Attachment G

Biological Assessment

Attachment G to the ALP Project Draft Supplemental Environmental Impact Statement (DSEIS) provides the Biological Assessment which has been prepared pursuant to Section 7 of the Endangered Species Act of 1973 to address potential impacts to endangered Colorado River fishes and their designated critical habitat and other threatened and endangered species.

Biological Assessment

Animas-LaPlata Project
Colorado-New Mexico

Prepared for:

U.S. Department of Interior
Bureau of Reclamation

Prepared By:
Miller Ecological Consultants, Inc.
Fort Collins, Colorado

December 20, 1999

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BIOLOGICAL ASSESSMENT -ANIMAS-LAPLATA PROJECT

INTRODUCTION

This Biological Assessment was prepared pursuant to Section 7 of Endangered Species Act of 1973 (Act), as amended, to address project impacts to endangered Colorado River fishes and their designated critical habitat; the bald eagle; and the southwestern willow flycatcher. Candidate species not previously addressed are also included.

The Fish and Wildlife Service (Service) and Bureau of Reclamation (Reclamation) have consulted/ conferenced, both formally and informally, regarding potential impacts to protected species which may occur as a result of construction and operation of previous project plans and the proposed Animas-LaPlata project (Project) as described in this assessment. Table 1 provides a summary of effects on the listed species. Table 2 contains a list of major actions and correspondence between the agencies in accordance with the Act.

The scope of this Biological Assessment covers the proposed Project as describe herein. The main change since the earlier opinions is that the project is now limited to an average annual depletion of 57,100 AF and the irrigation delivery system has been eliminated. For the purpose of this analysis, the full project development scenario of 120,000 acre/ft diverted and a net annual average depletion of 57,100 acre/ft was assumed. Projected return flows to the La Plata River from the non binding portions of the alternative would enhance flows in the reaches of the river where shortages to irrigation users are common. As a practical matter, it is unlikely that these return flows can be protected and passed downstream during water short months. The use of these return flows by downstream irrigators during water short periods become depletions incidental to the project. To prevent exceeding the total project depletion of 57,100, project uses would be reduced by the amount of incidental depletion resulting from the return flow use.

In consideration of new information and revisions to the project plan, Reclamation requested re-initiation of consultation, an updated species list and an extension of the consultation period to allow for additional data collection in a Memorandum to the Service dated June 16, 1999. The Service provided a list of endangered, threatened and candidate species which may be present in the area influenced by the Project in a June 23, 1999 Memorandum.

The species which were identified by the Service are the endangered Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), peregrine falcon (*Falco peregrinus*), black-footed ferret (*Mustela nigripes*); and the southwestern willow flycatcher (*Empidomax traillii extimus*); the Mancos milk-vetch (*Astralagus humillimus*), the Mesa Verde cactus (*Sclerocactus mesae-verdae*), the Knowlton's cactus (*Pediocactus knowltonii*), the threatened bald eagle (*Haliaeetus leucocephalus*), Mexican spotted owl (*Strix occidentalis lucida*); the federal proposed Canada lynx (*Lynx canadensis*) and mountain plover (*Charadrius montanus*) and the candidate species boreal toad (*Bufo boreas boreas*) and Sleeping Ute milk-vetch (*Astralagus tortipes*).

The peregrine falcon was officially delisted in 1999 and is not discussed in this Biological Assessment.

In keeping with 51 Federal Register 19926, 19949 (June 3, 1980) (preamble to Section 7 consultation regulations) any possible effect, whether beneficial, benign, adverse, or of an undetermined character triggers formal consultation requirement. Therefore, this assessment summarizes the distribution, abundance, life requisites and potential impacts on these species and their habitat, and proposes offsetting measures where applicable, for species which may be affected by the project.

Species lists provided during earlier consultations included threatened, endangered, and candidate plant species. During those consultations the Service determined that none of the listed plants would be impacted by the proposed project. Consideration was given to the Ute ladies' tresses orchid (*Spiranthes diluvialis*), but the Service determined that based on current and historical records it is not likely to occur within the project area. The interim survey guidelines (November 23, 1992) exclude southwestern Colorado from survey requirements.

Surveys to detect Mexican spotted owls were conducted jointly by Service and Reclamation biologists in 1992. These surveys did not detect any Mexican spotted owls present in the vicinity of Ridges Basin (site of the Project). No other suitable habitat for the species will be affected by the project, and Reclamation determined the project would have no affect on the Mexican spotted owl. By memorandum dated August 3, 1992, the Service concurred with this finding. The information concerning this species is on file with the Service and has not been repeated here.

Table 1. Summary of impacts of the Preferred Alternative on the listed species.

Species	Impact
Colorado pikeminnow	May affect
Razorback sucker	May affect
Bald eagle	May affect
Southwest willow flycatcher	May affect, not likely to adversely affect
Black footed ferret	No effect
Mexican spotted owl	No effect
Mancos Milk vetch	No effect
Mesa Verde Cactus	No effect
Knowltons Cactus	No effect
Canada lynx	No effect
Mountain plover	No effect
Boreal toad	No effect
Sleeping Ute Milk Vetch	No effect

SUMMARY OF CONCLUSIONS

Analysis of the potential impacts on endangered and candidate species concluded that the proposed Animas-La Plata project may affect but is not likely to adversely affect the bald eagle. The proposed action, which consists of the smaller size Ridges Basin Reservoir, only M&I deliveries, and the Navajo Nation Municipal Pipeline, may affect but is not likely to adversely affect the Southwestern willow flycatcher at the pipeline crossings. Surveys conducted in 1999 at the proposed crossings on the San Juan River confirmed the presence of potential habitat. Prior to any construction at the crossing locations, Reclamation would survey the proposed route and avoid any disturbance of habitat that was utilized by the Southwestern willow flycatcher.

The non-binding non-structural portions of the preferred alternative are not discussed in this Biological Assessment, however San Juan River depletions from non-binding uses are included. There is not enough detail to specific actions related to the non-binding scenarios to evaluate impacts at this time. The Supplement to the Final Environmental Impact Statement (SEIS) will provide the mechanism for conducting appropriate surveys and consultations for protected species as those non-binding and non-structural features are developed in detail.

Reclamation is working toward operation of Navajo Reservoir to benefit endangered fish and critical habitat that exist downstream. This new Navajo Reservoir operation is related to the Project as well as to other water resource activities in the basin, such as the Navajo Indian Irrigation Project. This relationship stems from past Endangered Species Act consultations, which established and relied upon the San Juan River Recovery Implementation Program (SJRIP) and listed certain reasonable and prudent alternatives to avoid jeopardy to endangered species; San Juan River flow recommendations developed and approved by the SJRIP; and Reclamation's previous commitment to operate Navajo Reservoir for the benefit of endangered fish. Hydrology studies for the Project show that the SJRIP flow recommendations can be met under the proposed Project plan.

Effects of the project as proposed in 1991 on the listed Colorado pikeminnow and razorback sucker were the subject of the October 25, 1991 Biological Opinion for the project. This Opinion determined the project is likely to jeopardize the continued existence of these species by appreciably reducing the likelihood of both the survival and recovery of the species in the wild by further reducing its numbers, reproduction, and distribution, and included a reasonable and prudent alternative to avoid the likelihood of jeopardy. The Reasonable and Prudent alternative for the 1991 Opinion included 1) an Animas – La Plata project that results in an initial depletion of 57,100 acre-feet (AF), 2) 7 years of research to determine endangered fish habitat needs, 3) operation of Navajo Dam to provide a wide range of flow conditions for the endangered fish, 4) a guarantee that the Navajo Reservoir will be operated for the life of the Project to mimic a natural hydrograph based on the research, and 5) legal protection for the reservoir releases to and through the endangered fish habitat to Lake Powell and a commitment to develop and implement a Recovery Implementation Program for the San Juan River (USFWS 1991).

Effects of the project as proposed in 1996 on critical habitat for the listed fishes were the subject of the February 26, 1996 Biological Opinion. The Service's biological opinion was that the Project as described in 1996 is likely to jeopardize Colorado pikeminnow and razorback sucker and adversely modify or destroy their critical habitat. The Reasonable and Prudent alternative included 1) an Animas – La Plata Project that results in an initial depletion of 57,100 AF (Phase I, Stage A only), 2) research to determine endangered fish habitat needs, 3) operation of the Navajo Dam to provide a wide range of flow conditions for the endangered fish, including low winter flows, 4) a procedure to implement flow recommendations, 5) a commitment to release peak flows out of Navajo Dam as agreed upon with the Biology and Navajo Dam Operating Committees, 6) a guarantee that, based on the results of the research program and dependent upon the prevailing hydrology, Navajo Dam will be operated for the life of the Animas-La Plata project to mimic a natural hydrograph, Reclamation has agreed under Section 7 (a) 1 to re-operate Navajo Dam for recovery of endangered fishes and 7) provide legal protection for the reservoir releases instream to and through the endangered fish habitat to Lake Powell. In order to preclude jeopardy and adverse modification, all seven elements must by implemented (USFWS 1996).

Reclamation has completed or is complying with most of the elements for both the 1991 and 1996 RPAs. The Seven Year Research Program has been completed and final study reports are being prepared. Flow recommendations to benefit the endangered fish based on the research were made by the SJRIP Biology Committee and adopted by the SJRIP Coordination Committee. Reclamation has operated Navajo Dam in accordance with the flow recommendation from the San Juan Recovery Implementation Program during the research period and continues to follow the recommendations based on the hydrologic conditions to benefit the two endangered fish in the San Juan River. The flows have included both peak flows and low winter flows. Reclamation has completed a study of low winter flows downstream of Navajo Dam.

The Preferred Alternative includes a 120,000 AF reservoir at Ridges Basin and an average annual depletion of not more than 57,100 AF. This depletion meets the requirements of the 1991 and 1996 RPAs. The ALP Project may affect the endangered Colorado pikeminnow and razorback sucker and adversely modify their habitat. Hydrology studies for the Project show that the flow recommendations can be met with the Project operational, even with "indirect" depletions mentioned above.

Table 2. Chronology of Section 7 Consultation: Animas-La Plata Project

Chronology of Section 7 Consultation
Animas La-Plata Project

03/09/79	Service provided species list
06/27/79	Biological Assessment on Animas La-Plata Project, Water and Power Resources (now Reclamation)
12/28/79	No-jeopardy Biological Opinion
02/06/90	Reclamation determined may affect for Colorado Pikeminnow
02/15/90	Service concurred with may affect, added listed plant and terrestrial wildlife to species list
03/02/90	Reclamation Biological Assessment transmitted to Service
05/07/90	Service rendered draft Biological Opinion - Jeopardy with no reasonable and prudent alternative (RPA)
05/22/90	Razorback sucker was proposed for listing
12/21/90	Bureau of Indian Affairs requested to participate in the consultation process
03/04/91	Reclamation requested the Service conference on the razorback sucker and proposed a RPA for the project regarding the Colorado Pikeminnow
03/21/91	Service issued a Conference Opinion for razorback sucker
04/15/91	Reclamation concurred with the March 31, 1991 conference opinion
06/06/91	Reclamation requested consultation extension to 06/21/91 for Colorado pikeminnow
06/14/91	Service concurred with extension
10/23/91	Final Rule on razorback sucker published, to be effective 30 days later
10/24/91	Memorandum of Understanding to implement the RPA signed by Secretary of the Interior including the elements of the forthcoming Biological Opinion: Modify operations of Navajo Dam, legally protect releases, development of a Recovery Implementation Program.
10/25/91	Final Biological Opinion on project issued by Service: Jeopardy w/RPA
10/25/91	Conference Opinion issued on the razorback sucker
11/22/91	Final Rule listing razorback sucker as endangered species became effective
12/16/91	Conference opinion on razorback sucker adopted as a biological opinion
04/24/92	Service issued an addendum to the Conference Opinion on the razorback sucker to review and clarify earlier finding
03/05/93	Critical habitat proposed for four species of endangered Colorado River fish
07/23/93	Southwestern willow flycatcher proposed for listing
03/21/94	Final Rule on the determination of critical habitat for four Colorado River endangered fishes published in the Federal Register
04/19/94	Reclamation requested re-initiation of formal consultation and extension of consultation period to complete on-going data collection efforts

04/20/94	Effective date for critical habitat designation
06/01/94	Service provided Reclamation with and up-dated species list and concurred with the extension of consultation period
03/29/95	Southwestern willow flycatcher listing effective
05/31/95	Reclamation issues Biological Assessment addressing Colorado River fishes, bald eagles, southwestern willow flycatchers, black-footed ferrets, roundtail chub, peregrine falcon, flannelmouth sucker, and loggerhead shrike
02/26/96	Final Biological Opinion issued by Service: Jeopardy with Reasonable and Prudent Alternative
06/16/99	Reclamation requested updated species list
06/23/99	Service provided Reclamation with an up-dated species list.

PROJECT DESCRIPTION

INTRODUCTION

The project plan includes both structural and non-structural elements designed to achieve the fundamental purpose of securing the Colorado Ute Tribes an assured water supply in satisfaction of their water rights as determined by the 1986 Settlement Agreement and the 1988 Settlement Act and by providing for identified municipal and industrial water needs in the project area.

The structural component of the Preferred Alternative would include an off-stream storage reservoir (approximately 120,000 af total capacity) with a conservation pool of approximately 30,000 af; a pumping plant with a pumping capacity of up to 280 cubic feet per second of capacity; a reservoir inlet conduit (all designed to pump and store water from the Animas River); and a pipeline designed to transport treated municipal water from Farmington, New Mexico to the Shiprock area, New Mexico. All structural facilities would be designed to deplete no more than an average of 57,100 afy. This depletion limit of an average 57,100 afy is consistent with the 1996 Biological Opinion issued by the Fish and Wildlife Service.

Consumptive use of water from the structural portion of the project would be restricted to M&I uses only and would be allocated in the following manner[1]:

Southern Ute Tribe (M&I)	19,980 afy depletion
Ute Mountain Ute Tribe (M&I)	19,980 afy depletion
Navajo Nation (M&I)	2,340 afy depletion
ALP Water Conservancy District (M&I)	2,600 afy depletion
San Juan Water Commission (M&I)	10,400 afy depletion

Under this allocation, the Colorado Ute Tribes are still approximately 13,000 af short of the total quantity of depletion recognized in the settlement agreement. Therefore, the non-structural component of the project would establish and utilize a water acquisition fund which the Colorado Ute Tribes could use to acquire water rights on a willing buyer/willing seller basis in an amount sufficient to allow the Tribes approximately 13,000 afy of depletion in addition to the depletions available from the structural portion of the project. Preliminary cost estimates indicate that a one-time fund of approximately $40 million would be required to purchase the additional rights. However, to provide flexibility in the use of the fund, authorization would allow some or all of the funds to be redirected for on-farm development, water delivery infrastructure, and other economic development activities.

[1]The balance of the available depletions is lost to evaporation making total depletions of 57,100 afy.

Water Supply of the Preferred Alternative

Source and Amount of Water Supply

The primary source of the water for the structural portion of the Preferred Alternative is the Animas River. The project water requirements would be met from the water supply after meeting all current uses, all uses that could occur without further federal action (primarily exercise of state water rights not presently being used as identified by Colorado and New Mexico) and all uses for which favorable biological opinions have been issued.

The water supply for the non-structural alternatives would include the Pine, Florida, Animas, La Plata and Mancos rivers and McElmo Creek. The supply would be developed from existing uses within each basin, with the associated historic shortages, so no additional water is needed to meet the demands of the non-structural components.

Depletion of San Juan River Basin Water Supply

Under the Preferred Alternative, the project would be developed to provide an average annual diversion of 111,965 af of which 57,100 af would be depleted. While the Animas River is the primary supply, the points of diversion and return flow vary depending on the proposed use. Table 3 lists the various uses and the average diversion and demand. The depletions listed are the cumulative depletions of all uses. The measurement point for the depletion is the San Juan River at Four Corners, New Mexico. The annual depletion at this location would range between 8,200 and 100,500 af. Depletions at other locations in the system may be greater or less than this amount depending on the location relative to the diversion and return flow points.

Diversion points high in the system depend on direct diversions from the Animas River, augmented by supply from Ridges Basin Reservoir. Diversions lower in the system may utilize return flows and gains in the river that are surplus to baseline needs.

Table 3 Water Supply by Non-binding potential Uses for the Preferred Alternative.

Water Supply by Use for the Preferred Alternative				
Category	Diversion (af)	Depletion (af)	Diversion Location	Return Flow Location
Southern Ute				
Florida Mesa housing	140	70	Ridges Basin	Animas at Florida Confluence
Animas River basin housing	140	70	Ridges Basin	Animas at Florida Confluence
La Plata River basin housing	140	70	Ridges Basin	La Plata at Farmington
Animas Ind. Park M&I	40	20	Ridges Basin	Animas at Florida Confluence
Ridges Basin golf course	796	398	Ridges Basin	Ridges Basin
Ridges Basin Resort	44	22	Ridges Basin	Ridges Basin
Coal mine	830	415	Ridges Basin	La Plata at state line
Coal fired power plant	27,000	13,500	Ridges Basin	La Plata at state line
Livestock + wildlife	30	15	Ridges Basin	La Plata at state line
Southern Ute Total	**29,160**	**14,580**		
Ute Mountain Ute				
La Plata housing	280	140	Ridges Basin	La Plata at state line
Mancos Canyon Golf Course	978	489	Ridges Basin	Mancos River
Mancos Canyon Resort	33	17	Ridges Basin	Mancos River
Gas power plant	4,600	2,300	San Juan at SJPP	San Juan above Shiprock
Livestock & wildlife	40	20	Ridges Basin	La Plata at state line
La Plata Basin Resort	30	15	Ridges Basin	La Plata at state line
La Plata Basin Golf Course	626	313	Ridges Basin	La Plata at state line
La Plata Basin Dude Ranch	10	5	Ridges Basin	La Plata at state line
Ute Mountain Ute Total	**6,597**	**3,299**		
Regional Water Supply				
Durango	15,338	7,669[1]	Ridges Basin	Animas R. below pump
Bloomfield & Upstream uses	4,533	2,267	San Juan-Cit. Ditch	San Juan at Farmington
Farmington	28,373	14,187	Farmington M&I Div	San J. below Animas Confluence
Florida Mesa	7,016	3,508	Ridges Basin	Animas at Florida Confluence
Red Mesa Plateau	2,105	1,052	Ridges Basin	La Plata at state lines
Kirtland, NM	7,016	3,508	Farmington M&I Div	San Juan above Hogback
Aztec, NM	4,911	2,456	Aztec M&I Div	Animas R. at Farmington
Less - ALP Water Cons. Allocat.	-5,200	-2,600		
San J. Water Comm. Allocat.	-20,800	-10,400		
Total Regional Water Supply	**43,292**	**21,646**		
Total Ute Settlement	***79,050***	***39,525***		
Other Uses				
Navajo Nation	4,680	2,340	Farmington M&I Div	Shiprock below gage
ALP water conservancy	5,200	2,600	See Regional Water Supply	
San Juan Water Commission	20,800	10,400	See Regional Water Supply	
Ridges Basin Evaporation	2,235	2,235	Ridges Basin	none
Total Other Uses	**32,915**	**17,575**		
			Range of depletions at Four Corners, New Mexico 8,200 - 100,500 afy	
Total Water Use	***111,965***	***57,100***		

Water Supply by Use for the Preferred Alternative				
Category	Diversion (af)	Depletion (af)	Diversion Location	Return Flow Location
Design total	*111,965*	*57,100*		
Design - Calculated Use	*(0)*	*(0)*		

[1] includes water supply for Durango already consulted on between Durango/Corps of Engineers/USFWS

Operational Requirements of the Preferred Alternative

Project Operation

Pumping plant and dam outlet works operation would be controlled from the control room of the Durango Pumping Plant. The control room would be in communication with the Reclamation office in Durango where operation of southwestern Colorado projects is coordinated. River flow, reservoir level, outlet flows and upstream watershed gage data indicative of changes in river flow would be directed to an operational model to advise of the best combination of pumping units to meet the reservoir and downstream demands and comply with the river bypass requirements and downstream commitments. Equipment maintenance duties and inspection patrols of the dam and reservoir would be directed from the pumping plant. Equipment and facility repair tasks beyond the scope of periodic maintenance duties would be assigned to specialized contractors.

Project Power

The ALP Project is part of the Colorado River Storage Project (CRSP). Part of the electric power produced by the federal hydroelectric generating facilities of the CRSP have been reserved for participating project purposes including the power requirements for the project. The estimated power requirements for reservoir filling and for future full project use are:

Peak monthly demand; Summer: 17,500 kW; Winter: 8,500 kW
Annual energy required: 63 million kWh

San Juan Endangered Species Recovery Implementation Program

The project can be operated to meet the flow recommendations established by the SJRBRIP in support of recovery of the endangered fish in the San Juan River below Farmington. While Navajo Dam is the primary operational control to achieve these flow recommendations, the operation of Ridges Basin Reservoir may also affect the ability of the system to sustain the flows recommended. Meeting these flow recommendations would require modification of the Durango pumping plant operation to meet minimum base flows and avoid impacts to the spring runoff flows that could violate the flow requirements. Plans include limiting the 280 cfs pumping capacity to 240 cfs in June and controlling pumping during the period November through

February when Navajo Reservoir falls below a target level and pumping would impact the ability to meet the minimum flow in the San Juan River with minimum releases from Navajo reservoir.

Filling Period of Ridges Basin Reservoir

Since the project demands will lag the initial filling of Ridges Basin Reservoir, the filling schedule will follow the same operating rules as normal operation. Pumping rates would follow all requirements of normal system operation to avoid impact to existing uses and meet SJRBRIP flow recommendations. Depending on the nature of runoff during the filling period, filling is anticipated to take from one to three years.

Structural Components and Associated Features of the Preferred Alternative

Structural components and associated features of the Preferred Alternative include:

- Durango Pumping Plant and Ridges Basin Inlet Conduit
- Ridges Basin Dam and Reservoir
- Navajo Nation Municipal Pipeline
- Electrical Transmission Lines
- Ridges Basin Recreational Element
- Relocations
- Construction Program

Durango Pumping Plant and Ridges Basin Inlet Conduit

Durango Pumping Plant would pump water from the Animas River and lift it through the Ridges Basin Inlet Conduit into Ridges Basin Reservoir. The pumping plant would be located on the west side of the river across from Santa Rita Park located on the south side of downtown Durango, Colorado. Access to the pumping plant would be from CR 211 immediately north of Centennial Mall. On site with the pumping plant would be the intake structure, a parking area, a surge chamber, and an electrical switchyard. The intake structure would conduct water from the river through control gates and to the fish screen, then into a covered basin that serves as a forebay for the pumping plant. The entrance to the intake structure would consist of a sloping grate 48 feet long, situated to conform to the riverbank and designed to exclude the entry of debris into the control gates. The fish screen, 80 feet back from the river, would be designed to keep fish greater than two inches from passing, and all fish would be channeled back to the river by the velocity in a bypass pipe at the base of the screen. The intake structure would be covered except for the fish screen area that would be open to facilitate cleaning and maintenance.

