I Diversions	5.0	
Hogback	30.7	
Additional Depletions	38.3	
	101.0	
M&I Contracts from Navajo		
San Juan Powerplant	16.0	
Total New Mexico Depletions		439.0
<u>Colorado Depletions</u>		
Upstream of Navajo		
Upper San Juan	7.8	
Navajo-Blanco	6.5	
Piedra	6.5	
Pine River	58.1	
	78.9	
Downstream of Navajo		
Florida	18.1	
PL Animas and LaPlata Rivers	32.8	
Mancos	16.2	
	67.1	
Total Colorado Depletions		146.0
Total San Juan River Depletions		585.0
Return Flows from Dolores River Imports	25.0	
Net Depletions Measures at Bluff Utah		560.0

<sup>1</sup> Taken from 1991 Biological Assessment prepared for NIIP.

<sup>2</sup> 104 is the average water divertable from 1929 to 1974 under the operating rules. For the period 1929 to 1985, the average is 110.

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 (March 21, 1991 Draft Biological Opinion, U.S. Fish and Wildlife Service, Denver, Colorado).

Information on existing water quality in the San Juan River and on-project waters has been derived from data gathered during the 1989 and 1990 investigations of Department of Interior (DOI) sponsored irrigation projects in the San Juan Basin (Blanchard et al. in prep.). The results of April 1991 sampling efforts provided in the Biological Assessment prepared for this consultation have also been included in the analysis of baseline water quality conditions.

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. Concentrations of selenium in the various media sampled from NIIP ponds are presented in Table 3.

Table 3. Concentration of Selenium (ug/g dry wt.) in Aquatic Biota From the Navajo Indian Irrigation Project (NIIP)--1990-91.

<u>Site*</u>	<u>Species</u>	<u>Range</u>
I-1	Odonata	8.75
I-2	Hemiptera/Odonata	32.3
I-3	Hemiptera/Odonata	4.42
I-6	Hemiptera/Odonata	10.2
I-6A	Hemiptera/Odonata	3.00
I-10	Coleop/Hemip/Odon.	1.44
I-13	Hemiptera	3.12
I-14	Hemiptera	1.81
I-1	Tiger Salamander	23.5
I-2	Tiger Salamander	51.3
I-3	Tiger Salamander	5.24
I-6	Tiger Salamander	4.22
I-10	Tiger Salamander	3.83
I-13	Tiger Salamander	3.71
I-14	Tiger Salamander	3.40
I-1	Chara	3.13
I-2	Chara	9.90
I-3	Potamogeton	2.52
I-6	Chara	1.20
I-6A	Chara	1.33
I-10	Potamogeton	1.00
I-13	Chara	1.48
I-14	Potamogeton	1.01

\* See Key for Table 3.

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Key to Sampling Sites in Table 3.

NIIP Sampling Sites

- I- 1. South Pond-Gallegos Canyon Drainage
- I- 2. Middle Pond-Gallegos Canyon Drainage
- I- 3. North Pond-Gallegos Canyon Drainage
- I- 6. Lower Pond-Ojo Amarillo Canyon Tributary Drainage  
(1 mile north of Navajo Highway 3003)
- I-10. Avocet Pond
- I-13. Southwest Pond-Chinde Wash Drainage
- I-14. Southwest Pond-Chinde Wash Drainage

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 (Table 4).

Table 4. Range and Mean Concentration of Selenium (ug/g dry wt.) in Fish from the San Juan River, New Mexico--1990-91.

<u>River Reach*</u>	<u>Species</u>	<u>Range</u>	<u>Average</u>
A	Carp	4.52---5.49	5.01
B	Carp	2.75---3.03	2.89
C	Carp	2.29---2.78	2.54
D	Carp	2.69---2.82	2.76
E	Carp	2.79---3.51	3.15
F	Carp	3.76---3.80	3.78
G	Carp	2.52---3.76	3.14
A	Flannelmouth Sucker	2.30---2.89	2.60
B	Flannelmouth Sucker	2.17---2.57	2.37
C	Flannelmouth Sucker	1.41---2.28	1.85
D	Flannelmouth Sucker	1.56---1.79	1.68
E	Flannelmouth Sucker	1.79---2.79	2.29
F	Flannelmouth Sucker	1.93---2.07	2.00
G	Flannelmouth Sucker	1.97---2.14	2.06
E	Channel Catfish	1.37---1.79	1.58
F	Channel Catfish	1.89---1.99	1.94
G	Channel Catfish	1.92---2.58	2.25
A	Brown Trout	8.25---8.29	8.27
B	Brown Trout	3.09	

\* See Key for Table 4.