The pumping plant would be placed about 160 feet back from the river and would be both lower and not so long as the structure described in the 1996 FSFES. The flow requirement of 280 cubic feet per second (cfs) facilitates the application of single stage horizontal centrifugal pumps instead of the higher-capacity vertical spiral case pumps proposed previously. The single stage horizontal pumps are similar in silt handling capability, are more accessible for maintenance, and require less vertical space in the structure. Five pumps would provide a total of 280 cfs and four smaller pumps would handle lower flows, trim flows between the large pumps, and provide redundancy in case one of the large pumps is out of service. A bay will be provided in the plant that would allow the City of Durango to use the facility to pump water to their terminal reservoir. The rate of pumping would be governed by:

Downstream senior water rights demands on the river
The amount of water in the river
Minimum bypass flows
The capacity of Durango Pumping Plant
Design-based reservoir filling criteria

The Durango Pumping Plant is also limited to 240 cfs in June to avoid impacting endangered fish flow requirements in the San Juan River. Pumping is further limited, when all other downstream requirements are satisfied, to allow the following bypass flows in the Animas River at the pumping plant intake: October through November - 160 cfs: December through March - 125 cfs: and April through September - 225 cfs.

Oriented with the long side parallel with the river, the pump and equipment portion of the plant would be below the finished ground surface with an interior height of 43 feet, a width of 57 feet, and a length of 250 feet. Over this portion of the plant the crane housing would extend 24 feet above the ground to facilitate loading, unloading and maintenance of the pumping units and equipment. The crane housing would be about 40 feet wide and 250 feet long.

Construction would use cast in place and precast concrete. A spherical air chamber would be partially buried along side the parking area behind the plant and away from the river. Incoming power lines and an electrical switchyard would be located to the south, between the plant and CR 211. Fill slopes between the plant and the intake structure and between the intake structure and the river would provide space to accommodate the site landscaping.

The Ridges Basin Inlet Conduit - The conduit route from the Animas River up Bodo Draw to Ridges Basin was selected because it provides the lowest pumping lift between the river and the active storage pool of the 120,000 af Ridges Basin Reservoir. It is also relatively close to the river and the terrain not unusual for pipeline construction. The route of the conduit from the pumping plant to the reservoir is along the trace identified in the 1996 FSFES. It proceeds southerly from the pumping plant, turns southwest to cross CR 211 and the Bodo creek flow line, continues to a point some 1200 feet south of CR 211 then turns up Bodo draw, south of the creek line, and crosses the crest along side CR 211. An air vent of about 12 inches diameter would stand about eight feet above ground just before the crest of the ridge. Construction would include about 11,200 feet of 66-inch diameter steel pipe with a corrosion-protective coating and about 800 feet of improvements in the discharge course toward the reservoir. The conduit would be buried in a trench at a normal depth of five to eight feet below the ground and backfilled, so that upon completion of construction the terrain would be returned to natural contours. To conserve pumping lift the cost of various depths of additional excavation across the crest at top of the draw, including tunneling, were compared with the saving in future power costs. It was found most economical to excavate up to 35 feet deep at the crest and maintain a maximum flow line elevation of 6950 feet. The conduit would terminate on the reservoir side of the crest with a stilling structure from which the flow would continue down to the reservoir in a rock-lined ditch.

Ridges Basin Dam and Reservoir

Ridges Basin Reservoir would have the following features:

Maximum Reservoir Capacity -120,000 af
Maximum Water Surface Area - 1,500 acres @ elevation 6,882 feet
Minimum Reservoir Capacity – 30,000 af
Minimum Water Surface Area - 870 acres @ elevation 6,815 feet
Active Capacity - 90,000 af
Inactive Capacity - 30,000 af

Ridges Basin Reservoir would be formed by the construction of Ridges Basin Dam on Basin Creek, approximately three miles upstream from its confluence with the Animas River. To retain 120,000 af and provide for flood storage requires a dam with a crest elevation of 6892 feet is required. The dam height would be 217 feet above stream-bed. The dam site is defined by narrowing of the downstream end of Ridges Basin with a prominent sandstone ridge to the left (northeast) of Basin Creek and two sandstone and siltstone ridges about 500 feet apart to the right. The preferred dam for the 120,000 af capacity reservoir would use the prominent sandstone for the left abutment and the more upstream of the two ridges for the right abutment. This is the same alignment that was selected for the large dam described in the 1996 FSFES. With the smaller dam now proposed the right abutment of the planned embankment would not encounter the coal bearing formation that was a concern in the 1980 FES.

The valley floor at the dam site is covered with 40 to 90 feet of alluvial deposits over shale with lesser amounts of sandstone near the abutments. The alluvial material consists of sandy clay, clayey sand and lean clay with varying amounts of gravel. The water table reaches a maximum of about 45 feet below the ground surface upstream of the dam site and approaches ground surface near the downstream toe of the dam site.

Construction materials available are impervious clay in Borrow area A within the reservoir area, and pervious material including boulders, cobbles, gravel and sand in Borrow area B, a terrace two miles downstream. The proposed design for Ridges Basin dam would accommodate these formations and materials with a zoned earthfill dam containing a thick impervious core bordered by filters and drains and supported by sloping pervious shells upstream and downstream. The upstream and downstream slopes in the 90,000 af active zone would be 2:1 (horizontal to vertical) with a bench at the bottom level of active storage and below that level: 3:1 upstream and 2-1/2:1 downstream. The core would bear directly on the foundation rock and the compressible alluvium would be removed both upstream and downstream for placement of the shell of the dam. Foundation exposure for construction would require a soil-bentonite cutoff wall upstream of the upstream toe of the dam with dewatering wells. This is a different concept from that proposed for the larger dam described in the 1996 FSFES. The previous design employed a wick drain system and preloading to consolidate the upstream alluvial material rather than removing it. The current design involves a much smaller quantity of material and eliminates the two-stage construction delay of the prior design where foundation consolidation had to occur before embankment construction could proceed. Construction quantities include approximately 2.6 million cubic yards of foundation excavation and 5.6 million cubic yards of zoned fill.

A tunnel through the left abutment would serve as the reservoir outlet. The outlet works include an intake approach channel, intake structure, upstream pressurized tunnel, gate chamber with access adit, open channel flow downstream tunnel, and stilling basin and discharge channel. The main gates would have an emergency release capacity of 1500 cfs. Jet-flow valves would be provided to control releases up to 250 cfs, one for the planned releases to meet project water demands up to 130 cfs and another to meet releases associated with future uses of the Colorado Ute Tribes. The stilling basin would be adequate to contain flows discharged during annual testing of gate and valve operation. Flanges would be provided in the gate chamber for connection of future distribution pipelines. Outlet works would be designed to preclude entrance of live fish into Basin Creek and the Animas River.

Basin Creek falls about 420 feet along its 3.2 mile course from the dam to the Animas River. Planned water supply from Ridges Basin Reservoir range from 25 to 130 cfs and future releases for non-binding Colorado Ute water use development could amount to an additional 120 cfs. These releases would exceed the normal high flow in Basin Creek and an increase in silt transport to the Animas River is expected until equilibrium is achieved. Alternative means of control of silt transport investigated include the following:

Armor the channel with rock
Replace the streambed with a concrete lined channel
Install a number of check or vortex weirs
Release flows into a conduit laid along side of Basin Creek

Creating steps in the channel with a series of check and drop or vortex weirs was selected as the preferred means of control. It would produce an increase in silt transport initially but would stabilize with use. It would also create some wetlands. The steps would be placed about 150 feet apart throughout the 2.5 miles of creek bed that is incised into a clayey sand formation. The lower 0.7 miles of creek has frequent natural rock controls and would accept the additional flow without significant modification.

Access for construction activities would be from CR 211 and space for construction equipment and supplies would be located in the reservoir basin. Future access for operation and maintenance would connect with CR 213, La Posta Road, and proceed along the general alignment of existing private roads to Borrow Area B, then along the northerly canyon side up Basin Creek to the dam. A roadway across the downstream slope of the dam would provide access to the dam crest at the right (southwest) abutment.

Navajo Nation Municipal Pipeline

The Navajo Nation Municipal Pipeline would be constructed generally along the alignment of the existing system that conveys municipal water to several Navajo Nation chapters around Shiprock, New Mexico and Farmington, New Mexico. The pipeline would deliver 4,560 af (2,340 af of depletion) of M&I water from the ALP Project. The 4,560 af of water represents about one-half of the M&I requirements of the six Navajo Nation chapters located along the route of the pipeline. These chapters include: Shiprock, Cudei, Hogback, Nenahnezad, Upper Fruitland, San Juan, Sanostee, and Beclaibito.

The pipeline would be approximately 29 miles long. It would replace a majority of the existing ductile iron line and follow the same alignment except for some minor relocations to avoid wetlands and ease with the construction of the new line. The replacement pipeline would begin at the western boundary of the City of Farmington on the south side of San Juan River and terminate at the Cortex storage tanks in Shiprock. The diameter of the pipeline would be 42 inches at its beginning and decrease to 14 inches at its terminus in Shiprock.

The first reach is 69,400 feet long and has a diameter of 42 inches. The first reach has approximately 32 turnouts and it supplies water to the Upper Fruitland Chapter, parts of the San Juan Chapter, and potable water for the Navajo Agricultural Product Industries. The elevation where it begins in the City of Farmington is 5,230 feet.

The second reach begins north of Morgan Lake and ends at the eastern boundary of the Hogback Chapter. It is 22,800 feet long with a diameter of 20 inches. This reach has approximately nine turnouts and serves Nenahnezad and the area around Morgan Lake. The initial elevation of this reach is 5,360 feet. At the end of this reach, a 16-inch diameter concrete siphon conveys water from the south side to the north side of the San Juan River.

The third reach would be 26,400 with a diameter of 20 inches and the final reach of the pipeline is 32,800 feet long and has a diameter of 14 inches. These two reaches have approximately 21 turnouts and supplies water to the Bureau of Indian Affairs and the greater Shiprock community and outlying areas. The final reach ends at the Cortex Tank in Shiprock at an elevation of 5,120 feet.

Two existing siphons would need to be replaced or supplemented. One is located under the San Juan River near the west side of Farmington, New Mexico and the other is located near the Hogback Chapter on the San Juan River. An additional seven million gallons of storage in storage tanks would be required. Alternative pipeline routes are being considered in the supplemental EIS. If routes change, endangered plant surveys will be completed and results provided to the Service.

Electrical Transmission Lines

Western Area Power Administration would provide project electrical power. The electrical power would be carried over the existing 115-kV Tri State Generation and Transmission Association lines with a short 0.5 mile extension to the Durango Pumping Plant. A 0.6 mile portion of the 115-kV Tri State Generation and Transmission Association transmission line would be affected by the planned full reservoir water surface at 6,882 feet elevation. Six pole structures that would stand in water of up to 12 of depth at their present location would be relocated up the slope. Powerlines would be designed raptor-proof.

Fish and Wildlife Measures

Lands would be acquired, developed, and managed to replace wetland and wildlife habitat losses from the Project. Approximately 2,500-3,000 acres would be required and would provide potential habitat for several of the listed species.

Ridges Basin Reservoir Recreation Elements

The Preferred Alternative consists of two recreation-related elements within Ridges Basin. One element is the establishment and maintenance of a 30,000 af minimum pool in Ridges Basin Reservoir for the purpose of enabling the reservoir to support a fishery. The second element consists of the development of facilities that would make the reservoir and surrounding areas available for a broad range of recreational activities.

Minimum Pool Establishment

Under the Preferred Alternative, Ridges Basin Reservoir would have a total capacity of 120,000 af. Of this, 30,000 af would be maintained primarily as a minimum pool for a fishery and water quality purposes. Operational parameters would, however, allow for drawdown below this minimum pool during some dry years. This allowance results in reduced construction costs and capacity that would otherwise be necessary, and would likely have a minimal impact the fishery within the reservoir.

Recreational Facilities

It is anticipated that under Preferred Alternative, a third-party would develop expanded recreational facilities within Ridges Basin. Such development would be subject to coordination with and approval by Reclamation. The Ridges Basin Reservoir surface area under the Preferred Alternative envisions the following characteristics as a potential development scenario:

1,980 people at one time;
218,400 annual user days;
10 miles of hiking trails (same as in the 1996 FSFES)
196 camping units;
37 picnic units and one group site;
One, four-lane boat ramp and 26 boat slips;

These facilities could require approximately 128 acres (same as 1996 FSFES). Electrical and potable water supplies would also be developed as well as wastewater and solid waste disposal facilities and programs. The development of recreational facilities could also require either a realignment of County Road 211 or the construction of a new roadway that would connect County Road 211 with Wildcat Canyon Road (County Road 141). Facilities would be available for use during the summer season (including late spring and early fall) and would be closed to the public during winter months. Recreation facilities would be planned and designed to be compatible with fish and wildlife plans and resources in Ridges Basin.

Relocations

Utility Relocations

Four gas pipelines lie within the reservoir area. The three owned by Northwest Pipeline Corporation (Northwest) and Mid-American Pipeline Company (MAPCO) would have to be relocated to permit dam construction to proceed. A relocation route analyses was prepared and the preferred relocation corridor is south of Ridges Basin on portions of Southern Ute Tribal land. Reclamation is working with the Southern Ute Indian Tribe to identify and address their concerns. A fourth pipeline owned by Greeley Gas Company extends from a connection with the Northwest natural gas pipeline in Ridges Basin and extends to Durango along CR 211. A section of the Greeley line would require relocation to tie into the relocated Northwest pipeline.

County Road 211

Portions of the existing CR 211 would be inundated by the reservoir and would be relocated above the future high water level. Two routes have been investigated. Each route would begin at CR 211 on the west side of the crest of Bodo Draw and proceed west about 1.3 miles along the low hills north of the proposed reservoir and near the 115-kV Tri State Generation and Transmission Association transmission line. At that point one alternative would turn to the north, up a draw, then continue westerly on top of the ridge 1.8 miles to an intersection with Wildcat Canyon Road (State Highway 141) at the entrance to the Rafter J residential area. The other alternative would continue west, cross the electric transmission line and continue 1.2 miles on the uphill (north) side of the transmission line to junction with existing CR 211 west of the future high water level.

Construction Program

Project construction would span a period of five to five and one-half years. Beginning with final design engineering, the relocation of gas pipelines would start while the specifications and construction documents are being completed for the dam. At the dam site, excavation of the tunnel portals and tunnel construction would start once the gas lines are removed, about six to eight months from project start. While tunnel construction for the outlet works is underway, the cut-off wall and dewatering wells would be installed, the outlet works stilling basin and channel constructed with the objective of completing stream diversion into the tunnel within 18 months under the dam contract or about 24 to 26 months along the project schedule. The pumping plant and conduit work would begin with equipment delivery times on the order of 12 to 14 months anticipated. Foundation excavation at the dam would be programmed for 8 to 10 months and embankment construction for 20 to 30 months depending on whether double shifts are used. In addition, fish and wildlife measures would be implemented during the construction program.

Land Acquisition

Reclamation currently owns 4,638 acres of land in the Ridges Basin area. For project construction proposed acquisitions include about 800 acres to complete the reservoir land, about 830 acres for the borrow area and access, 46 acres for the pumping plant, and easements for increased flows in Basin Creek. In addition 2,500 – 3,000 acres would be acquired for fish and wildlife mitigation purposes.

Estimated Construction Cost

Estimated construction costs were based on construction quantities measured on preliminary design drawings and on unit prices selected from similar work. Major equipment items were priced based on manufacture quotations with experience-based allowances for installation. Unit prices based on earlier years have been updated to April 1999 using construction indexes of the Reclamation Construction Cost Trends weighted for earth dams, pumping plants and steel pipelines. The estimated construction cost for the dam and related features is $195 Million.

Operating Cost

Operating cost includes operating and maintenance personnel, equipment operating and repair cost and electrical power for pumping. Repairs and services include annual payments made to a fund for pumping and electrical equipment repair and dam maintenance expense that is beyond the capacity of the regular maintenance personnel. Operating costs for Ridges Basin are estimated at approximately 1.2 million dollars. There would be additional operating costs for recreation and fish and wildlife facilities.

Description of Non-Structural Component of the Alternative

This portion of the recommended plan would consist of the creation of a dedicated Water Acquisition Fund ($40 million) that could be used by the Colorado Ute Tribes to acquire water rights on a willing buyer/willing seller basis in an amount sufficient to allow the Tribes approximately 13,000 afy of depletion in addition to the depletion from the structural portion of the project. This water would most likely remain on the land; however, it may be used elsewhere under certain scenarios. To provide flexibility in the use of the fund, authorization would allow some or all of the funds to be redirected for on-farm development, water delivery infrastructure, and other economic development activities.

- Pine River Basin – purchase 2,300 acres of land and leave water in Pine River for downstream diversion M&I purposes.
- La Plata River Basin – purchase 2,300 acres of land and dry up all the water on the land and use water for M&I purposes.
- Animas/Florida River Basins - purchase 2,300 acres of land and leave all the water on the land for purposes of farming.
- Mancos River Basin - purchase 3,300 acres of land dry up all the purchased land and use water for M&I purposes.

Conveyance Options to Deliver M&I Water to Future End Uses

Possible conveyance corridor routes were identified to most efficiently link water sources to future water uses if waters acquired were not to stay on the land. For purposes of analysis, reservoirs or water tanks would be required to store M&I water through dry months. A storage reservoir to store Animas River water would be located at Ridges Basin, and existing municipal storage facilities at Shiprock, Farmington, and the other communities would be used where required. Pumping plants and water treatment plants were located along the conveyance corridor routes where needed.

A branching pipe system with a water treatment plant and a pumping plant would extend eastward from Ridges Basin Reservoir to serve locations in the Florida Mesa area and areas located adjacent to the Animas River below the town of Durango. The Florida Mesa Lateral and the Sunnyside Lateral would deliver water to these areas. These features are described below. This Biological Assessment evaluates hydrology changes related to these features; however terrestrial impacts would be the subject of future analysis and consultation.

Florida Mesa Lateral

The Florida Mesa Lateral is a pipeline that would begin at the Ridges Basin Dam and run to the east. It would cross the Animas River and then follow along the Highway 160 corridor for about 4 miles. It would then turn and follow a southeasterly direction to a potential residential development on the Southern Ute Indian Reservation. The length of the Florida Mesa Lateral would be approximately 9 miles.

A water treatment plant would be located along the pipeline in an area between Ridges Basin Reservoir and the Animas River at elevation 6745 feet. A pumping plant would be located at the outlet of the treatment plant because the treatment plant is about 250 feet lower than the terrain along the pipeline alignment in the vicinity of the community of Loma Linda.

Sunnyside Lateral

The Sunnyside Lateral is a pipeline that would begin at a turnout on the Florida Mesa Lateral on the west side of the Animas River. The Sunnyside Lateral would run south along the west side of the river for about 4 miles and then cross the Animas River and continue south on the east side of the Animas River. The length of the Sunnyside Lateral would be approximately 7 miles.

In addition to these two laterals, two other pipeline/conduit laterals are possible. One would deliver water from the Ridges Basin dam to the City of Durango, and the other would convey water from Ridges Basin down Basin Creek to the Animas River.

Durango M&I Pipeline Lateral

A flange would be provided in the outlet works at the Ridges Basin Dam to allow the City of Durango to receive project water directly from the reservoir into a new pipeline that the City may construct in the future. The pressurized pipeline would be approximately 20 inches in diameter and would be constructed of steel or plastic. The pipeline would be routed down the dam access/haul road toward Borrow Area B then turn east across Blue Mesa north of the runway of Animas airport. From this point it would follow the route of La Posta Road (CR 213) north to Durango to tie into the M&I water distribution system for the city. The Durango Pumping Plant where City pumps would lift it through a connection with the existing raw ater pipeline to the City terminal reservoir. Instead of following the La Posta Road north to Durango, an alternative route would be to the south to serve water users south of the Cty along the Animas River.

A water treatment plant would be located along the pipeline in an area between Ridges Basin Reservoir and the Animas River at elevation 6,745 feet near the Animas airport. A pumping plant would be located at the outlet of the treatment plant. The pipeline distance to the water treatment plant is approximately 3.0 miles. A pipeline from there north to the Durango Pumping Plant and the existing crossing of the Animas River would be four miles, while a pipeline south would be approximately five miles long.

Basin Creek Discharge Lateral

The primary method of discharge from Ridges Basin to the Animas River would be to release the water directly into Basin Creek which flows into the Animas. An alternate to discharging water to users directly from the Ridges Basin Dam into Basin Creek would be to construct a reinforced concrete or steel conduit of 42 inches diameter which would be placed approximately parallel with the creek and carry released flows to the river. Using the haul road route to Borrow Area B and private property on downstream, conduit installation would leave the streambed relatively undisturbed. The maximum discharge to water users would be about 130 cfs. The conduit would be approximately 3.0 miles long and include two crossings of Basin Creek and a stilling basin before entering the river.

Coal Mine/Power Plant Lateral

The Coal Mine/Power Plant Lateral is a pipeline which would begin on the south shore of Ridges Basin Reservoir, cross the saddle between Ridges Basin and the Red Mesa area, and continue in a southerly direction to a point north of the New Mexico border. This lateral would serve potential development based on coal resources of the Southern Ute Indian Reservation. The pipeline would have two pumping plants in Ridges Basin, one at the south side of the reservoir and one along the ascent to the saddle separating Ridges Basin from the Red Mesa area. The pipe elevation at the saddle would be about 7420 feet.

After crossing the saddle, the Coal Mine/Power Plant Lateral would continue in a south-southwesterly direction for approximately 13 miles, and end at a potential power plant site located about 3 miles north of the Colorado and New Mexico border and about 4 miles east of Highway 140. This site was selected because of its close proximity to coal reserves which would be used to fuel the power plant. Water would also be served to a potential coal mining development in the vicinity of the power plant. Most of this alignment would be along an existing road. Turnouts from the Coal Mine/Power Plant Lateral could supply water for future coal mining north of the initial mine development in the vicinity of the power plant.

Breen/La Plata Lateral

The Breen/La Plata Lateral would begin at a turnout on the Coal Mine/Power Plant Lateral, approximately 1.6 miles south of the saddle separating the Red Mesa area from Ridges Basin. The lateral would run southwestward through the Red Mesa area into New Mexico, ending at the town of La Plata. The lateral would served future housing needs in the La Plata area for the Southern Ute Tribe.

A water treatment plant would be located about 0.8 miles west of the turnout, at approximately elevation 7380. From the treatment plant, the drinking water pipeline would continue due west to Highway 140, meeting the highway in the vicinity of Breen. At the highway, the pipeline would turn to the south and then run along the highway through the Red Mesa area and across the Colorado and New Mexico state line. The pipeline would depart from Highway 140 for a couple of miles to run through the community of Marvel. The total length of the pipeline would be approximately 24.2 miles.

Alkali Gulch Lateral

The Alkali Gulch Lateral would begin at a turnout on the Breen/La Plata Lateral, near Breen, Colorado, and would run due west for approximately 6 miles. This pipeline would provide water along a corridor of scattered rural residential development. The Alkali Gulch Lateral alignment ends about six miles from the western boundary of the Southern Ute Indian Reservation.

The lateral would provide domestic water for a water distribution line in the northwest part of the reservation. In addition, a future potential need for the lateral would be to provide domestic water to the Lewis Mesa area of the Ute Mountain Ute Indian Reservation should the Ute Mountain Utes develop a visitor center in the Ute Mountain Ute Tribal Park.

Grass Canyon Lateral

The Grass Canyon Lateral would begin at a turnout on the Breen/La Plata Lateral and would run to the west into the Ute Mountain Ute Indian Reservation. The lateral would end along the Mancos River south of Mesa Verde National Park. Total length of the lateral would be approximately 32 miles.

The turnout to the Grass Canyon Lateral would be along Highway 140, west of Marvel, Colorado. From its beginning, the Grass Canyon Lateral would run due west for about 8 miles, mainly along an existing road alignment. The next eight miles the pipeline would follow a corridor in a southwesterly direction to the county line of La Plata and Montezuma counties, on an alignment governed by topography and existing unimproved roads.