Key to River Reaches in Table 4.

San Juan River Reaches

- A. HAMMOND DIVERSION TO BLANCO
- B. BLOOMFIELD TO LEE ACRES
- C. LEE ACRES TO FARMINGTON
- D. LA PLATA RIVER TO OJO AMARILLO CANYON
- E. FRUITLAND TO HOGBACK
- F. SHIPROCK TO CUDEI
- G. CUDEI TO MANCOS RIVER

### Effects of the Proposed Action

The closest populations of the Mancos milkvetch are located on the Hogback south of the San Juan River and west of the BHP-Utah International Navajo Mine, approximately 6 miles from NIIP. No specimens of the milkvetch were encountered during surveys of representative sandstone areas. Similarly, no specimens of the Mesa Verde cactus were found during surveys of the NIIP area (Ecosystems Research Institute and Ecosphere Environmental Services 1991). The Service concurs with the finding of the Biological Assessment that the proposed project will have no effect on the Mancos milkvetch or Mesa Verde cactus.

The exposure of migrating or wintering bald eagles and peregrine falcons to contamination from prey species inhabiting NIIP ponds and the San Juan River which would receive selenium-contaminated irrigation return flows is not expected to be significant. The exposure of the raptors to bioaccumulation through ingestion of contaminated prey is limited by the brief time bald eagles and peregrine falcons remain in the proposed project area and the paucity of food items in the ponds. The possibility exists, however, for concentrations of selenium to increase in the ponds and in the wildlife species dependent upon them, thereby exposing individual bald eagles or peregrine falcons to selenium poisoning.

Full development of Blocks 1 through 8 of NIIP would require the depletion of the San Juan River by 56,926 af (with credit for return flows and without consideration of the time necessary for such flows to reach the river). This depletion is beyond the point of jeopardy delineated in the March 21, 1991, draft Animas-La Plata biological opinion and provides no increased flexibility in mimicking the natural hydrograph of the river which allowed the Animas-La Plata depletion.

Based on hydrologic modeling (utilizing the same model as that relied upon in the Animas-La Plata consultation), it is anticipated that the 56,926 af net depletion for Blocks 7 and 8 will be obtained by reduction of stream channel maintenance flows during the non-irrigation months of October through March in order to store waters in Navajo Reservoir for diversion to NIIP. This storage is not expected to reduce the frequency with which the 300,000 af spring flow would be made available, but will reduce flows in the channel of the San Juan River from an estimated 300 cfs to 185 cfs (a reduction of 38 per cent) during late fall to early spring in all years in order to release those waters to NIIP during the irrigation season.

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), 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 years; however, this assumption is unsupported by data. 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 has been predicted in the Biological Assessment to increase by about 3,100 af per year, or about 70 per cent greater than present conditions. 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 in the Biological Assessment 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 based only on assumptions provided in the Biological Assessment.

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.

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 available for bioaccumulation in prey species or in whole body contamination of the Colorado squawfish is considered likely to jeopardize the survival of the species in the San Juan River.

#### 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.

#### Alternative Evaluated But Removed From Further Consideration

An initial reasonable and prudent alternative to the full depletion of 56,926 af for NIIP was proposed by the Bureau of Indian Affairs at the inception of the consultation. That alternative consisted of redistribution of some of the water allocated to other Navajo projects (Hogback and Fruitland) currently depleting from the San Juan River, and the reduction of non-irrigation season flows in the river from 300 cubic feet per second (cfs) to approximately 230 cfs. The reduction of flows during the non-irrigation months of October through March by 70 cfs and storage of that water in Navajo Reservoir would permit its delivery to NIIP during the irrigation season. Implementation of these actions would reduce the total depletion for NIIP to 21,700 af.

The use of inactive storage of Navajo Reservoir was reviewed for its feasibility as an alternative to offset the impacts to the Colorado squawfish caused by the proposed 21,700 af depletion, i.e., the use of the inactive storage to supplement the flexibility

of operation of the reservoir in mimicking the natural hydrograph of the San Juan River for the benefit of the Colorado squawfish over and above that delineated in the March 21, 1991, draft biological opinion issued for the Animas-La Plata Project.

The Bureau of Indian Affairs was requested on September 13, 1991, to review the amount of inactive storage needed to provide additional flexibility, the construction modifications considered necessary to Navajo Dam to protect the dam as the water surface elevation was lowered, any additional facilities required to gain access to the inactive storage pool of the reservoir, and to provide a simulated hydrograph depicting the amount of flexibility gained in utilizing the inactive storage. On September 30, 1991, the Service was advised by the Bureau of Indian Affairs' consultant that (1) an estimated 260,000 af of the 600,000 af of inactive storage would be required to provide water to offset the depletion; (2) the upstream face of Navajo Dam would require additional rip-rap to protect the dam during drawdown to the inactive storage pool; and (3) pumping would be required about 10 per cent of the time to lift the water to the inlet of the NIIP canal. Initial cost estimates for the rip-rap and pumping ranged from \$10 to \$20 million.