After crossing into Montezuma County, the pipeline would continue westerly, into the Ute Mountain Ute Indian Reservation to provide water to a potential resort development along the north side of the Mancos River. In Montezuma County the pipeline would lie mainly along existing roads but also on undisturbed terrain. For most of its length it would run along Grass Canyon Road, which runs along an east to west oriented mesa paralleling the Colorado/New Mexico state line. The last 5 to 6 miles of the pipeline would continue west to the end of the mesa, drop off the mesa, cross the Mancos River, and continue downstream along an existing road to the potential resort area.

In addition to the delivery points cited above, the Grass Canyon Lateral could serve isolated rural residential development en route. The first half of the pipeline would run through rural areas in the Southern Ute Reservation. The second half of the pipeline would run through the Grass Canyon Road corridor of the Ute Mountain Ute Reservation.

Residential Branch of Grass Canyon Lateral

The Residential Branch would begin along the Grass Canyon Lateral at the boundary between the Southern Ute and Ute Mountain Ute Indian Reservations and run generally to the southeast. The Residential Branch would supply water to a potential Ute Mountain Ute residential development in the Barker Dome area, located 5 to 6 miles west of the La Plata River and approximately 2 miles north of the Colorado/New Mexico border. The Residential Branch would be about 2 miles in length. A booster pumping plant may be required along the Residential Branch.

Gas-Fired Power Plant Lateral

This lateral would begin on the north side of the San Juan River and run north to serve a potential gas fired power plant in the New Mexico portion of the Ute Mountain Indian Reservation. The potential power plant would lie approximately seven miles north of the San Juan River, at an elevation approximately 420 feet above the level of the river. This location was selected because of its location to gas reserves and it would be located on reservation boundaries. The pipeline would be approximately 8 miles long, and would skirt an existing coal mining development along the north side of the San Juan River. The river diversion would consist of a pumping plant along the San Juan River to lift the water to the elevation of the potential power plant. The diversion point would be about ten miles west of the Farmington Municipal Airport.

The San Juan River water carries a heavy sediment loading when heavy precipitation occurs in tributary drainage areas. The sediment load presents problems for river diversion systems, particularly pumping plants. Consequently, the facilities to provide water to the gas fired power plant would require either a pond at the power plant capable of storing several days' water supply, or a desilting pond at the diversion site along the San Juan River.

The water supply for the potential gas fired power plant would originate in the Animas River, and would flow to the diversion point in New Mexico through the Animas and San Juan rivers. Depending on runoff conditions and time of year, the water for the gas-fired power plant would be stored in Ridges Basin Reservoir for eventual release back to the Animas when required by the power plant.

San Juan and Animas Rivers Diversions

Operating within the depletion limits established by the Endangered Species Act (ESA), water could be left in the Animas and San Juan rivers or released from storage to serve the M&I needs of the ALPWCD service areas in Durango and the SJWC service areas in Aztec, Bloomfield, and Farmington, New Mexico. The lease or sale of M&I water to non-Indian users by the Ute Tribes could be served by the same means, as is the water from ALP Project which will serve the Navajo Nation Municipal Pipeline users. Water conveyed in either or both of these rivers would be diverted at the point of use, and stored in existing storage facilities (e.g., Farmington Reservoir, Shiprock Storage Tanks) or in storage facilities constructed for the purpose (e.g., Aztec Reservoir).

Non-Binding Future Water Use

Nearly 2,000 acres of land could be required for construction and operation of the various future water uses that have been identified for ALP project water by Indian and non-Indian water users. In addition there would be an undetermined amount of land involved in an expansion of the existing Southern Ute coal mine, and an unknown amount of acreage required for expansion of municipal water distribution systems . Acreage required for conveyance pipelines, pumping plants and water treatment plants are not included in this total. Non-binding water uses are speculative at this time and are not evaluated in this Biological Assessment with the exception of water depletions.

Conveyance Pipelines and Associated Facilities for Non-Binding Water Use

Convevance Pipelines

For analysis purposes, the water conveyed any distance from source to use would employ pressurized pipelines vs. open canals. Most conveyance pipelines would vary in size from 4 inches to 24 inches in diameter, and could either be steel or plastic, depending on the size and pressure requirements of the pipeline. (An exception would be the 48-inch Basin Creek discharge conduit of steel or concrete.). A standard 50 foot right-of-way width would be used for construction. Additional temporary work areas would be required at road and canal crossings. Following construction and restoration of the right-of-way and temporary work spaces, a 25 foot-wide permanent right-of-way would be dedicated to each conveyance pipeline. The remainder of the construction right-of-way would be restored to its previous use and condition.

Additional work space for spoil storage, staging, equipment movement, and material stockpiles would be required for construction at the following locations:

- Road and canal crossings,
- Side slopes,
- Stringing truck turnaround areas,
- Wetlands, and
- Any directionally drilled water bodies.

If all the non-binding options were developed, the related construction of conveyance pipelines would impact nearly 800 acres. In addition to land disturbed by construction along the pipeline rights-of-way, there would be additional acres disturbed by use of extra work space at road crossings and stream/canal crossings. The construction of four or more aboveground pumping stations which would affect about 20 acres of land during construction. An undetermined number of acres would also be disturbed by water treatment plant construction and temporary access roads.

Land dedicated as permanent right-of-way if all conveyance pipelines were constructed would be about 400 acres. An additional 10 acres would be required for the operation of the new pumping plants and an additional amount of acres for water treatment plants and the operation of permanent access roads. The permanent right-of-way would be maintained in a cleared, grassy condition or used for agricultural purposes, except as otherwise noted for wetlands, tree screens, etc.

Pumping Plants

Four pumping plants would be required one to pump water to the Florida Mesa, one to pump water from Ridges Basin Reservoir and another to pump water over the Red Mesa to points south and west. A fourth would be required to pump water to the gas power plant from the San Juan River. The typical pumping plant footprint would measure 15 x 35 feet, and would include a single story building to enclose the pump(s), an electrical power panel, and communications and gauging equipment. The entire facility is enclosed with a security fence, and a permanent access road is maintained to the facility. The land required for construction of the four pumping plants would total about 20 acres for construction and 10 acres for operation.

Water Treatment Plants

At least two water treatment plants would be required, one for treatment of Florida Mesa M&I water, and another for the M&I water used west of Ridges Basin. In addition, water used for M&I uses on the Animas and San Juan rivers would require treatment, but for the purposes of completing this analysis the existing municipal water treatment facilities would be used. The size of the typical water treatment plant would vary depending on capacity. The overall land requirements are expected to be less than 20 acres total.

HYDROLOGY

This section addresses potential impacts to hydrology that could result from actions associated with the Preferred Alternative. For analysis of impacts to hydrology, depletion of the full 57,100 afy described for the ALP Project is required.

The proposed Ridges Basin Pumping Plant is operated with a 280 cubic feet per second (cfs) capacity, limited to 240 cfs in June to avoid impacting endangered fish flow requirements in the San Juan River. Pumping is further limited to allow the following bypass flows in the Animas River at the pumping plant intake: October through November – 160 cfs; December through March - 125 cfs; and April through September - 225 cfs.

An underlying assumption in analysis of the impact to water resources and in project formulation was that there could be no adverse impact to existing water use in the San Juan River Basin.

The SJRBRIP flow recommendations (Holden 1999) were used as the basis for assessing the flow requirements for endangered fish in the San Juan River. Flow statistics based on the modeled period of 1929 - 1993 were compared to the flow requirements. Any violation of the recommended flows was considered significant. Operating criteria or project features were adjusted until the flow recommendations could be met.

The sections below discuss existing water resources/hydrology in the areas potentially affected by the Preferred Alternative. The depletions that are included in the baseline are those that are presently occurring, those that could occur without further federal action, and those that have undergone ESA Section 7 consultation, with the exception of the 57,100 afy depletion assigned to the ALP Project in the 1996 Biological Opinion. The period of analysis is water year 1929 through 1993.

San Juan River

The San Juan River is the largest of the project area rivers and collects inflow from all three rivers and other tributaries. Mean annual runoff in the river at Farmington just downstream of the confluence with the Animas River is about 1.13 million af. Near Bluff, Utah, mean annual discharge increases to about 1.25 million af. The increase is accounted for by tributary inflow below Farmington and irrigation return flow from the NIIP. As with the other rivers, flow peaks in the springtime and remains low from summer to fall, punctuated by short duration peaks resulting from storm events. The river is regulated by Navajo Reservoir and has substantial irrigation water use along both it and its tributaries. Navajo Reservoir has tended to reduce peak spring flows and to supplement flows in other seasons since its operation began in 1962. Proposed operation of Navajo Dam to mimic a natural hydrograph as specified in the SJRBRIP Flow Recommendation Report (Holden 1999) will result in flow patterns similar to those prior to 1962. Impact to flows are considered against the projected modified flow regime recommended by the SJRBRIP.

Navajo Reservoir

Navajo Reservoir has a maximum content of 1,701,300 af at the spillway crest (elevation 6,085 feet) with a surface area of 6,085 acres. The minimum content, controlled by the outlet works elevation to the NIIP is 625,675 af at elevation 5,985 feet in winter and 661,800 af at elevation 5,990 ft during the irrigation season.

Hydrology Impact

The project effect on the San Juan River varies somewhat between the confluence with the Animas River and Four Corners, New Mexico as return flow enters the system. The greatest impact, 80,700 afy, occurs between the confluence with the Animas and La Plata rivers. This is a short reach of river, the minimum flow requirements for endangered fish are met, and the percent impact (about 2 percent of total flow) is small. The Four Corners gage has been the typical location for analyzing flows for endangered fish. Therefore, all impacts are analyzed at Four Corners, New Mexico.

Table 4 summarizes the mean, maximum and minimum monthly average flows of the San Juan River at Four Corners, New Mexico, with- and without-project. The historic mean, maximum and minimum monthly average flows are plotted against the projected flow regime that will result from Project needs (Figures 1-3). In the driest winter months, the flows are the same for with and without Project conditions since Navajo Dam is operated to maintain a minimum flow at this location. The impacts in the other months are small.

Table 4. Mean monthly flows for the San Juan River at Four Corners, NM (U.S.G.S. Gage) with the Preferred Alternative, without (Baseline Condition), and the percent difference for the Modeled Period 1929-1993

Month	Baseline (Without Project) Mean Monthly Flow - cfs			With Preferred Alternative *Mean Monthly Flow - cfs*			Percent Change In Flow With *The Preferred Alternative*		
	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum
October	948	6,421	536	901	6,272	536	-5.0	-2.3	0.0
November	756	3,147	542	720	3,085	542	-4.8	-2.0	0.0
December	693	1,852	542	679	1,834	542	-2.0	-1.0	0.0
January	653	1,085	542	647	1,041	542	-0.9	-4.1	0.0
February	796	2,001	542	787	2,012	542	-1.1	0.5	0.0
March	1,333	6,053	541	1,221	5,918	541	-8.4	-2.2	0.0
April	2,432	7,401	531	2,280	7,332	531	-6.3	-0.9	0.0
May	4,593	12,261	852	4,355	12,048	772	-5.2	-1.7	-9.4
June	5,113	10,113	952	4,954	9,952	829	-3.1	-1.6	-12.9
July	1,512	5,017	643	1,409	4,869	625	-6.8	-2.9	-2.8
August	1,031	4,341	569	999	4,189	569	-3.1	-3.5	0.0
September	901	3,626	538	877	3,489	538	-2.7	-3.8	0.0
Average	1,730	5,277	611	1,652	5,170	592	-4.5	-2.0	-3.1
Minimum	653	1,085	531	647	1,041	531	-0.9	-4.1	0.0
Maximum	5,113	12,261	952	4,954	12,048	829	-3.1	-1.7	-12.9

Figure 1. Mean monthly flows (1929-1993) for the San Juan River at Four Corners, NM (U.S.G.S. Gage) with the Preferred Alternative and without (Baseline Condition).

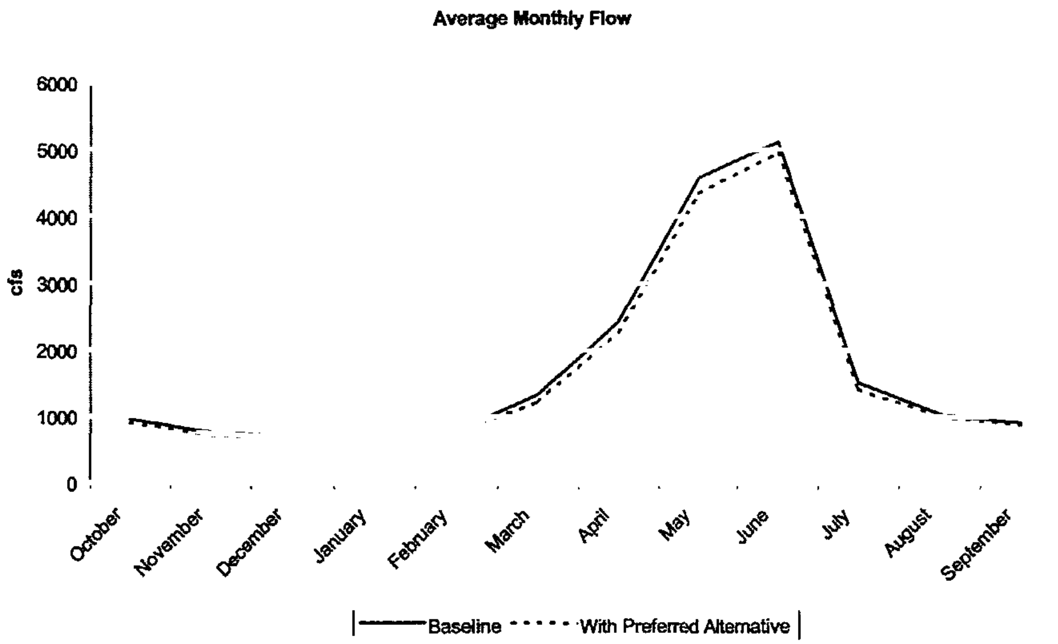


Figure 2. Average maximum monthly flows (1929-1993) for the San Juan River at Four Corners, NM (U.S.G.S. Gage) with the Preferred Alternative and without (Baseline Condition).

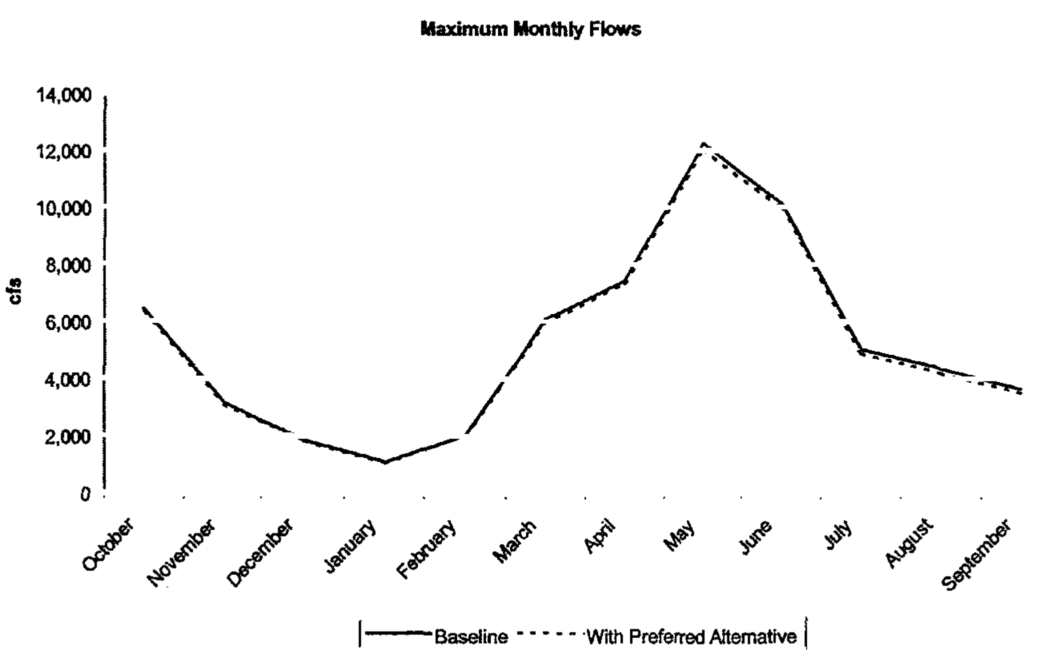
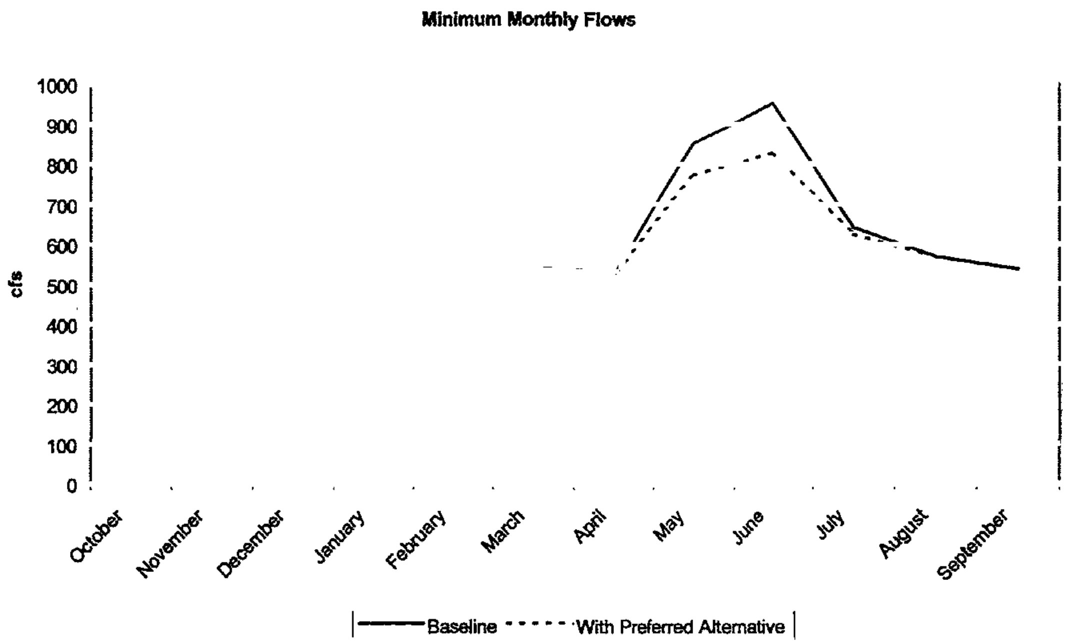


Figure 3. Average minimum monthly flows (1929-1993) for the San Juan River at Four Corners, NM (U.S.G.S. Gage) with the Preferred Alternative and without (Baseline Condition).



SPECIES ACCOUNTS

COLORADO PIKEMINNOW (*Ptychocheilus lucius*, Girard, 1856)

The Colorado pikeminnow is the largest of the four existing species of *Ptychocheilus* and is endemic to the Colorado River Basin. It is also the largest member of the minnow family (family Cyprinidae) native to North America with maximum weights that may have exceeded 80 lbs. This large predaceous minnow has a complex life history which has allowed it to exploit a volatile environment and survive to the present. The species is a generalist adapted to large seasonal flow variations, high silt loads, turbulence, low food bases and changing riverine subsystems (Smith 1981, Tyus 1986).

Once common throughout the Colorado River Basin, Colorado pikeminnow have declined from historic levels and are now found primarily in the Upper Basin of the Colorado River. Factors that have been implicated in the decline of the species include; alteration of natural stream flows and temperature regimes, loss of habitat and habitat fragmentation as a result of water development in the Colorado River Basin, and the introduction of nonnative fish species which altered the ecology of the environment in which Colorado pikeminnow evolved. Additionally, the poisoning of areas below newly created reservoirs in the 1960's to create more favorable conditions for game fish species may have hastened the decline of the species in some locations.

Historic Distribution and Abundance

Colorado River Basin

The Colorado pikeminnow (formerly Colorado squawfish) originally occurred throughout the Colorado River Basin. In the Lower Basin, the species was recorded in the Colorado River mainstem from the Gulf of California in Baja California del Norte to Lee's Ferry in Arizona. The species has also been recorded from most of the major tributaries to the Colorado River in the Lower Basin and the Salton Sea (Maddux et al. 1993). In the Upper Basin Colorado pikeminnow occurred in the mainstem from Lee's Ferry upstream to above Rifle on the Colorado River and at least to the town of Green River, Wyoming on the Green River. The species was common in the mainstem Green and Colorado Rivers. It also occurred in all the major tributaries to the Green and Colorado Rivers (including the San Juan River), and probably occurred in numerous smaller streams. Maddux et al. (1993) provides a more detailed list of the known distribution of Colorado pikeminnow in the Upper Basin.

San Juan River

In the San Juan River Basin the historic distribution of the Colorado pikeminnow included the entire mainstem of the San Juan River up to at least Rosa, New Mexico. This is approximately 25 miles upstream from present day Navajo Dam. In addition, this species may have ranged up the Animas River to approximately Durango, Colorado. Historic seasonal use of smaller tributaries in the subbasin is also probable.

Historic collections, which for the purposes of this Biological Assessment are defined as prior to the filling of Navajo Reservoir, have been sporadic. Cope and Yarrow (1875) were the first to report on fish from the San Juan River Drainage. Roundtail chub were reported by Lt. R. Birnie in 1874, but no reports were made of other species including Colorado pikeminnow. Jordan (1891) reported anecdotal accounts of Colorado pikeminnow, razorback sucker and flannelmouth sucker ascending the Animas River up to Durango during the spring. Jordan, however, did not collect any specimens. The first substantiated record of Colorado pikeminnow from the San Juan River drainage is three juveniles taken near Alcove Canyon, Utah, located approximately 7 miles upstream of Neskahai Wash, on July 4, 1936 (Platania 1990). Historic collections have included three juveniles collected in Utah in 1936, one juvenile collected in New Mexico prior to 1941, one adult collected in Colorado in 1955, two collected near Rosa, New Mexico in 1959, three young fish collected in Utah in 1960, eight collected during pre-impoundment surveys for Navajo Reservoir in 1962 (Platania 1990).

Current Distribution and Abundance

Colorado River Basin

Native populations of the Colorado pikeminnow are now restricted to the Upper Basin of the Colorado River. The species occurs in the Green, Yampa, White, Gunnison, Duchesne and San Juan River Basins. For a more complete description of the current distribution of Colorado pikeminnow in the Green and Colorado sub-basins see Maddux et al. (1993).

The greatest concentrations of Colorado pikeminnow are found in the Green River Basin. Tyus (1991a) suggested that the Green River sub-basin supported about an order of magnitude more Colorado pikeminnow than the Colorado River sub-basin. No comparisons have been made with the San Juan River sub-basin but preliminary catch effort data from recent studies suggest that populations in the San Juan River are less abundant than populations in either the Green or Colorado River.

San Juan River

A small population of Colorado pikeminnow has persisted in the San Juan River since the closure of Navajo Dam in 1962. Preliminary information available from research studies recently completed or currently in progress as part of the San Juan Recovery Implementation Program (SJRIP) indicates that the Colorado pikeminnow is reproducing and recruiting in the river to at least a limited degree. The range occupied by the species in the San Juan River has apparently shrunk since the closure of Navajo Dam and no verified collections of the species have occurred upstream of Shiprock in recent years. Recent collections, however, have not indicated a continuing range contraction. The current range of the Colorado pikeminnow in the San Juan River appears to be from Hogback Diversion (RM 158.6), downstream to Lake Powell. This estimate of current range is based on numerous fish collections made since 1987, recent radio telemetry studies, and credible sightings by qualified biologists and presence of potential instream barriers.