Following presentation of this alternative to the Navajo Tribal Council the consultant informed the Service that this alternative would be dropped from consideration and further analysis of its contribution to the flexibility of the system to mimic the natural hydrograph ceased.

#### Alternative To The Proposed Action

A reasonable and prudent alternative to the proposed depletion of the San Juan River by 56,926 af, and the contamination of the water and aquatic fauna of the river through the introduction of selenium from the proposed farming program, has been formulated to remove the likelihood of the action jeopardizing the continued existence of the Colorado squawfish. Implementation of this alternative will also serve as adequate conservation measures for the bald eagle and the peregrine falcon.

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.

#### Incidental Take

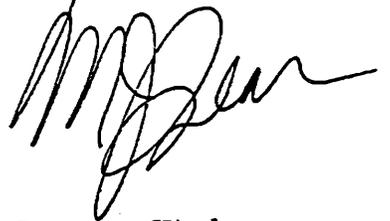
Section 9 of the Act prohibits any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish and wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation 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.

A handwritten signature in black ink, appearing to be 'M. Bliesner', written in a cursive style.

## cc:

Mr. Ron Bliesner, Keller-Bliesner Engineering, Logan, Utah  
Mr. Joseph Little, Bureau of Indian Affairs, Albuquerque, New Mexico  
Regional Director, Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah  
Director, Fish and Wildlife Service, Washington, D.C. (ES)  
Regional Director, Fish and Wildlife Service, Denver, Colorado  
Regional Solicitor, Department of Interior, Tulsa, Oklahoma  
Field Supervisor, New Mexico Ecological Services Office, Albuquerque, New Mexico  
Regional Hydrologist, Fish and Wildlife Service, Division of Engineering, Albuquerque, New Mexico

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APPENDIX A

Conference Report for the  
Razorback Sucker



# United States Department of the Interior

FISH AND WILDLIFE SERVICE  
POST OFFICE BOX 1306  
ALBUQUERQUE, N.M. 87103



OCT 28 1991

In Reply Refer To:  
Region 2/FWE/SE

## Memorandum

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

From: Regional Director

Subject: Section 7 Conference Report for the Navajo Indian  
Irrigation Project, Blocks 1 through 8

This responds to your request of September 27, 1991, for conference 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. The species of concern for this conference is the razorback sucker (Xyrauchen texanus), proposed for listing under the Act as an endangered species.

A conference is required between the agency and the Service when it is determined by the Federal agency that an action is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat. During the conference, the Service will make advisory recommendations, if any, on ways to minimize or avoid adverse effects to the proposed species.

The following conference report is based on information provided in the Biological Assessment furnished with the July 22, 1991, request for consultation on the proposed action for Federally listed species, the three supplements to that assessment provided on September 13, 1991, September 21, 1991, and September 30, 1991; the Final Environmental Impact Statement issued for NIIP on October 12, 1976; data in our files; and discussions with various people familiar with NIIP and the proposed razorback sucker.

### Biological Opinion

Based on the best scientific and commercial information currently available, the proposed construction and operation of Blocks 1 through 8 of NIIP are likely to jeopardize the continued existence of the proposed razorback sucker. The reasonable and prudent alternative provided in the October 17, 1991, biological opinion

(2-22-91-F-241) furnished for the formal section 7 consultation on the proposed action, and iterated herein, will avoid the likelihood of jeopardizing the continued existence of the razorback sucker.

### Background

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 of 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. The 1979 biological opinion issued for the proposed project did not address the razorback sucker. That biological opinion found that the proposed project would not jeopardize the three endangered species listed above. The gathering of new information, i.e., the capture of a razorback sucker in the river and the proposed listing of the species as Federally endangered, and an understanding of NIIP impacts to the environment has prompted this conference report.

### Project Description

As originally proposed, and at full development, NIIP would irrigate 110,630 acres of Navajo-owned lands in northwestern New Mexico. 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.

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 have been replaced by center pivots to increase efficiency and precision of irrigation and reduce

management problems. New blocks are also 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 greatly 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 delineated 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 based on an estimated return flow to the river through surface and deep ground transport of 52,320 af. The addition of Blocks 7 and 8 to NIIP would require an additional depletion of 56,926 af for a total depletion of 189,891 af with development of all eight blocks (Keller-Bliesner Engineering and Ecosystems Research Institute 1991). A return flow of 22,396 af has been estimated for Blocks 7 and 8 after equilibrium conditions are reached; this return credit has been accounted for in the 56,926 af depletion figure.