Due to the low numbers of Colorado pikeminnow collected it has not been possible to accurately quantify population size or trends for Colorado pikeminnow in the San Juan River. The largest concentration of adult fish is found in a 23 mile segment of river between Cudei Diversion (RM 142) and Four Corners (RM 119) (Ryden 1999). The greatest concentrations of wild YOY and juvenile Colorado pikeminnow are present in the river downstream of Mexican Hat (RM 52) and in the San Juan Arm of Lake Powell (Platania 1990, Lashmett 1994).

Collections between 1962 and 1986

Since the closure of Navajo Dam on June 27, 1962, collections of Colorado pikeminnow and other native fishes in the San Juan River can be conveniently grouped into the period between 1962 and 1986 and collections made after 1987. Between 1962 and 1986 monitoring for native fishes was relatively infrequent. There were, however, several biological surveys of San Juan River drainage, most occurred in Colorado or New Mexico. The most comprehensive surveys of the mainstem river downstream of Navajo Dam during this period were conducted by Sublette (1977) and VTN Consolidated Inc. and Museum of Northern Arizona (1978). Sublette (1977) sampled the river at 34 stations from Pagosa Springs, Colorado to Mexican Hat, Utah. He did not collect any Colorado pikeminnow but noted that his collections did not preclude their occurrence in the study area. VTN Consolidated Inc., and the Museum of Northern Arizona (1978) made 18 collections between Navajo Dam and Clay Hills Crossing, Utah and collected 1 juvenile pikeminnow near Aneth, Utah.

Platania (1990) summarized and verified all known collections of Colorado pikeminnow for the San Juan River between 1962 and 1986, including the collection by VTN Consolidated Inc. and the Museum of Northern Arizona (1979). A total of four Colorado pikeminnow, three of which were verified by Platania (1990) were collected during the period.

Collections After 1987

Beginning in 1987 the intensity of research on rare fish in the San Juan River increased considerably. In 1987 Reclamation funded a 3 year study to document the occurrence and distribution of rare Colorado River fishes and the habitat for the rare fish in the San Juan River. The results of that study were reported by Platania (1990). In addition, a research and monitoring program was initiated in 1991 under the auspices of the Seven Year Research Plan and SJRIP. This research was mandated as part of the Reasonable and Prudent Alternative for the 1991 Biological Opinion for the ALP.

Platania collected a total of 27 Colorado pikeminnow, including 8 adults and 19 Young-of-year (YOY) between 1987 and 1989. Adults were primarily collected upstream of RM 89, with the exception of one adult captured in April 1987 in the San Juan Arm of Lake Powell (RM -0.5) which was recaptured in September of the same year at RM 87. Seventeen YOY and juvenile fish were collected downstream of RM 100. Two young fish were collected at RM 125 and 121. In addition, one unverified young-of-year Colorado pikeminnow was reportedly collected by the Utah Division of Wildlife Resources near Bluff in 1990 (USFWS 1991).

Results of Seven Year Research Program

The Seven Year Research Program was designed to study the limiting factors for endangered fishes in the San Juan River. This program was one element of the 1991 BO. That research included surveys to determine species composition for adult and younger life stages, radio telemetry to determine movement and habitat use by endangered fish, and experimental stocking of endangered fish to determine habitat use, and response to the experimental flow regimes. The research also included detailed geomorphic characterization and habitat quantification at a wide range of flow regimes. Detailed results of the Seven Year Research Program are presented in the San Juan River Flow Recommendation Report (Holden 1999) and the individual final reports for each research component. The latter are in draft form and will be finalized in late 1999.

Since 1991 a number of Colorado pikeminnow have been collected in the San Juan River as part of the San Juan River Seven Year Research Plan and SJRIP. Nineteen (17 adult and 2 juvenile) wild Colorado pikeminnow were collected between 1991 and 1995 by electrofishing (Ryden 1999). Ryden (1999) estimated a population of 19 pikeminnow for river miles 119.2 to 136.6 for this time period.

Preliminary information from radio telemetry studies of adult Colorado pikeminnow (Ryden 1999) indicate that adult Colorado pikeminnow are most abundant between Cudei and Four Corners. Fish captured and radio tagged within the reach tend to stay in that section of river. Local movements of fish, however, have occurred and there is evidence that the range of the species extends up to the Hogback Diversion at RM 158.6. Miller and Ptacek (1999) reported that one radio tagged fish moved above Cudei Diversion in July 1994, and two probable sightings have also occurred between Shiprock (RM 148) and Hogback Diversion (RM 158.6) during research sampling (Ryden and Pfeifer 1995).

Fifty adult Colorado pikeminnow were stocked in the San Juan River in October, 1997. These fish were released in the San Juan River near the confluence with the Animas River. Fifteen of these fish were implanted with radio transmitters prior to release and monitored for habitat use until late summer 1998.

Sampling efforts for young fish conducted as part of the SJRIP have included larval drift collections at Mexican Hat (RM 52), near Four Corners (RM 119) and the "Mixer" (RM 129) as well as intensive seining collections encompassing the river from Hogback (RM 159) to the San Juan Arm of Lake Powell (<RM 0). Since 1991 wild YOY Colorado pikeminnow have only been collected from the lowermost river reaches in or near the high water zone of Lake Powell. Larval Colorado pikeminnow have been collected from the Mexican Hat and Mixer drift sites.

Experimental stocking of young Colorado pikeminnow was initiated in 1996. These fish were monitored for retention in the system and habitat use after stocking. A larger percentage of the fish stocked remained in the upper portion of the river than in the lower river (UDWR 1999). The fish were found in low velocity habitats until they reached a size large enough to move to alternate habitats in the main channel of the river. These larger fish (approximately 125mm –

300mm) are beginning to show up in the ongoing riverwide monitoring and population estimate investigations (D. Ryden personal communication, D. Rees personal communication).

The San Juan River Flow Recommendations developed by the SJRIP Biology Committee were designed to benefit the endangered fishes and the native fish community on which they depend. The flow recommendations include flow magnitude, duration and frequency. The recommendations used historic hydrology and the research results as the basis for the flow levels. The flow recommendations mimic the shape of a natural hydrograph with a peak in late May or early June followed by a descending limb to base flow in late July or early August. The flow regime was designed to provide the channel forming and channel maintenance requirements of the San Juan River. These components are necessary to maintain the complex habitat required by the endangered fishes. The flow regimes includes the channel maintenance needed to clean the cobble and gravel areas used for spawning and to provide the low velocity habitat for larval and young of the year fish.

Life History/Habitat Requisites

The Colorado pikeminnow has a complex life cycle. The species is a generalist adapted to seasonally variable flows, high silt loads and turbulence, low food bases and changing riverine subsystems (Tyus 1991a). The species has survived to recent times by incorporating various life history strategies to deal with climates varying from pluvial to arid and has adapted to utilize virtually every habitat available. It has been hypothesized that migrations reported for the Colorado pikeminnow represent a perfect life history strategy for the survival of a large predaceous fish in the historic Colorado River environment (Smith 1981, Tyus 1986, 1990).

Adult and Juvenile

Adult Colorado pikeminnow are a large river fish and utilize a variety of habitats including runs, eddies, backwaters, tributary mouths, riffles and other habitats depending on season, streamflow, water temperature, activity and availability (Holden and Wick 1982, Tyus 1990, Maddux et al. 1993). Tyus (1991a) reported that adults tend to stay within specific river reaches when not engaged in spawning related activities and utilize various habitats over a 5 km (3 mile) or longer reach on a day to day basis.

During peak runoff periods Colorado pikeminnow typically move into low velocity habitats such as backwater areas, and flooded bottomlands (Wick et al. 1983). These areas are considered important for general health and reproductive conditioning of the fish (Tyus 1990). Valdez and Masslich (1989) reported that fish in the Green River occupied primarily slow runs, slackwater, eddies, and backwaters during the winter. Wick and Hawkins (1989) reported that during winter fish on the Yampa River, an unregulated tributary to the Green, utilized backwaters, runs and eddies but were most common in shallow ice covered shorelines.

In the San Juan River preliminary results of radio telemetry studies of habitat use show results similar to those reported in the literature. Miller (1994) and Miller and Ptacek (1999) reported that during the peak discharge (prespawning) period in 1993 habitat types utilized included eddies, slow side channels and shorelines, and the Mancos River confluence. He also noted that water temperature in those habitats was noticeably warmer than the main channel during late June and early July. Results from habitat use studies conducted throughout the year indicated that adult fish are most commonly found in runs, the most common habitat in the river (Ryden and Pfeifer 1994b, Miller 1994, Bliesner and Lamarra 1994). However, results from habitat use studies by Miller and Ptacek (1999) also show a high degree of selectivity for eddy and slackwater habitats. These two habitat types combined make up less than 1 percent of the available habitat in the areas where fish were contacted.

Reproduction and Spawning

Most of the data and observations about Colorado pikeminnow reproduction are known from the Green and Yampa Rivers, except for some recent observations from the San Juan River. Tyus (1990) tracked 57 Colorado pikeminnow with radio telemetry to two spawning areas, located in the Green and Yampa Rivers where he captured an additional 208 fish between 1980 and 1988. Numerous captures of ripe fish and radio telemetry results suggested that spawning occurred in relatively small river reaches that were less than 19 km (12 miles) in length. Habitats in these reaches included large, deep pools, eddies, submerged bars of cobble, gravel, boulder, and sand substrates associated with the main channel. Substrate differed between the two locations. In the Yampa River, substrates were dominated by overlapping cobbles intermingled with gravel and sand. Substrates in the Green River were boulders, sand and silt. Indirect observations of suspected spawning fish using radio telemetry indicated that fish rested or staged in pools or eddies [average depth 1.8 m (6 ft.); average velocity 0.30 m/sec (1.0 ft/sec)] for hours or days and moved abruptly to nearby cobble or boulder bars [average depth 0.9 m (3.0 ft); average velocity 0.58 m/sec (1.9 ft/sec)]. Fish remained in the faster water habitats for 30 minutes to 3 hours and presumably spawned before returning to their staging habitats.

In general, two components appear necessary for adult Colorado pikeminnow spawning habitat. A resting or staging area with large pools, eddies, or other low velocity habitat, where fish find suitable resting and feeding areas between spawning events or where males can come into contact with females, and a deposition-fertilization habitat in riffles and shallow runs were fish actually congregate and spawn (Tyus 1991a).

Maddux et al. (1993) reviewed timing of Colorado pikeminnow spawning in the Green and Yampa Rivers and reported that it occurred after the peak runoff season, from June to mid August. Spawning began when temperatures reached 17.8° to 25°C (64° to 77°F) and peak spawning activity occurred between 22° to 25°C (72° to 77°F).

Two locations in the San Juan River have been identified as potential spawning areas based on radio telemetry and visual observations (Ryden and Pfeifer 1994b; Miller and Ptacek 1999). Both locations occur within the "Mixer" (RM 133 to 129.8), a geomorphically dynamic reach of the San Juan River. The upper spawning location was located at RM 132. The lower spawning location was located at approximately RM 131.1. Both locations consisted of complex habitat associated with cobble bar and island complexes. Habitat at these locations was similar to spawning habitats described for the Yampa River and was composed of side channels, chutes, riffles, slow runs, backwaters and slackwater areas near bars and islands. Substrate in the riffle areas was clean cobbles. Specific spawning habitat at the lower spawning area, based on radio telemetry and visual observations, was a fast narrow chute with a small adjacent eddy. Primary cobble was 3 to 4 inches in diameter (Miller and Ptacek 1999).

During 1993 radio tagged Colorado pikeminnow were observed moving to suspected spawning locations in the "Mixer" beginning around July 1. Fish were on suspected spawning areas between approximately July 12 to July 25. During this period flows in the San Juan River were on the descending limb of the spring runoff. Between July 1 and July 12 flow decreased from 123 m^3/s (4,340 ft^3/s) to 59m^3/s (2080 ft^3/s) and had dropped to roughly 25 m^3/s (900 ft^3/s) by July 25. Temperatures increased from approximately 20° to 25°C (68° to 77°F) during the same time period. Observations for other years show a similar pattern. However, specific spawning times and duration of the spawning period appear to vary.

Nursery and Rearing

Colorado pikeminnow larvae hatch in 3.5 to 6.0 days at 20° to 22°C (Hamman 1981). Larvae emerge from the substrate soon after hatching and move or are transported downstream to low velocity river reaches where they occupy biologically productive habitats. These habitats usually consist of warm, shallow, shoreline embayments and backwaters formed in the late summer by receding flows (Tyus and Haines 1991). Young-of-year, juvenile and subadult fish have also been collected from backwater areas over silt and sand bottoms. Unlike razorback sucker larvae they do not occupy flooded shoreline habitats since they are hatched on the descending limb of the hydrograph and flooded habitats are generally unavailable to the lifestage.

In the San Juan River young-of-year Colorado pikeminnow have been collected from backwaters while larval fish have been found in the mainstream drift. Young-of-year captures have been below RM 12 in the lowermost reaches of the river and within the full pool elevation of Lake Powell. Platania (1990) also collected young-of-year from backwaters in the lower San Juan but captured eight fish higher in the system between approximately RM 85 and RM 126.

Studies of nursery habitat use during the Seven Year Research program showed that young Colorado pikeminnow, both wild and stocked, used low velocity habitats during the first season of life (UDWR 1999). Most of the collections of wild fish have been from the lower San Juan downstream of Mexican Hat.

Movement/Migration

Adult. Adult Colorado pikeminnow are known to exhibit seasonal movement patterns of varying magnitude, especially during spring migrations that indicate a fidelity for certain spawning sites. Distance involved in spawning migrations can vary substantially between individual fish and among river systems. In the Green River Basin upstream and downstream migrations to spawning areas of up to 370 km (230 miles), one way, have been reported (Tyus 1990, Maddux et al. 1993, Irving and Modde 1994). Adults in the Green River Basin apparently have a fidelity for a particular spawning area. Recapture and movement studies have shown particular Colorado pikeminnow on the same spawning area over multiple years and there are no records showing exchange of fish between different years (Wick et al. 1983, Tyus 1990, Tyus and Karp 1989). Migrating adults in the Green River often pass through many kilometers of apparently suitable spawning habitat to reach a particular spawning site. An olfactory homing mechanism was proposed to account for this behavior (Tyus 1985, 1990).

Not all populations of Colorado pikeminnow undertake dramatic long distance migrations. Radiotelemetry studies of adult Colorado pikeminnow in the Grand Valley region of the Colorado River (reviewed by Maddux et al. 1993) found that movement during April through October was limited to 40 to 48 km (25-30 miles). McAda and Kaeding (1991) suggested that the limited seasonal movement of Colorado pikeminnow was due to the wide distribution of spawning habitats in the Grand Valley area and that the seasonal movements of adults to spawning areas was relatively short. Fidelity of fish for a particular spawning area in the reach was unknown.

After spawning, adult fish will typically return to resident or home ranges that they occupied previously (Tyus 1991a, Irving and Modde 1994). Overwinter movements within these locations are usually small with the majority of fish remaining in a 2 to 3 mile stretch of river (Valdez and Masslich 1989).

In the San Juan River Colorado pikeminnow appear to exhibit primarily short range spawning migrations, however occasional long range seasonal spawning movements have also been documented. Ryden and Pfeifer (1994b) investigated year round movements of 11 radio tagged Colorado pikeminnow between 1991 and 1993 and found limited seasonal migrations to spawning areas in the "Mixer". Seasonal movement patterns noted by Ryden and Pfeifer (1994b) included a tendency for adult fish to stage in or near the Mancos River (RM 122.6) before migrating to spawning areas located at RM 131.1 and 132 in the "Mixer". Seasonal migrations of Colorado pikeminnow to spawning locations were generally less than 24 km (15 miles).

The majority of fish that were studied between 1991 and 1994 remained in the reach of the San Juan River between Cudei Diversion (RM 142) and immediately below Four Corners (RM 117) (Ryden and Pfeifer 1994b; Miller and Ptacek 1999). Occasional movements upstream and downstream of this area were documented for certain individuals. Mean maximum displacement, and mean final displacement of fish in the San Juan were very close to that reported for Colorado pikeminnow in the "15-Mile Reach" of the Colorado River, but lower than other reaches of the Colorado, Green and Yampa Rivers (Ryden and Pfeifer 1994b).

Longer seasonal migrations in the San Juan have also been noted, though the data is limited. Platania (1990) documented the movement of a tagged, adult Colorado pikeminnow from the San Juan Arm of Lake Powell (RM -0.5) in April, 1987 to RM 87 near Bluff by August 7 of the same year. This fish demonstrated a 141 km (87.5 mile) movement that was presumably related to spawning. In addition, the single Colorado pikeminnow that was caught and radio implanted outside of the Cudei to Four Corners reach made an apparent spawning migration from near Bluff to the "Mixer". The fish was originally implanted in October 1993 near Bluff, Utah at RM 73.7. It overwintered in the Bluff area but moved upstream to a suspected spawning location near RM 131 during late June and July, 1994 (Miller and Ptacek 1999). It subsequently returned to RM 78.9 in the Bluff area by September, 1994. Total distance of the movement, one way, was approximately 93 km (58 miles).

Most available information suggests that wild Colorado pikeminnow in the San Juan River apparently exhibit a spawning fidelity for the "Mixer" reach (RM 133 - 129.8) (Miller and Ptacek 1999). Two of five fish, one male and one female, tracked during multiple years used the "Mixer for two consecutive seasons. In addition, all suspected spawning migrations of radio tagged Colorado pikeminnow have terminated in or near that area.

Young. Larval drift is an important part of the Colorado pikeminnow lifecycle (Tyus and Haines 1991), and unpublished laboratory studies indicate that drift of the larval stage may be active rather than passive (Tyus 1991b). In the Green River Basin larval Colorado pikeminnow emerge from spawning substrates and enter the drift soon after hatching (reviewed by Tyus 1991b). Fish are actively or passively transported downstream for approximately six days and may travel average distances of up to 160 km (100 miles) to reach low velocity nursery areas (Tyus and Haines 1991).

In the San Juan River, larval drift occurs as evidenced by their capture in larval drift nets in the mainstem near Mexican Hat and the presence of post-larval fish only in downstream reaches. During the 1991 to 1993 period, assuming that most larval fish were spawned in the "Mixer" many of the larvae would have drifted a distance of around 190 km (120 miles) before being caught in the lower San Juan River.

Tyus (1991b) also found that young Colorado pikeminnow in the Green River Basin were highly mobile, utilizing several habitats in a 24-hour period. They exhibited a diel pattern of backwater use that was positively related to backwater temperature. Most of young fish he captured occupied backwater habitat where water temperatures equaled or exceeded main channel temperatures.

Juveniles. Little is known about the movement of juvenile Colorado pikeminnow (Age 1 to Age 5). Fish are highly mobile at this life-stage and infrequently caught. Population data reviewed by Tyus (1991a) indicated that in the Green River Basin juvenile fish move upstream as they mature. Such movement likely occurs during the late juvenile or early adult stage.

Juvenile fish collected from the San Juan River are generally found along shoreline areas or secondary channel habitats.

Diet

The diet of young Colorado pikeminnow consists primarily of zooplankton and insect larvae (USFWS 1990). The species becomes piscivorous at a very early age with predation on other fish documented at sizes as small as 30 mm (Tyus and Karp 1991). The majority of the diet of juveniles is fish, with the major prey item being red shiner. Adults are almost exclusively piscivorous, feeding on most native and nonnative fish in the river. However, historical and more recent accounts also indicate that adults feed on a variety of items including swallows, rabbits, grubs, and mormon crickets (Tyus and Minckley 1988, Quartarone 1993).

Biotic Interactions

Native Species Interactions. The Colorado pikeminnow evolved as a top predator in the Colorado River system, and it likely preyed on various life stages of all the native fishes in that system (Vanicek and Kramer 1969, Minckley 1973, Joseph et al. 1977, Bestgen 1990). Younger lifestages of Colorado pikeminnow may have been preyed on by roundtail chub and bonytail chub, however these species are primarily omnivorous and only occasionally consume fish (Vanicek and Kramer 1969, Minckley 1973). A potentially greater source of predation on young fish would have been cannibalism by larger members of the species. However, through drift of young to downstream nursery areas and concentration of adults in upstream areas this interaction may have been minimized.

Relatively little competition would have existed between the Colorado pikeminnow and other native fishes, except possibly during very early lifestages before the species becomes piscivorous. In general, population dynamics of the species would likely have been controlled by availability of crucial habitats and prey abundance.

Nonnative Species Interactions. Introduced fish may have subjected Colorado pikeminnow to biological interactions for which they were poorly adapted due to their previous isolation (USFWS 1990). Sixteen species of fish originally inhabited the Colorado River Basin. Fifty five species of fish now occur in the basin of which 13 are native (Tyus et al. 1982). Moyle et al. (1986) noted that the west in general has seen wholesale replacement of its native fish communities, primarily by eastern species. Habitats which he identified as conducive to the establishment of nonnative species included reservoirs, other non-flowing waters, coldwater lakes, coldwater streams, desert streams, isolated habitats and large rivers. The massive introductions that have occurred are believed to have affected the native fish of the Colorado River, including the Colorado pikeminnow (Minckley et al. 1991, Hawkins and Nesler 1991). Because Colorado River fishes evolved with relatively few natural predators they probably lack predator avoidance or defense traits (Meffe 1985). In addition, many introduced predators are small enough to infiltrate shallow backwater habitats that historically provided refuge for young fish from larger native piscivores (Meffe et al. 1983). Colorado pikeminnow may be experiencing increased mortality and reduced recruitment through increased predation by nonnative species on early lifestages, increased competition with nonnative species, and other nonnative species interactions.

Predation by red shiners, though not documented on Colorado pikeminnow larvae, has been noted for other fish larvae in the Yampa River (Rupert et al. 1993). Tyus and Karp (1991) also reported that walleye (*Stizostedion vitreum*) was a predaceous species in the upper basin which could negatively affect Colorado pikeminnow. In the San Juan River there have been no documented cases of predation of nonnative fish on Colorado pikeminnow, however, the probability of documenting such an incident would be extremely low due to the low numbers of Colorado pikeminnow in the river. Predation by channel catfish and other species, primarily centrarchids on native fish, has been documented (Brooks et al. 1999).

Another predation interaction with nonnative fish that may negatively affect Colorado pikeminnow is predation by adult Colorado pikeminnow on channel catfish. Quartarone (1993) documented accounts in the Upper Colorado River Basin of dead Colorado pikeminnow with channel catfish lodged in their mouths. According to these accounts the phenomena was widespread after the introduction of channel catfish to the upper basin in the 1920's and 30's. More recently McAda (1983) and Pimental et al. (1985) have documented the same phenomena, indicating mortality through predation on channel catfish.

Effects of competition by introduced fish species have yet to be adequately assessed, but common use of habitats, and diet overlap suggest negative impacts to the native fish fauna, including Colorado pikeminnow. Muth and Snyder (1994) documented diet overlap between Colorado pikeminnow and red shiners, channel catfish and other species to a lesser degree. However, they could not determine if competition existed between the species for a limited food resource. Beyers et al. (1994) provided experimental evidence for reduced growth of Colorado pikeminnow under competition with fathead minnow (*Pimephales promelas*). Karp and Tyus (1990) suggested that growth and survival of young Colorado pikeminnow may be adversely affected by the aggressive behavior of introduced green sunfish, red shiner and fathead minnow, and that negative interactions may be most acute when changes in river level limits backwater habitats or other resources.

Impacts Of Proposed Action

Scope of Impact Assessment

The Service issued a biological opinion on the impacts of the proposed ALP on the Colorado pikeminnow October 25, 1991, and a biological opinion on the impacts of the proposed ALP on the Colorado pikeminnow designated critical habitat on February 26, 1996. The Reasonable and Prudent Alternatives for those opinions are summarized below.

The October 25, 1991 Opinion determined the project is likely to jeopardize the continued existence of these species by appreciably reducing the likelihood of both the survival and recovery of the species in the wild by further reducing its numbers, reproduction, and distribution, and included a reasonable and prudent alternative to avoid the likelihood of jeopardy. The Reasonable and Prudent alternative for the 1991 Opinion included 1) an Animas – La Plata project that results in an initial depletion of 57,100 acre-feet (AF), 2) 7 years of research to determine endangered fish habitat needs, 3) operation of Navajo Dam to provide a wide range of flow conditions for the endangered fish, 4) a guarantee that the Navajo Reservoir will be operated for the life of the Project to mimic a natural hydrograph based on the research, and 5) legal protection for the reservoir releases to and through the endangered fish habitat to Lake Powell and a commitment to develop and implement a Recovery Implementation Program for the San Juan River (USFWS 1996).

Effects of the project on critical habitat for the listed fishes were the subject of the February 26, 1996 Biological Opinion. The Service's biological opinion was that the Project as described in 1996 is likely to jeopardize Colorado pikeminnow and razorback sucker and adversely modify or destroy their critical habitat. The Reasonable and Prudent alternative included 1) an Animas – La Plata Project that results in an initial depletion of 57,100 AF (Phase I, Stage A only), 2) research to determine endangered fish habitat needs, 3) operation of the Navajo Dam to provide a wide range of flow conditions for the endangered fish, including low winter flows, 4) a procedure to implement flow recommendations, 5) a commitment to release peak flows out of Navajo Dam as agreed upon with the Biology and Navajo Dam Operating Committees, 6) a guarantee that, based on the results of the research program and dependent upon the prevailing hydrology, Navajo Dam will be operated for the life of the Animas-La Plata project to mimic a natural hydrograph, Reclamation has agreed under Section 7 (a) 1 to re-operate Navajo Dam for recovery of endangered fishes and 7) legal protection for the reservoir releases instream to and through the endangered fish habitat to Lake Powell. In order to preclude jeopardy and adverse modification, all seven elements must by implemented (USFWS 1996).

The scope of this Biological Assessment covers the proposed Project as previously described in this Biological Assessment. The main change since the earlier opinions is that the project is now limited to an average annual depletion of 57,100 AF, reduction in pumping plant capacity, and the irrigation delivery system has been eliminated at this time. For the purpose of this analysis, the full project development scenario of 120,000 acre/ft diverted and a net annual average depletion of 57,100 acre/ft was assumed.

The Seven Year Research Program specified as one element of the 1991 Opinion has been completed and final reports are in preparation. The most recent findings on Colorado pikeminnow are summarized to update the information from the 1996 Biological Assessment. As part of the completion of that research, the Biology Committee for the SJRIP has made year round flow recommendations for the San Juan River. These flow recommendations were adopted by the Coordination Committee. These flow recommendations are designed to benefit the listed fish and the critical habitat. Reclamation has agreed to operate Navajo Reservoir to benefit downstream endangered fish and critical habitat and to meet the flow recommendations as closely as possible while meeting other Navajo Unit purposes and subject to completion of the Navajo Operations environmental impact statement. Hydrology studies for the ALP indicate that the endangered fish flow recommendations can be met under planned Project operations.

Impacts to Colorado pikeminnow and Critical Habitat

Operation of the Project would reduce flows in the San Juan River and reduce the important spring flows by 240 – 280 cfs (Table 2); however the proposed action can be operated to allow the flow recommendations for the San Juan River to be met (Table 5). These flow recommendations are presented in detail in Holden (1999). The flow recommendations were based on the results of the Seven Year Research Project and determined to be the best available information on the needs of the endangered species and their habitat. The flow recommendations are designed to mimic a natural hydrograph and include criteria that take into account the natural hydrologic variability in the San Juan River. By meeting these flow recommendations, there should be a benefit to the Colorado pikeminnow and its designated critical habitat. Thus operation of the Project should not interfere with operations of Navajo Reservoir to benefit the Colorado pikeminnow and its designated critical habitat.

The projected impacts to the hydrograph are presented in Figures 1-3. Average monthly flows will be reduced by less than 5% in the majority of the months. The reduction in flow is greater than 10% in one month of the minimum flow years. The largest reductions in flow occur during the runoff period. The reduction in flow could result in a reduction in the amount of habitat available in the river, however, the flow recommendations can be met with the Project. Potential impacts in the driest year include: a reduction in the extent of flooded habitats for adult pre-spawning fish and the amount of time they are inundated; a reduction in spawning habitats for adult fish and possible impacts to nursery habitats as a result of decreased peak discharges.

The hydrologic analysis of the Project operation showed that the San Juan River Flow Recommendations could be met (Table 5). The last column in Table 5 shows the Flow Recommendation thresholds for flows. Flow regimes that meet or exceed these threshold values meet the flow recommendations. The flow regimes important for this Biological Assessment included the Current conditions, ALP Baseline and With Project conditions. The only flow regime that did not meet the flow recommendation thresholds was the Post Navajo Dam scenario (1962-1991 time period).

The largest monthly impact would occur in the driest water year (one year out of 63) with a decrease of 12.9% in June flows. There would be an average decrease of 4.5% in monthly flows in average water years. No flow reductions in average water years exceed 10% (See Table 4, Hydrology section this report).

Summary/Conclusion

We conclude that the operations of the Project with a planned depletion of 57,100 acre feet without offsetting measures may affect Colorado pikeminnow in the San Juan River and critical habitat.

Table 5 San Juan River Flow Statistics by flow scenario for the period 1929-1993 (Source: Animas –LaPlata Project Water Resources Report 1999)

Summary of Flow Statistics for San Juan River at Four Corners, NM for Pre- and Post-dam Historic Flows, Current Development Level, ALP Baseline Conditions with and Without Indian Trust Lands and with Project Conditions with and Without Indian Trust Water for Period 1929-1993

Parameter	Flow Regime							
	Pre-dam 1929-1961	Post-dam 1962-1991	Current Conditions 1929-1993	ALP Baseline 1929-1993	Baseline + 20,000 AF Indian Trust	With Project And no Indian Trust	With Project + 8,000 AF Indian Trust	Flow Recommendation Threshold
Average Peak Daily Runoff – CFS	12,409	6,749	10,041	8,821	8,963	8,629	9,645	
Average Runoff – AF	1,263,890	891,712	1,042,635	904,749	887,484	858,410	851,502	
Peak>10,000 CFS – frequency	55%	20%	43%	42%	42%	42%	42%	
Peak>8,000 CFS – frequency	67%	37%	77%	62%	62%	60%	62%	
Peak>5,000 CFS – frequency	91%	53%	97%	74%	77%	77%	77$	
Peak>2,500 CFS – frequency	100%	90%	100%	98%	98%	97%	97%	
AF>1,000,000 – frequency	55%	40%	42%	38%	37%	34%	32%	
AF>750,000 – frequency	67%	47%	63%	54%	51%	51%	48%	
AF>500,000 – frequency	91%	67%	82%	68%	68%	66%	66%	
>10,000 CFS for 5 days – frequency	39%	**13%**	35%	31%	31%	28%	28%	20%
>8,000 CFS for 10 days – frequency	45%	**17%**	46%	42%	40%	40%	40%	33%
>5,000 CFS for 21 days – frequency	64%	**37%**	68%	60%	51%	57%	55%	50%
>2,500 CFS for 10 days – frequency	100%	83%	97%	86%	88%	80%	80%	80%
Maximum years between flow events for minimum duration								
10,000 CFS - 5 days	4	**14**	6	9	9	9	9	10
8,000 CFS - 10 days	4	**7**	6	6	6	6	6	6
5,000 CFS - 21 days	4	**7**	3	4	4	4	4	4
2,500 CFS - 10 days	0	1	1	2	2	2	2	2
Non-corrected Perturbation	12%	27%	17%	22%	23%	22%	23%	
Average Date of Peak	31-May	01-Jun	04-Jun	04-Jun	04-Jun	04-Jun	04-Jun	
Standard Deviation of Peak Date	23	35	12	14	14	16	16	
Days > 10,000 CFS	14	3	6	5	5	4	4	
Days > 8,000 CFS	23	8	16	13	13	12	12	
Days > 5,000 CFS	46	28	43	34	33	33	32	
Days > 2,500 CFS	82	67	71	59	57	56	55	
Meets recommendation			yes	yes	yes	yes	yes	

Note: Values in bold indicate non-compliance with standard

RAZORBACK SUCKER (*Xyrauchen texanus*, Abbott 1861)

The razorback sucker is a large monotypic catostomid species endemic to the Colorado River Basin (Miller 1959). It was once widespread and common in warmwater reaches of many Colorado River Basin streams from Wyoming to Mexico. Distribution and abundance of the species has declined in recent years and it is now extirpated from most of its historic range. Interruptions of natural flow patterns, obstruction of migration routes and destruction of historic habitat by diversions and impoundments have contributed to the decline of the species. In addition, introductions of nonnative species that prey on and compete with the razorback sucker and toxic contamination from heavy metals have adversely affected the species. Due to its imperiled status the razorback sucker was listed as an endangered species under the Endangered Species Act of 1973, as amended, effective November 22, 1991.

Historic Distribution and Abundance

Colorado River Basin

The razorback sucker was once common throughout 3,500 miles of the Colorado River Basin. Its range included the mainstem river and major tributaries in Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming; and the State of Baja California Norte and Sonora of Mexico (Ellis 1914, Minckley 1973).

The species was most abundant in the Lower Colorado River Basin downstream of the present day Lake Mead and was very abundant around Yuma, Arizona (Gilbert and Scofield 1898). Known collections and reports of occurrence in the lower basin were summarized by Maddux et al. (1993).

In the Upper Basin, razorback suckers historically occurred in the Colorado and Green River drainages. In the Colorado River drainage, razorback suckers were present in the Gunnison River and San Juan rivers, and from Lee's Ferry to near Rifle on the mainstem of the Colorado River (Maddux et al. 1993). In the Green River drainage, historic distribution of the species was from the confluence of the Green and Colorado Rivers upstream to the town of Green River Wyoming, including portions of all the major tributaries (Maddux et al. 1993).

San Juan River

The past distribution of the razorback sucker in the San Juan Basin has not been well documented and is not well known. The range of the species in the San Juan River probably included the mainstem river from its confluence with the Colorado River upstream to and including portions of the Animas River. The original range of the species in the San Juan River Basin may have been greater but early surveys and collections are sporadic or lacking. Anecdotal evidence exists that suggests razorback suckers were present at least seasonally in the Animas River (Jordan 1891, Koster 1960). The New Mexico Department of Game and Fish also investigated reports that suggested the occurrence of razorback sucker in the Cedar Hill area of the Animas River (approximately 7 to 8 miles downstream of the state line) during the 1930s and

1940s. The first verified record of the species for the San Juan River was in 1976, when two adults were collected from an irrigation pond near Bluff, Utah (Platania 1990).

Current Distribution and Abundance

Colorado River Basin

Distribution and abundance of the razorback sucker have been reduced to a fraction of their historic standing and appear to be continuing to decline. No significant natural recruitment to any population has been documented in recent years (Maddux et al. 1993).

The formerly large Lower Basin populations have been extirpated from most of the remaining riverine environments. A large population of razorback suckers, estimated at approximately 25,000 adults, exists in Lake Mohave (Marsh 1995), however these are mostly older fish and natural recruitment in this population is lacking. Some managed recruitment, however, is occurring in the Lake Mohave population as a result of intensive efforts to control predation on young fish through the use of predator free grow out areas.

The largest concentration of razorback suckers in the Upper Basin occurs in the upper Green River between the Duchesne and Yampa rivers (Lanigan and Tyus 1989, Bestgen 1990). Lanigan and Tyus (1989) estimated that between 758 and 1,138 razorback suckers were present in the upper Green River. Recent evidence indicates that although there has been some limited recruitment this population is declining. Occasional captures of razorback suckers also still occur in the Colorado River in the Grand Valley but have declined appreciably since 1974 (Maddux et al. 1993). Adults of the species are rarely collected in the lower Green and Colorado Rivers. Larval razorbacks suckers, were collected between 1992 and 1994 from several locations on the Green River downstream from its confluence with the Yampa River, and in the Colorado River Arm of Lake Powell. No verified collections of larval fish have been made in the Colorado River above its confluence with the Green River. Collections of juvenile fish in the upper basin are extremely rare.

San Juan River

Current distribution of razorback suckers in the San Juan River, including introduced fish, is from approximately Hogback Diversion (RM 158.6) to the San Juan Arm of Lake Powell (Figure 1). Naturally occurring or wild razorback suckers have not been collected from the San Juan River in Colorado or New Mexico and have rarely been collected from the riverine portions of the San Juan River in Utah. Most collections of wild fish have occurred in the San Juan Arm of Lake Powell over suspected spawning locations. Recent reported collections of wild specimens in the San Juan River Basin total 41 different fish (Platania 1990).

Results of the San Juan River Seven Year Research Program

Intensive ongoing collections between 1990 and 1994, part of a continuing research program by the San Juan Recovery Implementation Program (SJRIP) have not resulted in the capture of any additional wild razorback suckers from riverine habitats in the San Juan River.

A total of 939 hatchery raised razorback suckers were introduced into the San Juan River between March of 1994 and October 1996 (Ryden 1999b). Fifty-seven of the razorback suckers were implanted with radio transmitters and followed to determine habitat use and movement. The remainder of the stocked razorback suckers were implanted with PIT tags for identification before release. The fish originally stocked in 1994 are still being collected during the annual monitoring of the river (Ryden 1999a).

Results of this study provided insight into habitat use and behavior of razorback suckers in the San Juan River. Results of radio tracking indicated that fish used less complex, higher velocity habitats during warmer months, but used habitats with higher complexity (where they mostly occupied areas of low velocity) during the cold water months (Ryden 1999b). Ryden (1999b) determined that sections of the river that were apparently preferred by razorback suckers included two locations associated with backwater habitats (RM 38.6 and RM 77.3), and one location that may be associated with spawning (RM 100.2). During May 1997 two larval razorback suckers were collected downstream from RM 90. This represented the first documentation of successful spawning by razorback suckers in the San Juan River. A five-year plan for augmentation of razorback suckers in the San Juan River was initiated during 1997 (Ryden 1999b).

Life History/Habitat Requisites

Razorback suckers occupy a diverse array of habitats during various portions of their life history. Specific habitat preferences and factors limiting their abundance in native riverine habitats have been difficult to define due to the scarcity of extant populations (Maddux et al. 1993). In general the species tends to be most abundant in calmer, "flatwater" river reaches rather than higher velocity canyon reaches. Tyus (1987) reported that 80 percent of the adults captured in the Green River were in water with no measurable velocity. All captures were from reaches with low gradient, none were collected from whitewater reaches. Bestgen (1990), in his status review of the razorback sucker, stated that the species may have been historically uncommon in turbulent canyon reaches of the Lower Basin. However, collections of fish have been made from throughout the Colorado River Basin in both low and high gradient reaches and canyon reaches may be biologically significant as migration or transport corridors or spawning locations.

Adult and Juvenile

Riverine habitats which are used by adult razorback suckers include mainstem portions of moderate to large streams and rivers and associated low velocity habitats such as backwaters, embayments, tributary mouths, side channels, sloughs and oxbow lakes (Lanigan and Tyus 1989, Tyus and Karp 1989, 1991, Bestgen 1990). Other habitats include shallow to deep channels and low velocity habitats adjacent to midstream sandbars and seasonally flooded off channel areas (Tyus 1987, Tyus and Karp 1991, Valdez and Masslich 1989). Adults will use a variety of habitats with water velocities ranging between 0.0 and 0.61 meters per second (m/s) but use of zero or low velocity habitats is most common (Miller and Hubert 1990).

During much of the year adult razorback suckers in lotic environments utilize near shore and mid channel habitats including slow runs, eddies, pools, and backwaters and are sometimes found in association with instream cover (Bestgen 1990). During the winter period adult fish select

Powell and a commitment to develop and implement a Recovery Implementation Program for the San Juan River (USFWS 1996).

Effects of the project on critical habitat for the listed fishes were the subject of the February 26, 1996 Biological Opinion. The Service's biological opinion was that the Project as described in 1996 is likely to jeopardize Colorado pikeminnow and razorback sucker and adversely modify or destroy their critical habitat. The Reasonable and Prudent alternative included 1) an Animas – La Plata Project that results in an initial depletion of 57,100 AF (Phase I, Stage A only), 2) research to determine endangered fish habitat needs, 3) operation of the Navajo Dam to provide a wide range of flow conditions for the endangered fish, including low winter flows, 4) a procedure to implement flow recommendations, 5) a commitment to release peak flows out of Navajo Dam as agreed upon with the Biology and Navajo Dam Operating Committees, 6) a guarantee that, based on the results of the research program and dependent upon the prevailing hydrology, Navajo Dam will be operated for the life of the Animas-La Plata project to mimic a natural hydrograph, Reclamation has agreed under Section 7 (a) 1 to re-operate Navajo Dam for recovery of endangered fishes and 7) legal protection for the reservoir releases instream to and through the endangered fish habitat to Lake Powell. In order to preclude jeopardy and adverse modification, all seven elements must by implemented (USFWS 1996).

The scope of this Biological Assessment covers the proposed Project as previously described in this Biological Assessment. The main change since the earlier opinions is that the project is now limited to an average annual depletion of 57,100 AF and the irrigation delivery system has been eliminated at this time. For the purpose of this analysis, the full project development scenario of 120,000 acre/ft diverted and a net annual average depletion of 57,100 acre/ft was assumed.

The Seven Year Research Program specified as one element of the 1991 Opinion has been completed and final reports are in preparation. The most recent findings on razorback sucker are summarized here to update the information from the 1996 Biological Assessment. As part of the completion of that research, the Biology Committee for the SJRIP has made year round flow recommendations for the San Juan River. These flow recommendations were adopted by the Coordination Committee. These flow recommendations are designed to benefit the listed fish and the critical habitat. Reclamation has agreed to operate Navajo Reservoir to benefit downstream endangered fish and critical habitat and to meet the flow recommendations as closely as possible while meeting other Navajo Unit purposes and subject to completion of the Navajo Operations environmental impact statement. Hydrology studies for the ALP indicate that the endangered fish flow recommendations can be met under planned Project operations.

Impacts to razorback sucker and Critical Habitat

The Project would deplete flows and lower spring runoff in an area of critical habitat (Table 4); however the proposed action can be operated to allow the flow recommendations for the San Juan River to be met (Table 5). Please see "Impacts to Colorado pikeminnow" section for full discussion of flow regime changes.

By operating the Project to help meet these flow recommendations, there should be a benefit to the razorback sucker and its designated critical habitat. Thus operation of the Project should not interfere with operations of Navajo Reservoir to benefit the razorback sucker and its designated critical habitat. The projected impacts to the hydrograph are presented in Figures 1-3. Potential impacts include: a reduction in the extent of flooded habitats for adult pre-spawning fish and the amount of time they are inundated; a reduction in spawning habitats for adult fish and possible impacts to nursery habitats as a result of decreased peak discharges.

Summary/Conclusion

Based on a review of the available data and literature we conclude that the operations of the Project without offsetting measures (with a planned depletion of 57,100 acre feet) may affect razorback suckers and adversely modify critical habitat in the San Juan River.

BALD EAGLE (*Haliaeetus leucocephalus*)

Distribution and Abundance

The bald eagle (*Haliaeetus leucocephalus*) is associated with aquatic ecosystems throughout its range, which formerly included most of the North American continent. Population numbers declined and range diminished in the lower 48 states through the 1970's and the species was listed as endangered February 14, 1978 except in Minnesota, Wisconsin, Michigan, Oregon, and Washington, where it was classified as threatened (43 FR 6233). Factors affecting this decline included human persecution, prey reduction, habitat loss, and reproductive impairment caused by environmental contaminants resulting in egg shell thinning and hatching failure.

Since the banning of DDT in 1972 and the initiation of intensive protection efforts, the number of breeding pairs has increased from an estimated 400 in the lower 48 states in the early 1960's to over 2,660 nesting pairs in 1989. The number of known occupied territories doubled between 1982 and 1990 when they were reported nesting in all but five of the 50 states (Hunt et al. 1992). The largest breeding populations are now concentrated in southern Alaska, British Columbia, along the coast of Canada and Washington, around the Great Lakes, the Chesapeake Bay, and in Florida (USFWS 1982; Peterson 1986; USFWS 1986). Smaller breeding populations are found in the northern Rocky Mountain states, primarily associated with large lakes and rivers. Breeding in the southwestern U.S. has been restricted to the Salt and Verde River systems in Arizona, although in some areas a slow increase in resident bald eagle activity has been observed.

On July 12, 1994, the Service proposed downlisting the endangered populations to "threatened" except those in the Southwestern Recovery Region. A 32 percent increase in occupied breeding areas was noted since 1990 and recovery goals had been exceeded in the Chesapeake, Southeastern, Pacific and Northern Recovery Regions. However, downlisting was not proposed for the Southwestern Region (southeastern corner of California, Arizona, New Mexico, west Texas, and the Oklahoma panhandle) because numbers remained low and breeding populations localized. Low adult survival rates and threats to riparian areas from human activity created a need for intensive management, especially at nest sites (USFWS 1994).

On March 23, 1995, the Service reopened the comment period for this proposed action citing new information to indicate that southwestern bald eagles are unlikely to be reproductively isolated from other populations. Although threats to riparian zones remain in the southwest, new evidence indicates immigration to the population. The Service has issued a final rule to list all bald eagles in the lower 48 states as threatened, but leaves conservation measures in place (USFWS 1995a).

With the exception of resident breeding populations in central Arizona and Sonora Mexico, recent studies indicate that the majority of bald eagles wintering in the Southwest (Arizona, New Mexico, Colorado, Utah), and as far south as Mexico, are actually migrants from Pacific Northwest and Canadian populations (USFWS 1982). Harmata (1993) documented wintering bald eagles in the San Luis Valley, Colorado returning to central Canada to breed. The largest overwintering populations are found at the low- to mid-elevation ranges in Colorado, eastern

Utah, and northern New Mexico, and populations are increasing. Mid-winter counts (data collected by the respective state wildlife agencies) yielded over 800 bald eagles in Colorado during the 1992-93 winter and 1235 in 1994. The numbers of eagles counted in Colorado in 1995 was 931, down from the 1994 high. Fewer eagles may have wintered as far south as Colorado due to the warm weather. The trend, however, is a population increase (Craig 1995). Selected wintering ranges in New Mexico include, Navajo Lake, Chama Valley, Cochiti Lake and the Caballo Reservoir (NMDGF 1993). Reclamation funded a bald eagle study on Caballo Reservoir for three years. The wintering bald eagle population peaked in January (23 total in 1995) with eagles leaving by mid-March (Nicholopoulos 1995).

Only a small number of bald eagles remain in the southwest each spring to nest and rear young. Colorado documented 14 breeding pairs in 1992, with 20 young produced. In 1984 17 pairs nested in the southwest and the total increased to 30 in 1994 (AP 1995). In central New Mexico, one productive nesting pair was documented at Caballo Reservoir in 1988, along with another empty nest, which was reported to have been active in the 1980's. Two eggs hatched in March 1995 on a ranch a few miles from the reservoir (Nicholopoulos 1993a and 1995).