### Species Description

Endemic to the Colorado River system, the razorback sucker was originally proposed for listing as a threatened species in April 1978 (43 FR 17373). No critical habitat for the species was designated. The proposal was subsequently withdrawn in May 1980, in compliance with provisions of the 1978 amendments to the Endangered Species Act. These amendments required the Service to include critical habitat in the listing of most species and to complete the listing process within 2 years or withdraw the proposal from further consideration. In March of 1989 a petition to list the razorback sucker as an endangered species was received and a positive finding was made in June 1989 and subsequently published by the Service in August 1989 (45 FR 33586). A proposed rule to list the razorback sucker as endangered (without critical habitat) was published on May 22, 1990 (46 FR 21154).

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).

### 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 March 21, 1991, draft biological opinion for the Animas-La Plata Project 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 (Draft Biological Opinion, Fish and Wildlife Service, Denver, Colorado, March 21, 1991).

Information on existing water quality in the San Juan River and on-project waters has been derived from data gathered during the 1989 and 1990 investigations of Department of Interior (DOI) sponsored irrigation projects in the San Juan Basin (Blanchard et al. in prep.). The results of April 1991 sampling efforts provided in the Biological Assessment prepared for this consultation have also been included in the analysis of baseline water quality conditions.

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 investigation had 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 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 razorback sucker, 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.

#### Effects of the Proposed Action

Full development of Blocks 1 through 8 of NIIP would require the depletion of the San Juan River by 56,926 af (with credit for return flows and without consideration of the time necessary for such flows to reach the river). This depletion is beyond the point of jeopardy delineated in the March 21, 1991, draft Animas-La Plata biological opinion and provides no increased flexibility in mimicking the natural hydrograph of the river which allowed the Animas-La Plata depletion.

Based on hydrologic modeling (utilizing the same model as that relied upon in the Animas-La Plata consultation), it is anticipated that the 56,926 af net depletion for Blocks 7 and 8 will be obtained by reduction of stream channel maintenance flows during

the non-irrigation months of October through March in order to store waters in Navajo Reservoir for diversion to NIIP. This storage is not expected to reduce the frequency with which the 300,000 af spring flow would be made available, but will reduce flows in the channel of the San Juan River from an estimated 300 cfs to 185 cfs (a reduction of 38 per cent) during late fall to early spring in all years.

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 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 years; however, this assumption is unsupported by data. Surface drainage, flowing to the San Juan through man-made and natural channels, may carry contaminants accumulated from the farm fields to the river.

With full development through Block 8, agricultural runoff in the washes has been predicted in the Biological Assessment to increase by about 3,100 af per year, or about 70 per cent greater than present conditions. 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 is expected 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. 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 in the Biological Assessment 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 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 based only on assumptions provided in the Biological Assessment.

During the 1989 and 1990 DOI 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 presence 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.

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 razorback sucker. Although data are not available on specific effects of the element on the species, or levels at which discernible declines in reproduction or viability may be expected, any increase which raises the concentration is considered likely to jeopardize the survival of the razorback sucker in the San Juan River.

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

A reasonable and prudent alternative to the proposed depletion of the San Juan River by 56,926 af, and the contamination of the water and aquatic fauna of the river through the introduction of selenium from the proposed farming program, has been formulated to remove the likelihood of the action jeopardizing the continued existence of the Colorado squawfish. Implementation of this alternative will also serve to protect the razorback sucker.

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 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 cubic feet per second (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 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 the occupied habitat of the Colorado squawfish.

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

#### 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. Consistent with 50 CFR 402.10, an incidental take statement provided with a conference opinion does not become effective unless the Service adopts the opinion once the listing is final.

The Service does not anticipate that the proposed action will result in any incidental take of the razorback sucker. 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 the Service's conference report on the effects of the proposed construction and operation of Blocks 1 through 8 of the Navajo Indian Irrigation Project on the proposed razorback sucker. Conference reports provide advisory recommendations to assist the agency in eliminating conflicts that may be caused by the proposed action. The recommendations in this report are not legally binding with respect to the razorback sucker as a proposed species. Pursuant to 50 CFR 402.10 (d), this report may be adopted as the biological opinion when and if the razorback sucker is listed if no significant information or changes in the action alter the content of the report.

A handwritten signature in black ink, appearing to be 'M. J. [unclear]', located in the lower right quadrant of the page.

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