In the 1960's, Hubbard documented a breeding pair in San Juan County, New Mexico (cited in NMDGF 1993). Although a few potential nests have been recently found along or near the Animas and La Plata rivers, no breeding activity is currently known from the Project area. In April 1995, a pair was seen on a nest a few miles from Navajo Reservoir. Presently, only wintering bald eagles occur within the Animas and La Plata drainages. These eagles likely are migrants from northern populations (Grubb 1983), arriving in late November and leaving in March. Summering bald eagles from the northern populations may also occur as transients (NMDGF 1993).

To assess the numbers, distribution, and habitat use of bald eagles in the Animas-La Plata area, the Bureau of Reclamation has conducted monthly winter helicopter surveys of the Animas (from Falls Canyon north of Durango to the San Juan River) and La Plata (from Hesperus to the San Juan) River corridors. The Mancos River also was surveyed (from the town of Mancos to the San Juan River), but no bald eagles were sighted during December 1993, January 1994, or January 1995 surveys. Surveys conducted by the Colorado Division of Wildlife and the National Park Service similarly indicate low use of this drainage by bald eagles; therefore, it was eliminated from further study.

Data from Reclamation's surveys indicate bald eagles arrive on the floodplains by mid-November and leave by late March or early April. Populations appeared to peak during mid-February during the study period, except on the Animas River in 1995 when numbers peaked in mid-January and dropped significantly by mid-February. These differences may be weather related.

Life History/Habitat Requisites

Migration and temporal and spatial distribution of bald eagles in the Southwest depend on weather conditions (Brown and Stevens 1992) and food availability (Brown 1993). Wintering bald eagles in the Southwest are often described as opportunistic foragers, readily changing locations and prey (USBR 1990; Brown 1993). Food availability often is a major stimulus in determining distribution and habitat use patterns (Grubb et al. 1989). In New Mexico and Colorado, migrant, over-wintering bald eagles tend to concentrate at reservoirs and along rivers and streams where food is abundant and where prey are vulnerable (Grubb 1984; Brown et al. 1989; Grubb et al. 1989; NMDGF 1993).

Feeding

Bald eagle foraging ranges may be influenced by such factors as the distribution of strategic perches and isolation from disturbance (Hunt et al. 1992; Hunt 1993). Bald eagles prefer to perch near food sources (Sabine 1987; Stalmaster 1987; Harmata 1993) on sturdy branches which permit good visibility and unobstructed flight (Stalmaster 1987; BOR 1990). Reclamation's surveys reveal that most bald eagles are associated with mature cottonwood trees in areas relatively free from the human disturbance which occurs in many locations on both rivers.

Swisher (1964) observed that ducks were the principle food of wintering bald eagles feeding at the Bear River Migratory Bird Refuge in northern Utah. However, wintering bald eagles in western Connecticut congregated near hydroelectric dams and fed almost exclusively on injured or dead fish, largely ignoring numerous waterfowl (Russock 1979). Terrestrial habitats were preferred by wintering eagles in Rush Valley, Utah and Navajo Lake, New Mexico, during seasons of surplus jackrabbits and deer and elk carcasses, respectively (Grubb 1984; Sabine 1987). Harmata (1993) noted wintering bald eagles in the San Luis Valley, Colorado often spent less time in riverine habitats during river freezing weather and more time in upland areas searching for carrion which constituted up to 80-90% of the eagles diet.

Prey availability in the project area is broad. Deer are numerous along both drainages, waterfowl are common along the Animas River, and native fish, especially suckers, are abundant in both rivers. High concentrations of deer, particularly on the La Plata River below the Colorado state line, were observed during all survey years. The severity of the winter will affect the carrion supply and it is not unusual for bald eagles to switch more to carrion as winter losses of deer, elk, and other animals mount. In the Project area in New Mexico, bald eagles rely heavily on carrion (Bill Falvey pers. comm. 1994).

Data from castings taken from beneath communal roosts confirm a disproportionate use of mammalian carrion as a food source. Mule deer, rabbit, prairie dog, rock squirrel, domestic dog, meadow mouse, and porcupine remains have been identified by Reclamation biologists. Waterfowl and crayfish remains also were found. While fish remains were not observed in castings, bald eagles have been seen on rocks in the Animas River, presumably fishing. The availability of fish in shallow water (and warm weather) probably dictates the level of use of this food source.

Roosting

At night, bald eagles typically roost in groups, along riparian zones and in draws and canyons offering protected microclimates (Grubb 1979; Grubb and Eakle 1987). Roosting typically occurs close to prime feeding areas (Grubb et al. 1989), but when sites are unavailable, bald eagles may travel several miles for food (Swisher 1964). Grubb (1984) reported high use of three communal roosts located within relatively protected canyons at Navajo Lake, New Mexico. Roosts were typically located within 0.25 to 1.25 miles from the lakeshore. Within these roost stands, discrete trees located on the canyon floor or immediately adjacent side slopes were used preferentially.

Communal roosts often share four common attributes: a clear line of sight to surrounding terrain; a favorable microclimate; stout perches high above the ground; and freedom from human activity (Stalmaster 1987). Among north-central Arizona bald eagles, communal roosting patterns and movements between communal roosts are determined by weather conditions and prey availability (Grubb et al. 1989) and this is likely the case in the Project area. Disturbance is another factor. A wintering bald eagle on the Rio Chama River in New Mexico primarily roosted near Abiquiu Reservoir on calm days without human disturbance, but on windy and days of increased human activity it roosted in a secluded canyon (Stahlecker and Smith 1993).

Communal roost data collected by Reclamation during the winter of 1997-98 identified two communal roost/roost areas on the La Plata River. One roost was located 3.5 miles downstream of the Cherry Creek confluence and the second roost was located 1 mile below the Long Hollow confluence. In 1998-99 bald eagles were only found using a communal roost near the roost identified in 1997-98, downstream of Cherry Creek. During the winter of 1998-99 a communal roost was also identified in the San Juan Arm of Navajo Reservoir (USBR unpublished file data).

The only communal roost confirmed in the Animas drainage is in Line Canyon, approximately 1.25 miles inland from the floodplain. While individual or small groups of eagles were found roosting in floodplain cottonwood gallery forest sites, no new established communal roosts were located. A difference between the two drainages is the presence of considerable canyon habitat adjacent to the Animas River; such habitat is limited in the La Plata drainage.

Nesting

The availability of suitable nesting structures within close proximity to abundant food sources, preferably bodies of water, and minimal human disturbance appear to be prerequisites to maintaining suitable breeding habitat. The greatest densities of nesting bald eagles throughout its range are found in areas of minimal human activity. Habitat suitability decreases greatly as human disturbance increases (Peterson 1986).

Bald eagle productivity in the Project area has a sporadic history, but the number of eagle pairs attempting to nest regionally does seem to be increasing slowly. Between 1988 and 1995 successful nesting was observed in central New Mexico near Caballo Reservoir (USBR 1990; Nicholopoulos 1993b; Nicholopoulos 1995). A large stick nest at nearby Elephant Butte

Reservoir, described by Grubb and Eakle (1987), was active in the 1980's but is now abandoned due to residential development (Nicholopoulos 1993a). In 1995, a bald eagle pair was sitting on a nest near Navajo Reservoir. Electra Lake, in Colorado north of the project area, reportedly has had an active nest site, but no nest was located during Reclamation surveys.

During March most of the overwintering bald eagles in the project area leave, presumably migrating north. Although there are currently no known active nests within the Project area, two with a history of production are known in the Animas River drainage between Durango and the San Juan River. One is in Colorado, approximately 10 miles north of the state line; the other about a mile south of the state line. One nest with documented production is located in a tall, narrow, open ponderosa pine, approximately 1.5 miles from the river. It was an active producer in the 1970's, but apparently has received little use since (J. Craig pers. comm. 1994). Increasing human encroachment along the Animas and La Plata rivers may preclude successful reproduction by the less tolerant bald eagle within the Project area in the future.

Impacts of the Proposed Action

Other than incidental summer migrants, the bald eagles in the Animas-La Plata project area are primarily a wintering population. Food abundance, human disturbance, and short-term climatic weather changes undoubtedly affect concentrations and distribution patterns. Bald eagles in the project area rely heavily on mammalian carrion, especially deer. Therefore, any reduction in fish numbers would have minimal impact on this species. By contrast, the completion of the Ridges Basin reservoir could offer a new prey base in mild weather. Fisher and Hartman (1983) reported reservoirs provide habitats that promote optimal hunting conditions for wintering bald eagles. The attraction may stem from increased fish diversity and biomass, reduced turbidity, stabilized water flows, and concentrated numbers of waterfowl. Lake freezes will undoubtedly influence prey availability, but the overall food supply will be enhanced.

The primary threat to bald eagles in the project area is growth-induced human disturbance. Although the ALP probably will increase summer visitation in the area, Durango is currently experiencing a population influx paralleling or exceeding that in other areas of the west. Growth and building are projected to increase rapidly with or without the project. Bulldozing and house building occurs in the flood plains of both the Animas and La Plata rivers. The roost sites are in jeopardy of mechanical destruction as the land becomes increasingly valuable real estate. A summary of recent data collected by Reclamation suggests that bald eagles may avoid areas of human disturbance (Table 6).

The bald eagles in the Project area are primarily a wintering population, although nesting has occurred both to the north and south. Reclamation has conducted six years of aerial surveys along the Animas and La Plata rivers to determine bald eagle use in the Project area (Figures 4 and 5). Additional information has been collected on the San Juan River since 1997 (Figure 6). Primary use sites include cottonwood trees along the Animas and La Plata rivers and occasionally those adjacent to some canals. Although daytime use is in areas associated with human habitation, night roosts are in isolated locations. Results of Reclamation surveys indicate that currently, unrelated to the Project, cottonwood trees are being felled and development is encroaching on areas of eagle use, reducing available habitat. River stage changes due to the Project are not expected to affect riparian habitat use by the eagles.

An additional concern is the potential for bioaccumulation of toxic materials, particularly heavy metals. Reclamation studies of bald eagle casts have indicated a high use of mammalian carrion in the diet of bald eagles; however, fish remains are less easily identifiable in casts. Ridges Basin Reservoir would expand the prey base of wintering eagles, when accessible, but contaminants could bioaccumulate in fish and affect bald eagles. Accordingly, Reclamation contracted with the NBS to conduct a contaminant impact analysis. The report evaluated data collected on water, sediments, invertebrates and fish for the following: arsenic, boron, cadmium, chromium, copper, lead, lithium, molybdenum, mercury, nickel, selenium, silver, uranium, vanadium, and zinc. Results indicate mercury and selenium could be of some concern because they biomagnify through the food chain. Based on the assumptions used in the analysis, mercury could represent a hazard to eagle reproductive success due to ingesting contaminated fish (however, mercury levels in the Animas River exceed concentrations in similar systems). Selenium concentrations in soil and water samples are of concern, but concentrations in fish do not appear to be high enough to create a problem for fish-eating birds. In September 1999, Reclamation and ERI collected sediments, vegetation, invertebrates, and fish from Farmington Reservoir (an off-stream reservoir which receives its inflow from the Animas River and is serving as a surrogate for Ridges Basin Reservoir) for contaminant analysis. Preliminary data analysis suggests that copper, mercury and selenium approach levels in some fish species (and life-stages) that could of concern to feeding bald eagles. Ice cover on Ridges Basin should reduce the length of time it is available as a feeding area. Reclamation will monitor bioaccumulation of mercury, selenium, and other elements in potential food items of the bald eagle. Habitat mitigation areas developed under the Project should provide new and restored habitat that has long-term protection for eagles.

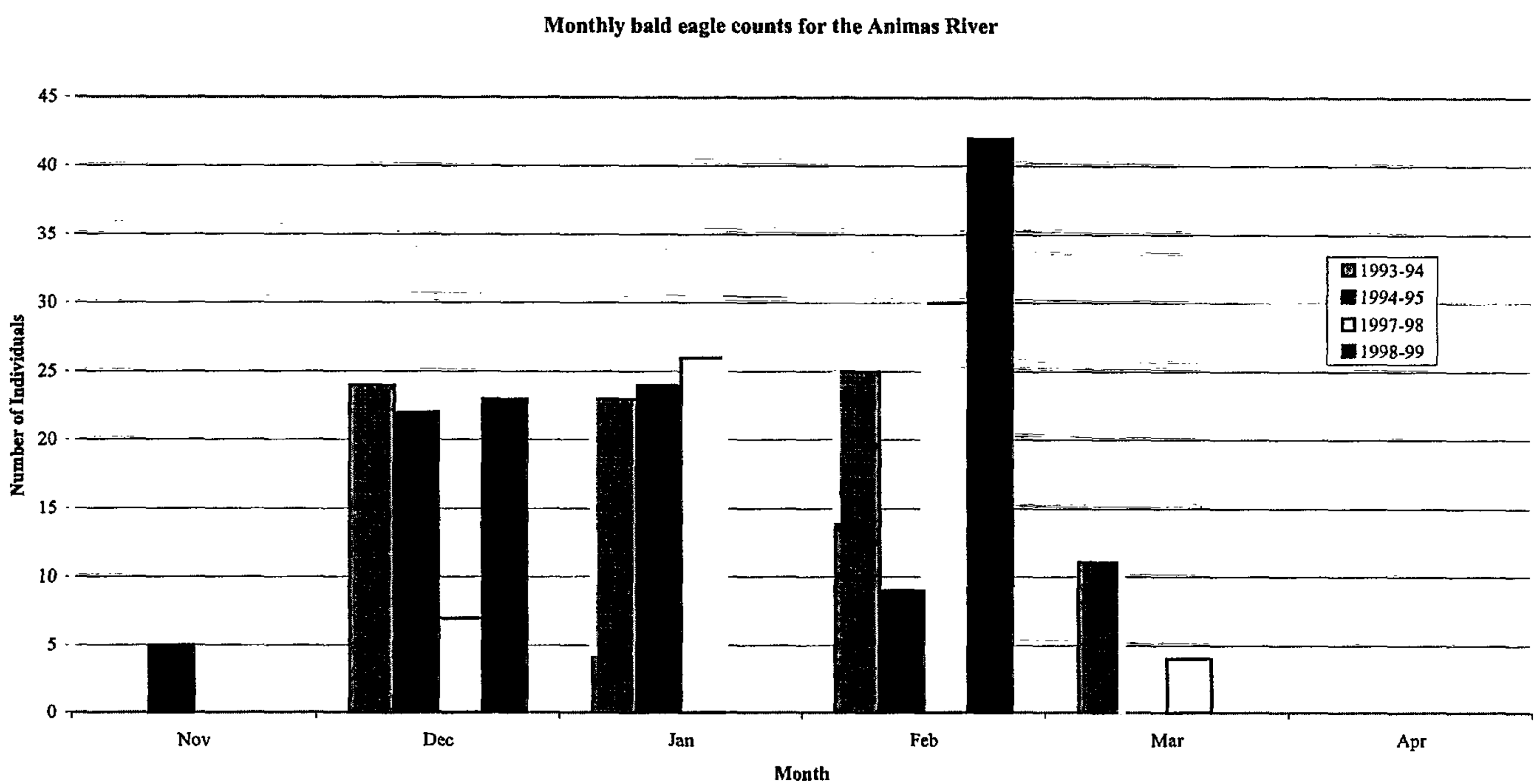
Table 6: **Riparian and disturbance associations of bald eagles during winter surveys. Data provided by Bureau of Reclamation 1999.**

	Percent of eagles observed			
	Animas	**La Plata**	**San Juan**	**All Rivers**
Along the River				
Riparian - Cottonwood Forest	50	32	20	36
Riparian – Shrub	0	0	0	0
Riparian - Wetland/Meadow	0	0	0	0
Riparian - Isolated Cottonwoods	50	68	80	64
Lands Contiguous to River				
Adjacent Disturbance - Undisturbed	15	44	12	18
Adjacent Disturbance - Residential	23	19	12	21
Adjacent Disturbance - Cultivated	59	37	70	58
Adjacent Disturbance - Urban	2	0	6	3

Summary/Conclusion

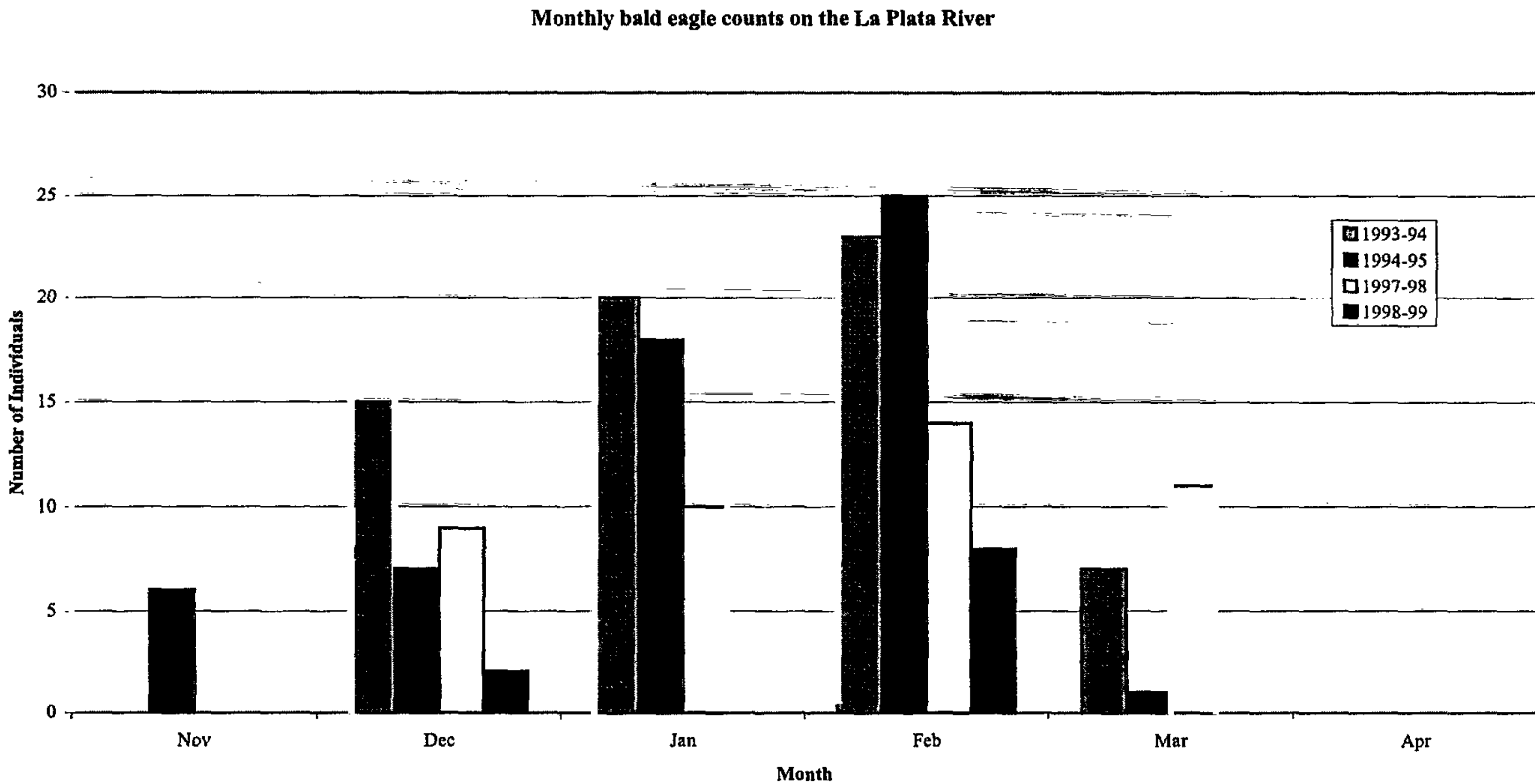
Implementation of the preferred alternative may affect the bald eagles because of potential bioaccumulation concerns.

Figure 4. Bald eagle counts on the Animas River. Data summarized from winter surveys conducted by the Bureau of Reclamation.



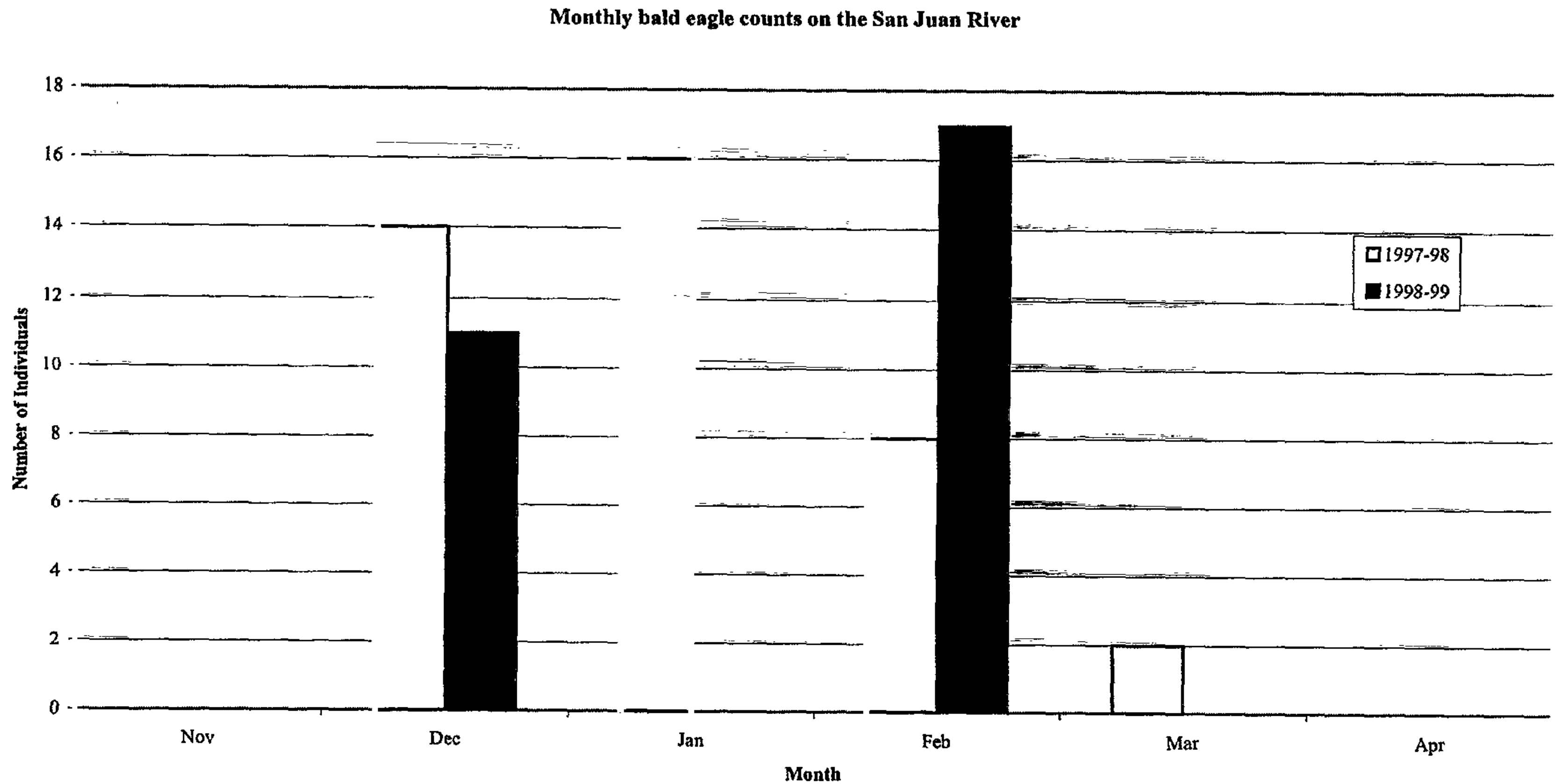
Winter	November	December	January	February	March	April
1993-94		24	23	25	11	0
1994-95	5	22	24	9	0	0
1997-98		7	26	30	4	
1998-99		23		42		

Figure 5. Bald eagle counts on the La Plata River. Data summarized from winter surveys conducted by the Bureau of Reclamation.



Winter	November	December	January	February	March	April
1993-94		15	20	23	7	0
1994-95	6	7	18	25	1	0
1997-98		9	10	14	11	
1998-99		2		8		

Figure 6. Bald eagle counts on the San Juan River. Data summarized from winter surveys conducted by the Bureau of Reclamation.



Winter	November	December	January	February	March	April
1997-98		14	16	8	2	
1998-99		11		17		

SOUTHWESTERN WILLOW FLYCATCHER (*Empidonax traillii extimus*)

Distribution and Abundance

The southwestern willow flycatcher (*Empidonax traillii extimus*) is one of at least four commonly recognized subspecies of willow flycatchers, neotropical migrants with a broad breeding range extending from Nova Scotia to British Columbia and south to Baja California. The taxonomy is difficult and morphological differences are subtle making field identification extremely difficult. First described in 1948, *E.t. extimus* is a small passerine (13-15 cm) with grayish/greenish upperparts, whitish throat, olive gray breast and yellowish belly. Two pale wingbars are visible, but the eye ring is lacking or indistinct (NMDGF 1986, USFWS 1993). Females tend to be somewhat smaller, but typical of the Tyrannidae, there is no sexual dimorphism (Seutin 1987).

Although there is much individual variation (Phillips 1948), the southwestern willow flycatcher is distinguished from other subspecies by distribution, morphology, color, nesting ecology, and possibly song dialect (Aldrich 1953, King 1955, Sogge 1994). *E.t. extimus* is the southernmost subspecies, breeding from southern California to west Texas (Unitt 1987, USFWS 1992, Browning 1993). *E.t. brewsteri* breeds on the west coast of North America from British Columbia to south Central California and migrates through the breeding range of *E.t. extimus*. The unclearly defined boundary between the more northerly breeding range of *E.t.adastus* and that of *E.t. extimus* crosses through the project area (USFWS 1995b).

The subspecies is rare in the southwestern United States and has been extirpated from much of its former range (Hunter et al. 1987). Its historic breeding range includes Arizona, New Mexico, southern California, and southern portions of Nevada, Utah, and perhaps southwestern Colorado; the eastern edge extends into western Texas (USFWS 1993). Winter range includes central American from Mexico to Panama and possibly Colombia (Phillips 1948). Neither migration routes nor wintering areas are well known, although winter movement may be tied to water availability (Gorski 1969). Threats to this species on the wintering grounds are undocumented, but habitat loss in Latin and South American increases the urgency of protection efforts in the United States.

Though never common, *extimus* population declines have corresponded with loss and modification of riparian habitats (Phillips 1948). Modification and fragmentation of these systems, as a result of development and livestock grazing, have devastated southwestern willow flycatcher habitat. Destruction of native willow/cottonwood vegetation has provided opportunity for invasion by exotic species, notably tamarisk (*Tamarix* sp.). Habitat fragmentation has benefitted cowbirds (*Molothrus* sp.) which parasitize willow flycatcher nests, further contributing to population declines. With only rare and isolated habitat remaining, the risk of local extirpation of the southwestern willow flycatcher is increasing.

Unitt considered *E.t. extimus* less common than many other species listed on the Federal endangered species (1987) and was proposed for listing as endangered with critical habitat on July 23, 1993 (USFWS 1993). The southwestern willow flycatcher is endangered in Arizona, New Mexico, and California. This subspecies was listed as federally endangered, effective March 29, 1995 (USFWS 1995b).

Population trends and breeding status of the southwestern willow flycatcher are not being extensively monitored, but limited data has indicated a continuing decline. The USFWS estimated that only 300-500 breeding pairs remained in the United States (USFWS 1995b). This included the largest colonies in California (115 pairs) and approximately 100 pairs in New Mexico (Sogge 1994). In New Mexico, willow flycatchers probably have bred in the Rio Grande, Gila, San Francisco, and Zuni river basins (Hubbard 1987) and in both the San Juan valley and mountains (NMDGF 1994). Hubbard (1987) indicated that the range of the southwestern willow flycatcher may extend into southwestern Colorado, but Unitt (1987) considered the New Mexico-Colorado border the boundary of *E.t. extimus*. During 1998 a team was organized for the purpose of developing a recovery plan for the southwestern willow flycatcher. A draft recovery plan was expected by late 1999. Implementation of this plan should occur soon after the completion of a draft report.

Life History/Habitat Requisites

Southwestern willow flycatchers arrive in the southwestern United States in mid-May and probably return to wintering grounds in Central and South America in August and September (Brown 1991). Willow flycatchers are present in New Mexico from early May through Mid-September (NMDGF 1994). *E.t. extimus* is an insectivorous riparian obligate (Hunter et al. 1987) preferring habitat near open water (Gorski 1969, Sogge 1994). Although it may be a widely scattered migrant, breeding occurs only along rivers, streams and wetlands in dense vegetation. These areas provide both nesting and foraging habitat. Dense, multistoried vegetation near surface water or moist soil is consistently selected by breeding birds. Structural complexity of riparian vegetation is important and highly correlated with habitat use (Whitmore 1975).

Vegetative composition can be variable. Shrubs, such as willows (Salix sp.) are common habitat components, with or without a cottonwood (*Populus* sp.) overstory. Russian olive (*Eleagnus* sp) and tamarisk (*Tamarix* sp.) are also suitable. Structural complexity could be correlated with temperature regulation (Hunter et al. 1987). Monotypic tamarisk stands in the Grand Canyon, which lack structural complexity, have had low nesting success. In Utah, *extimus* was confined to areas of 70-100% shrub density, with few large trees (Whitmore 1977). Vegetative structure is important. Nesting occurs in generally dense and homogenous thickets of trees or shrubs approximately 4-7 meters in height with dense foliage 0-4 m above the substrate. Surface water or saturated soil always occur near the nest site (Phillips et al. 1964, Muiznieks et al. 1994 in USFWS 1995b).

Patch size is not well known. From 2.8 to 3.1 ha could be typical (Brown 1991), but 0.5 ha has been noted (Sogge 1994). Willow flycatchers have been observed defending territories approximately 1,100 m^2 in both breeding and wintering ranges (Gorski 1969). The importance of habitat fragmentation cannot be underestimated; larger patches are more likely to support willow flycatchers (Sedgwick and Knopf 1992). Habitat quality may be a factor, i.e., patch width may be narrower in higher quality habitats. Although there is no correlation between stream width and flycatchers (Sedgwick and Knopf 1992), *E.t. extimus* is not found along high gradient streams (Sogge 1994).

Proximity to water may be correlated with food supplies. Although little is known of southwestern willow flycatcher food preferences, the birds are probably generalists and opportunistic feeders. *Empidonax* flycatchers hover and glean insects from foliage and are conspicuous in feeding habits (King 1955). In the Grand Canyon, southwestern willow flycatchers forage on sandbars, backwaters, and at water's edge (Tibbetts et al. 1994). There is little information on prey species (USFWS 1995b), but arachnids and both larval (lepidoptera) and adult insects (odonata, orthoptera, lepidoptera, coleoptera, hymenoptera, and diptera) are taken (NMDGF 1994).

Breeding

Willow flycatchers are highly territorial with males arriving earlier than females to set up territories. Nest building begins after breeding territories are established. Nests are built in small trees or shrubs, preferentially in willows and rose (NMDGF 1994), in a fork or horizontal branch 1-5 meters above ground (Tibbetts et al. 1994). The nest is an open cup of bark, hair, typha and grass, often lined with feathers (Johnson 1989, NMDGF 1994). The outside diameter of the nest is approximately 7.7 cm (3 in) wide and 7.7 cm (3 in) deep.

A clutch of two to four eggs is laid from late May through July (Unitt 1987). The buffy white eggs are 18 x 14 mm (Reed 1965 in NMDGF 1994) and lightly mottled with brown flecks at the larger end. After approximately a 12-14 day incubation, nestlings spend 12 or 13 days in the nest before fledging (Brown 1988; Tibbetts 1994). The breeding season (eggs or young in nest) extends from early June to mid-July, late May to late July in New Mexico (NMDGF 1994). Clutch size is one to four eggs in New Mexico (Hubbard 1987). A single clutch is typical, however renesting has been known to occur after the first nest is destroyed (Brown 1988).

Habitat destruction and attending brood parasitism is probably the greatest threat to southwestern willow flycatchers (Bohning-Gaese et al. 1993). Riparian destruction, modification, and fragmentation caused by development and grazing has provided new foraging habitat for brown-headed cowbirds (Molothrus ater) and populations of this species continue to expand (Hanka 1985; Harris 1991; USFWS 1993). Cowbirds may remove prey eggs, the parasite's eggs hatch earlier, and the larger nestlings are more competitive in the nest. Nearly all known populations of *E.t.extimus* occur in ungrazed habitats (Serena 1982, Harris et al. 1987 in USFWS 1995b).

The characteristic territorial call, "fitz-bew," may be a differentiating characteristic among the four subspecies of willow flycatchers. The call is most frequently heard in the morning (Tibbitts et al. 1994). Another vocalization, the "whitt," an alarm or contact call, is heard less frequently and probably has less acoustic variability. *E. t. extimus* may be confused with the more common *E.t. brewsteri* when the latter migrates through to more northern breeding grounds (Aldrich 1951, Unitt 1987) as the latter sings during migration, making sub-specific distinctions difficult until mid-June (Brown 1991). *E.t. adastus* occurs in western Colorado and may also be found in the project area. The four subspecies possibly may be differentiated by characteristics of the "fitz-bew" call. *E.t. extimus* sings a more slurred "fit-za-bew" and the "bew" syllable is less distinct (USFWS 1995b).

Very preliminary analyses of willow flycatcher sonograms indicate the vocalizations of Colorado birds, north of the project area, closely resemble *E.t. adastus* in Oregon. New Mexico birds appear to have characteristics intermediate between *E.t. extimus* in Arizona and *E.t. adastus*. The single recording of the willow flycatcher on the La Plata in 1994 place it with Colorado birds. (Sedgwick, pers. comm.).

Bureau of Reclamation Studies

In an attempt to clarify the status of southwestern willow flycatcher within the project area, the Bureau of Reclamation contracted the National Biological Service (NBS) to conduct surveys for the southwestern willow flycatcher along the Animas, La Plata, and Mancos river drainages during the 1994 season (Sedgwick 1994) using the established protocol (Tibbetts et al. 1994). A total of 93 surveys were conducted for willow flycatchers between May 27 and July 16 1994. When a willow flycatcher was detected, a follow up survey was completed to collect additional data.

Due to problems obtaining access, less that five percent (5%) of the Mancos River was surveyed, although the entire Animas River (from Durango to Farmington) and 80% of the La Plata (Breen to Farmington) was surveyed. Cowbirds and livestock/grazing occurred at the majority of the sites (82% and 76%, respectively). The surveys (n=93) confirmed the presence of six (6) willow flycatchers in five locations, all on the La Plata River.

A single flycatcher was detected on a second survey. Although no nest was found at this location, the male was at the site on both surveys and exhibited territorial behavior. He was probably a breeding, territorial male. No flycatchers were detected in resurveys of the other sites which led Sedgwick (1995) to conclude these flycatchers were migrants, not breeding in the area.

During 1997 and 1998 the riparian area along the San Juan River from Navajo Dam downstream to the Colorado stateline was surveyed for southwestern willow flycatchers (Ecosphere Environmental Services 1999). Fourteen of the sites surveyed during this study were upstream of the Animas River, while sixteen of the sites were downstream of the Animas River. The best habitat in the study area for southwestern willow flycatchers occurred in a 12-mile section immediately below Navajo Dam. Most of the surveys were conducted in this area. During this study a number of willow flycatchers were observed. Many of these could have been the southwestern subspecies, however only a few of the southwestern subspecies were confirmed (Ecosphere Environmental Services 1999). The results of this willow flycatcher data are summarized in Table 7.

All confirmed southwestern willow flycatchers that were reported during the survey occurred in an area of the San Juan River downstream from its confluence of the Animas River. The sightings consisted of one nesting pair in 1997, and three nesting females with one territorial male in 1998. The 1997 nest fledged at least one bird and the 1998 nests fledged at least four birds. The survey results suggest that the San Juan River corridor may be an important area for southwestern willow flycatchers and willow flycatchers (subspecies undetermined) during migration or during the breeding season (Ecosphere Environmental Services 1999).

Table 7. **Minimum number of willow flycatchers observed along the San Juan River, New Mexico. Data was summarized from a two-year study conducted by Ecosphere Environmental Services (1999).**

	Number of southwest willow flycatchers		Number of willow flycatchers	
	1997	1998	1997	1998
May 15-31	0	0	12	9
June 1-20	0	0	2	12
June 21-July 11	2	4	2	4
Number of nests	1	4		

Another recent survey for southwestern willow flycatchers was conducted along the San Juan River in Utah, between the Four Corners Bridge and Mexican Hat (Blakney 1997). This survey was conducted during 1997, and included six locations that were surveyed three times each. The dates of the survey periods were May 15 - 31; June 1 - 21; and June 22 - July 10. Only one willow flycatcher was reported during these periods. This bird was heard during the first survey period at a location near Aneth, Utah, and was not found again (Blakney 1997).

Quality habitat for willow flycatchers is in short supply along most of the San Juan River corridor (Blakney 1997; Ecosphere Environmental Services 1999). Suitable habitat for willow flycatchers is also minimal and patchy along the Animas, La Plata and Mancos corridors (Sedgwick 1995). Habitat continues to be reduced due to grazing, residential development, oil/gas activity, and intrusion of exotics, particularly russian olive. Sedgwick (1995) characterized the Mancos river as poor habitat, the Animas River as poor to fair habitat, and the La Plata riparian corridor as fair habitat in northern reaches, but severely degraded in southern reaches.

Impacts of the Proposed Action

Any potential project impacts to the southwestern willow flycatcher would be those to the riparian zone. A reduction in capacity to maintain or provide sufficient flows for regeneration of suitable riparian habitat could potentially affect *E. t. extimus.*

In 1994, Reclamation contracted the National Biological Service to conduct surveys along the Animas, La Plata, and Mancos river drainages for willow flycatchers. Only six willow flycatchers, of indeterminate subspecies, were detected, all on the La Plata River in areas predicted to not be impacted by the Project; these birds were assumed to be migrants, as no nesting pairs or nests were observed (Sedgwick, 1994). The results suggest that very few willow flycatchers occur on these drainages, either during the breeding season or in migration. Surveys since conducted in the Project area and surrounding regions support this (Blakney 1997; Rhea Environmental Consulting 1997; Johnson and O'Brien 1998; Ecosphere Environmental Services, 1998; ENSR 1998a; ENSR 1998b; BLM 1998). Any potential impacts to southwestern willow flycatchers would be related to possible impacts to wetland/riparian vegetation. Reclamation's Biological Assessment (1995) concluded the Project would be unlikely to adversely affect the southwestern willow flycatcher, and on July 7, 1995, the Service provided Reclamation a memorandum concurring with the No Effect Determination for this species.

In October, 1999, while conducting the vegetation survey described above, ERI evaluated the potential riparian habitat in two possible impacted areas, one near Farmington and the other at the Hogback, where the proposed Navajo Nation Municipal Pipeline would cross the San Juan River. Willows were present in small patches at both crossing locations. As such, potential southwestern willow flycatcher habitat could be affected during construction of the pipeline.

The Animas, La Plata, and Mancos offer only marginal habitat for southwestern willow flycatchers (Sedgwick 1995) and usage is low. Greater threats to southwestern willow flycatcher than potential affects from depletions and minor hydrologic changes, are further habitat destruction and fragmentation from rapidly increasing development along these rivers. In areas not subject to aggressive residential building, grazing within the floodplain is not uncommon. In Reclamation's surveys, over 76% of the survey sites were grazed. Cowbird numbers increase with habitat fragmentation due to grazing and these nest parasites were noted at over 81% of the sites surveyed (Sedgwick 1995).

Wetland and riparian habitats impacted will be replaced through a mitigation program. The temporary impacts to potential habitat will not result in a shortage of suitable habitat considering the low population numbers in the project area.

Enhancement Opportunities

Reclamation realizes that suitable riparian habitat is key to not only listed species, but all wetland/riparian dependant species as well. We are therefore taking an ecosystem approach to mitigation for the Animas - La Plata project. In selecting mitigation sites, the needs of neotropical migrants, native fishes, and bald eagles all will be taken into consideration. Measures will be employed to maintain the riparian zone and regeneration of both willow and cottonwoods to ensure suitable habitat for many species, including the willow flycatcher. Areas slated for enhancement or restoration will also incorporate the needs of this species.

Summary/Conclusions

There is a potential impact to Southwestern willow flycatcher habitat at the crossing locations for the Navajo Nation Municipal Pipeline. These impacts can be avoided by staging construction activities at times when the birds are not present and revegetation with native willows after construction is completed. This activity may affect but is not likely to adversely affect Southwestern willow flycatcher.

MEXICAN SPOTTED OWL (*Strix occidentalis lucida*)

On November 4, 1991, the Mexican spotted owl (*Strix occidentalis lucida*) was proposed for listing as threatened. Reclamation, in conjunction with the Service, conducted a field survey designed to detect Mexican spotted owls in the Ridges Basin Reservoir area (Reclamation - ALP Final Supplement, 1996). No owls were detected, and it was determined that the species would not be affected by construction and operation of the Project. The Service concurred with this finding in an August 3, 1992, memorandum.

MOUNTAIN PLOVER (*Charadrius montanus*)

It is unlikely that mountain plover occur within the project area. In western Colorado, the mountain plover breeds only in the northern portion of the state and would therefore be unlikely to be affected by the Project. There would be no effect to this species by the Project.

BLACK-FOOTED FERRET (*Mustela nigripes*)

The black-footed ferret (*Mustela nigripes*), a member of the weasel family, is generally considered the rarest of all North American mammals (Armstrong 1972). It was listed as an endangered species by the Fish & Wildlife Service on March 11, 1967.

Distribution and Abundance

Black-footed ferrets were once thought to be extinct. Most are currently under capitivity in a Fish and Wildife Service conservation breeding program. Although the black-footed ferret was found over a wide area historically, it is difficult to make a conclusive statement on its historical abundance due to its nocturnal and secretive habits. The black-footed ferret's historical range, based on specimens collected since its identification, includes 12 States (Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah and Wyoming) and the Canadian Provinces of Alberta and Saskatchewan. There is prehistoric evidence of this ferret from Yukon Territory, Canada to New Mexico and Texas.

Although there are no specimen records for black-footed ferrets from Mexico, prairie dogs (*Cynomys* spp.) are established in Chihuahua and were present as far back as the Late Pleistocene-Holocene Age. Black-footed ferrets depend almost exclusively on prairie dogs for food and shelter and the ferret range coincides with that of prairie dogs. Since there is no documentation of black- footed ferrets breeding outside of prairie dog colonies, black-footed ferrets may have been historically endemic to northern Mexico (USFWS 1991).

Potentially, black-footed ferrets could occur in the Animas-LaPlata Project area. The last confirmed specimens from the Four-corners region are from the 1940s and 1950s (USFWS 1981 as cited in USFWS 1992). Unconfirmed sightings have occurred within the last few years from the Project area. However, there have been no verifiable recent sightings of this species near or within the Project area. Gunnison's prairie dogs are scattered throughout the area and, wherever prairie dogs are abundant, there remains the potential for the occurrence of black-footed ferrets.

Life Historv/Habitat Reauisites

Black-footed ferrets weigh between 1.5 and 3.5 lbs. They are short-legged, have long, well developed nonretractible curved claws, short rounded ears and relatively large eyes. After dark, the ferret's eyes show a green reflection from artificial light (Snow 1972; Chapman & Feldhamer 1982).

Mating takes place in early spring and the young are born about 41 days after gestation. The reproductive biology of *M. nigripes* is poorly documented. Black-footed ferrets are mainly nocturnal and appear above ground every few days. Adults of the opposite sex are found in the same prairie dog town but not in the same burrow system (Chapman & Feldhamer 1982).

Black-footed ferrets kill prey by attacking the neck and base of the skull. It has poor distance vision and moves close to the prairie dog or other small mammal prey before noticing it. Diet includes mice, ground squirrels, cottontail rabbits but primarily prarie dogs. Potential predators include coyotes, badgers, great horned owls, ferruginous hawks, golden eagles, red fox, bobcats and rattlesnakes (Forrest et al. 1985).

The traveling gait of the black-footed ferret is a slow gallop or series of jumps. They produce a pungent odor from their anal glands and, when irritated, they discharge the odor which can be detected at some distance (Chapman & Feldhamer 1982).

It is well established that the black-footed ferret is associated primarily with prairie dogs and prairie dog towns. Although ferrets have been seen under haystacks, in alfalfa fields, and buildings, most of these sightings occur during the time of dispersal and in most cases are probably temporary (Snow 1972).

<u>Impacts</u>

No documented prairie dog colonies of sufficient size to support black-footed ferrets are known to be located in the project area and no recent confirmed sightings of black-footed ferrets in the Project area. Reclamation's Biological Assessment (1995) concluded the Project would be unlikely to adversely affect the black-footed ferret, and on July 7, 1995, the Service provided Reclamation a memorandum concurring with the No Effect Determination for the black-footed ferret.

The Farmington to Shiprock pipeline route was surveyed in late summer 1999. No prairie dog colonies of sufficient size to support black footed ferrets are known to be located along the route. Therefore, the project, including the Farmington to Shiprock pipeline route, would have no effect on black footed ferret.

CANADA LYNX (*Lynx canadensis*)

It is unlikely that Canada lynx occur within the project area. On rare occasion, lynx (recently reintroduced in mountainous of northern and central Colorado) may travel across northern portions of the project area, but resident animals are improbable because the habitat is far from ideal for lynx, which prefer cooler, moister, more forested habitats. Therefore, the project would have no effect on the Canada lynx.

BOREAL TOAD (*Bufo boreas boreas*)

The boreal toad (*Bufo boreas boreas*) is a candidate species for federal listing that is only known to inhabit montane wetlands with an elevation greater than 8,500 ft. The entire area that might be affected by the preferred alternative of the ALP is at an elevation less than 8,500 ft.; therefore the Project would have no effect on the boreal toad.

MANCOS MILK-VETCH (*Astragalus humillimus*)

The Project area (except for the Farmington to Shiprock pipeline) was never surveyed for Mancos milk-vetch (which was added to the protected species list since the Final Supplement, 1996), despite being within its described range. Mancos milk-vetch grows on ledges and mesa tops of Point Lookout Sandstone, which is not found on the Project area. The surveys completed in late summer 1999 did not find any Mancos milk vetch along the proposed Farmington to Shiprock pipeline route. The Project would have no effect on the Mancos milk-vetch.

MESA VERDE CACTUS (*Sclerocactus mesae-verdae*)

Initial floral field surveys (Owen 1975; Spellenburg 1976) conducted in the project area failed to identify the presence of Mesa Verde cactus within the area of potential impact. Field surveys in 1999 did not identify the presence along the proposed Farmington to Shiprock pipeline route. There would be no effect on the Mesa Verde cactus.

KNOWLTON'S CACTUS (*Pediocactus knowltoni*)

Initial floral field surveys (Owen 1975; Spellenburg 1976) conducted in the project area failed to identify the presence of Knowlton's cactus within the area of potential impact. Field surveys in 1999 did not identify the presence along the proposed Farmington to Shiprock pipeline route. There would be no effect on the Knowlton's cactus.

SLEEPING UTE MILK-VETCH (*Astragalus tortipes*)

Sleeping Ute milk-vetch is only known from the southern flank of Sleeping Ute Mountain where it grows in mixed desert shrub communities on Mancos Shale badlands. There is no Mancos Shale in the project area. Field surveys in 1999 did not identify the presence along the proposed Farmington to Shiprock pipeline route. There would be no effect to the Sleeping Ute Milk vetch.

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Attachment G - Part 2

Biological Opinion

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
755 Parfet Street, Suite 361
Lakewood, Colorado 80215

IN REPLY REFER TO:
ES/GJ-6-CO-00-F-016
MS 65412 LK

JUN 19 2000

Memorandum

To: Area Manager, Western Colorado Area Office, Bureau of Reclamation, Grand Junction, Colorado

From: Colorado Field Supervisor, Fish and Wildlife Service, Ecological Services, Lakewood, Colorado

Subject: Final Biological Opinion for the Animas - La Plata Project, Colorado and New Mexico

In accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.), and the Interagency Cooperation Regulations (50 CFR 402), this transmits the Fish and Wildlife Service's final biological opinion for impacts to federally listed threatened and endangered species for the Animas-La Plata Project.

This biological opinion is in response to your December 22, 1999, memorandum and biological assessment for the Animas-La Plata Project. This is a reinitiation of consultation for the Animas-La Plata Project based on changes to the proposed project and new information on the species that was not considered in 1996. This biological opinion supercedes all previous biological opinions on the Animas-La Plata Project. The Service concurs with your conclusion that the proposed project may affect, but is not likely to adversely affect the Southwestern willow flycatcher (*Empidonax traillii extimus*). The Service also concurs with your "no effect" determination for the following listed and proposed species: Mexican spotted owl (*Strix occidentalis lucida*), black-footed ferret (*Mustela nigripes*), Canada lynx (*Lynx canadensis*), mountain plover (*Charadrius montanus*), Mancos milk-vetch (*Astragalus humillimus*), Mesa Verde cactus (*Sclerocactus mesae-verdae*), and Knowlton's cactus (*Pediocactus knowltonii*). The Service appreciates your evaluation of candidate species and concurs with your "no effect"determination for the boreal toad (*Bufo boreas boreas*) and Sleeping Ute milk-vetch (*Astragalus tortipes*). The Service concurs that the proposed project may affect the Colorado squawfish[1] (*Pychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), and bald eagle (*Haliaeetus leucocephalus*).

Consultation History

The Animas-La Plata Project has been in the planning process since the early 1960's and resulted in the preparation of a Definite Plan Report in 1979. At that time, Region 2 entered into formal section 7 consultation with Reclamation and rendered a biological opinion on

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[1]The American Fisheries Society has changed the common name of the Colorado squawfish to Colorado pikeminnow (Nelson et al. 1998), therefore, it will be referred to as the Colorado pikeminnow in this document.

December 28, 1979 (2-22-80-F-13). The 1979 biological opinion addressed the potential effects of the proposed Project on the endangered Colorado pikeminnow, bald eagle, and peregrine falcon (*Falco peregrinus*). Based on the capture of a single juvenile Colorado pikeminnow in the San Juan River at the mouth of McElmo Creek near Aneth, Utah, it was concluded that ". . . the proposed project is likely to further degrade the San Juan River to a point that this population will be lost. However, because of the apparent small size of the San Juan River pikeminnow population and its already tenuous hold on survival, its possible loss should have little impact on the successfully reproducing Green and Colorado Rivers pikeminnow populations and, therefore, the species itself."

During the 1979 consultation, there was a wintering population of approximately 20 bald eagles and one active nest site along the Animas River, and the Service concluded that reductions in streamflow would not significantly affect the eagle's food base of the Animas River or use of the area. While a historical aerie for peregrine falcons exists within the project area, it has been unoccupied since 1963, and there was no evidence of breeding activity or sightings in or around the immediate Project area. In addition, the Colorado Division of Wildlife determined that the surrounding hunting habitat is of marginal quality (Jerry Craig, CDOW, pers. comm.).

The 1979 biological opinion found the project was unlikely to jeopardize the continued existence of any of the three species identified above; however, several recommendations were made regarding Colorado pikeminnow and bald eagles in furtherance of their conservation. It was recommended that a Bald Eagle Management Plan be developed for project reservoirs. For Colorado pikeminnow, it was recommended that:

1. native fish populations of the San Juan River be thoroughly surveyed,

2. environmental needs of Colorado pikeminnow be determined,

3. an attempt be made to meet the above needs by adjusting projects on the San Juan River drainage, and

4. artificial facilities be provided and funded, in which to spawn and rear Colorado pikeminnow until such time that suitable habitats in the San Juan River can be developed and maintained.

Fishery surveys conducted from May 1987 to October 1989, found ten adult and 18 young-of-year Colorado pikeminnow and the presence of adult razorback sucker in the San Juan River (Platania et al. 1991). Based on this new biological information, Reclamation reinitiated section 7 consultation on February 6, 1990, and provided the Service with an updated biological assessment of project impacts on Colorado pikeminnow. On May 7, 1990, the Service issued a draft biological opinion concluding that the project would jeopardize the continued existence of the Colorado pikeminnow. No reasonable and prudent alternatives were identified at that time. Reclamation and the Service began actively seeking reasonable and prudent alternatives and in a March 4, 1991, letter Reclamation proposed a reasonable and prudent alternative to preclude the likelihood of jeopardy from the project. On August 6, 1991, the Service issued an updated Recovery Plan for the Colorado pikeminnow that identified the San Juan River from Farmington, New Mexico, to Lake Powell as a recovery area. The Service issued a final biological opinion for the Animas-La Plata Project on October 25, 1991, that concluded the project as proposed would likely jeopardize the continued existence of the Colorado pikeminnow and razorback sucker. The reasonable and prudent alternative in that opinion included: (1) an Animas-La Plata Project that was scaled back so that its initial stage would result in an initial depletion[2] of 57,100

[2]The Service defines a depletion as the amount of water that is not returned to a river system due to project implementation, i.e., the amount diverted minus return flows, plus evaporation loss from new reservoirs or ponds, equals the depletion.

acre-feet, (2) 7 years of research to determine endangered fish habitat needs, (3) operation of the Navajo Dam to provide 300,000 acre-feet/year of water for a wide range of flow conditions for the endangered fish 96 percent of the time, (4) a guarantee that the Navajo Reservoir will be operated for the life of the project to mimic a natural hydrograph and such operation would be based on the research, (5) legal protection for the reservoir releases to and through the endangered fish habitat to Lake Powell, and (6) a commitment to develop and implement a Recovery Implementation Program for the San Juan River. A Memorandum of Understanding and Supplemental Agreement to protect the releases for endangered fishes made from the Navajo Reservoir to and through the endangered fish habitat of the San Juan River to Lake Powell was signed in October 1991.

The 1991 opinion also concluded that the project was not likely to jeopardize the continued existence of the bald eagle. Development and implementation of a Bald Eagle Management Plan was included as a conservation recommendation.

As a result of the reasonable and prudent alternative in the 1991 biological opinion, the San Juan River Basin Recovery Implementation Program was formulated in 1992.

During informal consultation the Service determined that no threatened or endangered plant species would be impacted by the project. Also, after surveys were conducted, the Service concurred with Reclamation's no affect determination for the Mexican spotted owl.

In 1991, the razorback sucker was listed as endangered (56 FR 54957) and in 1994 critical habitat was designated for the Colorado pikeminnow and razorback sucker (59 FR 13374). The critical habitat designation includes the San Juan River from Farmington, New Mexico to Lake Powell. Based on these new listings, Reclamation reinitiated section 7 consultation on the Animas-La Plata Project. A biological opinion issued by Region 6 of the Service on February 26, 1996, for the Animas-La Plata Project found that the proposed development and subsequent depletion of 149,220 acre-feet of the San Juan River's flow would jeopardize the continued existence of the endangered Colorado pikeminnow and razorback sucker and adversely modify or destroy their critical habitat. A reasonable and prudent alternative that removed jeopardy and adverse modification to critical habitat was identified. The reasonable and prudent alternative includes: (1) an Animas-La Plata Project that scaled back to only result in an initial depletion of 57,100 acre-feet (Phase 1, Stage A only), (2) research to determine endangered fish habitat needs, (3) operation of the Navajo Dam to provide 300,000 acre-feet/year and a wide range of flow conditions for the endangered fish, including low winter flows, (4) a procedure to implement flow recommendations, (5) a commitment to release peak flows out of Navajo Dam as agreed upon with the Biology and Navajo Dam Operating Committees, (6) a guarantee that, based on the results of the research program and dependent upon the prevailing hydrology, Navajo Dam will be operated for the life of the Animas-La Plata Project to mimic a natural hydrograph (Bureau of Reclamation had agreed under section 7(a)(1) to reoperate Navajo Dam for recovery of endangered fishes), and (7) legal protection for the reservoir releases instream to and through the endangered fish habitat to Lake Powell.

In the 1996 opinion, the Service also determined that the proposed project "may affect" the bald eagle; and concurred that the proposed project was not likely to adversely affect the peregrine falcon, the southwestern willow flycatcher, or the black-footed ferret. Impacts to bald eagles were related to potential impacts to riparian vegetation associated with later stages of the proposed project not authorized under the Reasonable and Prudent Alternatives and potential bioaccumulation of contaminants in the prey base associated with Ridges Basin Reservoir.

Conservation Recommendations included in the 1996 opinion were developed to address the following concerns related to bald eagles:

1. A cooperative management plan be developed and implemented that emphasizes habitat management and protection.

2. Flow management strategies be implemented on the La Plata River to reduce impacts to future cottonwood recruitment areas.

3. Identification of canals that support important bald eagle habitat (cottonwood trees) and develop a strategy to avoid loss of the trees.

4. Develop a long term monitoring program that evaluates water quality in the Animas, La Plata and Mancos Rivers, including a determination whether heavy metals and selenium contamination become bioaccumulated in the food chain and become deleterious to bald eagles.

The Service also recommended a comprehensive environmental contaminant sampling and monitoring program be implemented by Reclamation at a number of sites.

Related Project Consultations

The San Juan River Recovery Implementation Program was initiated in October 1992 to address recovery needs for the two endangered fish, while allowing for water development in the basin in compliance with Federal and State laws, interstate compacts, Supreme Court decrees, and Federal trust responsibilities to the Southern Utes, Ute Mountain Utes, Jicarillas, and the Navajos. At the inception of the cooperative effort to formulate the Program, participants agreed that a relatively small amount of water was to be set aside to accommodate small individual requests for its use. That amount was fixed at an annual aggregate of 3,000 acre-feet. For 6 years, requests for these minor depletions were consulted on individually until the fall of 1998, when the 3,000 acre-feet ceiling was reached. The Service then, based on the information gained by the research activities of the Program and on a review of the types and amounts of depletions that have comprised the projects encompassed by the previous 3,000 acre-feet block of water, consulted on the aggregate, rather than the individual depletions for another block of 3,000 acre-feet. Since that time, it has been determined that some of the depletions included in the original 3,000 acre-feet block were double counted or were historical depletions and should not have been counted toward the original 3,000 acre-feet block. Recent investigations by the State of New Mexico and Colorado have determined that only 1,500 acre-feet of new minor depletion occurred during the 6 year period.

The 3,000 acre-feet block of water discussed above is intended to address minor depletions of up to approximately 100 acre-feet/year. Projects with larger depletions require individual consultations. In 1997, the Corps of Engineers initiated consultation for a new intake structure for the City of Durango on the Animas River. On March 17, 1998, the Service issued a biological opinion (GJ-6-CO-97-F-026) to the Corps of Engineers. The consultation involved an average annual water depletion of 1,439 acre-feet. A new depletion of 1,051 acre-feet/year and a historic depletion of 388 acre-feet/year. The City of Durango described the water supply that is currently provided by the new Gateway Pump Station as the same water supply as the Durango Municipal and Industrial Pipeline feature of the proposed Animas-La Plata Project. The City of Durango plans to abandon the new pump station when the Animas-La Plata Project is completed and obtain their water supply from Ridges Basin Reservoir through the proposed pipeline. Because section 7 consultation has been completed for 1,439 acre-feet/year, the hydrological analysis for the Animas-La Plata Project includes this amount in the environmental baseline for the proposed Animas-La Plata Project. However, because the City of Durango intends to use Animas-La Plata project water in the future, instead of the new Gateway Pump Station, the description of the Animas-La Plata Project states the project would deplete 57,100 acre-feet/year. Describing the water for the City of Durango is a unique situation, because it is part of the environmental baseline, yet it is also part of the proposed Animas-La Plata Project. Of the 57,100 acre-feet/year for the Animas-La Plata Project, 1,439 acre-feet/year is an existing depletion by the City of Durango.

The Service consulted with the Bureau of Indian Affairs on Blocks 1 through 8 of the Navajo Indian Irrigation Project in 1991 and again in 1994 after critical habitat was designated for the

Colorado pikeminnow and razorback sucker. Blocks 1 through 8 involved an average annual depletion of 149,420 acre-feet. In May 1999, the Biology Committee for the Program, issued flow recommendations for the San Juan River (Holden 1999). Mimicry of the natural hydrograph is the foundation of the flow recommendations. The recommendations provide information on the specific frequency and duration of flows recommended for spring peak releases from Navajo Reservoir. Recommendations for the base flow period are also provided. In 1999, after analyzing the flow recommendations and considering project elements designed to support recovery of the endangered fishes, the Service concurred with a determination of the Bureau of Indian Affairs that the completion of the NIIP (Blocks 9-11 with an average annual depletion of 120,580 acre-feet/year and a total depletion for all Blocks of 270,000 acre-feet/year) may affect but is not likely to adversely affect the endangered Colorado pikeminnow and razorback sucker, and is not likely to adversely modify or destroy designated critical habitat within the San Juan River Basin for the two fish.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The project analyzed in this biological opinion is the preferred alternative identified as "Refined Alternative 4" in the 2000 Draft Supplemental Environmental Impact Statement and described in the biological assessment. This alternative includes both structural and nonstructural components designed to achieve the fundamental purpose of securing the Colorado Ute Tribes an assured water supply in satisfaction of their water rights as determined by the 1986 Settlement Agreement and the 1988 Settlement Act and by providing for identified M&I water needs in the Project area. The Project area is located in southwestern Colorado and northwestern New Mexico and includes portions of La Plata and Montezuma Counties, Colorado and portions of San Juan County, New Mexico. The Southern Ute, Ute Mountain Ute, and portions of the Navajo Indian Reservation are included in the project area.

The structural component includes an off-stream storage reservoir (approximately 120,000 acre-feet total capacity) with a conservation pool of approximately 30,000 acre-feet; a pumping plant (up to approximately 280 cubic feet per second of capacity); and a reservoir inlet conduit, all designed to pump and store water from the Animas River. The proposed project would also include a pipeline designed to transport treated municipal water from Farmington, New Mexico to the Shiprock area in New Mexico (Navajo Nation Municipal Pipeline). The proposed reservoir would be located in Ridges Basin, near Durango, Colorado. The annual average water depletion from these project components is 57,100 acre-feet. A portion of this depletion (1,439 acre-feet/year) is an existing depletion by the City of Durango.

Consumptive use of water from Ridges Basin Reservoir will be restricted to M&I uses only and will be allocated in approximately the following manner[3]:

Southern Ute Tribe (M&I)	19,980 acre-feet/year depletion
Ute Mountain Ute Tribe (M&I)	19,980 acre-feet/year depletion
Navajo Nation (M&I)	2,340 acre-feet/year depletion
A-LP Water Conservancy District (M&I)	2,600 acre-feet/year depletion
San Juan Water Commission (M&I)	10,400 acre-feet/year depletion

Under the allocation shown above, the Colorado Ute Tribes are still approximately 13,000 acre-feet short of the total quantity of depletion recognized in the settlement agreement. Therefore, the proposed action includes a nonstructural element which would establish and utilize a water acquisition fund which the Tribes could use to acquire water rights on a willing buyer/willing seller basis in an amount sufficient to allow the Tribes approximately 13,000 acre-feet/year of depletions in addition to the depletions available from the structural component

[3]The balance of 57,100 acre-feet/year is lost to evaporation.

of the project. Water could be acquired in the Pine, Florida, Animas, La Plata and Mancos Rivers and McElmo Creek. Preliminary cost estimates indicate that a one-time fund of approximately $40,000,000 would be required to purchase the additional rights. However, to provide flexibility in the use of the fund, authorization would allow some or all of the funds to be redirected for on-farm development, water delivery infrastructure, and other economic development activities.

The proposed Durango Pumping Plant would pump water from the Animas River and lift it through the Ridges Basin inlet conduit over the ridge above Bodo Creek into Ridges Basin Reservoir. The pumping plant would be located on the west side of the river across from Santa Rita Park, 1.6 miles downstream from the center of Durango, Colorado. The intake structure would conduct water from the river through control gates and to a fish screen, then into a covered basin that serves as a forebay for the pumping plant. The entrance to the intake structure would consist of a sloping grate, 48 feet long, situated to conform to the riverbank and designed to exclude the entry of debris into the control gates. The fish screen, 80 feet back from the river, would be designed to keep fish greater than 2 inches long from passing, and all fish would be channeled back to the river by the velocity in a bypass pipe at the base of the screen. The intake structure would be covered except for the fish screen area that would be open to facilitate cleaning and maintenance. Five pumps would provide a maximum of 280 cfs and four smaller pumps would handle lower flows, trim flows between the large pumps, and provide backup in case one of the large pumps went out of service

Ridges Basin Reservoir, would be formed following construction of Ridges Basin Dam on Basin Creek, approximately 3 miles upstream from its confluence with the Animas River. To retain 120,000 acre-feet, and provide for flood storage, requires a dam with a crest elevation of 6,892 feet. Ridges Basin Dam will be a rolled earthfill structure with a height of about 217 feet above the streambed. The dam site is defined by narrowing of the downstream end of Ridges Basin with a prominent sandstone ridge to the northeast of Basin Creek and two sandstone, and siltstone ridges about 500 feet apart. A tunnel through the left abutment would serve as the reservoir outlet. The outlet works include an intake approach channel, intake structure, an upstream pressurized tunnel, gate chamber with access tunnel, open channel flow downstream tunnel, and stilling basin and discharge channel. The main gates would have an emergency release capacity of 1,500 cfs while secondary jet-flow valves would control releases of up to 100 cfs and 150 cfs. Flanges would be provided to connect future distribution pipelines. Basin Creek drops about 420 feet elevation along its 3.2-mile course from the dam to the Animas River.

The reservoir formed behind the dam is expected to flood an area of approximately 1,500 acres and extend about 2.4 miles up Basin Creek, with a capacity of 120,000 acre-feet. The reservoir would include useable storage of 90,000 acre-feet with a conservation pool of 30,000 acre-feet for recreation, water quality, and to maintain a fishery. The reservoir is expected to be drawn to or slightly below the 30,000 acre-feet level during extended periods of drought. The only mode of water release from Ridges Basin Reservoir identified at this time, is through the dam outlet works (i.e., left abutment tunnel and spillway) down Basin Creek.

Reclamation proposes to use Basin Creek as a means to convey project water from Ridges Basin Reservoir to the Animas River for future project demand. The conveyance system is designed for releases of up to 250 cfs, but the periodicity and timing of releases are undefined at this time. Since historic high flows in Basin Creek are only 65 cfs, channel modification will be required. Reclamation proposes to reduce the impact to Basin Creek channel wetlands and riparian vegetation by means of erosion and siltation controls that use a series of check and drop structures, or vortex weirs. According to Reclamation, the implementation of these controls would produce an increase in silt transport initially but would stabilize with use. Some wetlands could be created over time. The creek bed would be realigned into gentle curves and graded to create relatively flat slopes.

The Navajo Nation Municipal Pipeline will deliver 4,560 acre-feet (2,340 acre-feet of depletion) of M&I water from the ALP. The 4,560 acre-feet of water represents about one-half of the M&I requirements of the eight Navajo chapters located along the route of the pipeline. These eight chapters include: Shiprock, Cudei, Hogback, Nenahnezad, Upper Fruitland, San Juan, Sanostee, and Beclaibito. The Farmington to Shiprock pipeline will be approximately 29 miles long, and will replace an existing ductile iron line. The new pipeline will follow the same alignment as the old pipeline. The replacement pipeline will begin at the western boundary of the City of Farmington on the north side of the San Juan River and terminate at the Cortez storage tanks in Shiprock. The pipeline would cross the San Juan River twice. The diameter of the pipeline will be 24 inches at its beginning and decrease to 20 inches at its terminus in Shiprock.

Future use of most of the project water has not been identified, therefore, Reclamation developed non-binding scenarios to model potential future water use as shown in Table 1. The Service is not consulting on the individual projects listed in Table 1, but on a block of water resulting in an average annual depletion of 57,100 acre-feet. As individual projects are developed that use Animas-La Plata Project water or facilities, Reclamation or another appropriate Federal agency will analyze the project and determine if any threatened or endangered species may be affected in a manner that was not considered in this biological opinion. If the determination is "may affect" for any listed species, Reclamation or another designated lead Federal agency will consult with the Service on the individual project proposal.

Table 1. Water Supply by Non-binding potential Uses for the Preferred Alternative.

Water Supply by Use for the Preferred Alternative				
Category	**Diversion (acre-feet)**	**Depletion (acre-feet)**	**Diversion Location**	**Return Flow Location**
Southern Ute				
Florida Mesa housing	140	70	Ridges Basin	Animas at Florida Confluence
Animas River Basin housing	140	70	Ridges Basin	Animas at Florida Confluence
La Plata River Basin housing	140	70	Ridges Basin	La Plata at Farmington
Animas Ind. Park M&I	40	20	Ridges Basin	Animas at Florida Confluence
Ridges Basin golf course	796	398	Ridges Basin	Ridges Basin
Ridges Basin Resort	44	22	Ridges Basin	Ridges Basin
Coal mine	830	415	Ridges Basin	La Plata at state line
Coal fired power plant	27,000	13,500	Ridges Basin	La Plata at state line
Livestock + wildlife	30	15	Ridges Basin	La Plata at state line
Southern Ute Total	**29,160**	**14,580**		
Ute Mountain Ute				
La Plata housing	280	140	Ridges Basin	La Plata at state line
Mancos Canyon Golf Course	978	489	Ridges Basin	Mancos River
Mancos Canyon Resort	33	17	Ridges Basin	Mancos River
Gas power plant	4,600	2,300	San Juan at SJPP	San Juan above Shiprock
Livestock & wildlife	40	20	Ridges Basin	La Plata at state line
La Plata Basin Resort	30	15	Ridges Basin	La Plata at state line
La Plata Basin Golf Course	626	313	Ridges Basin	La Plata at state line
La Plata Basin Dude Ranch	10	5	Ridges Basin	La Plata at state line
Ute Mountain Ute Total	**6,597**	**3,299**		
Regional Water Supply				
Durango	15,338	7,669[4]	Ridges Basin	Animas R. below pump
Bloomfield & Upstream uses	4,533	2,267	San Juan-Cit. Ditch	San Juan at Farmington
Farmington	28,373	14,187	Farmington M&I Div	San J. below Animas Confluence
Florida Mesa	7,016	3,508	Ridges Basin	Animas at Florida Confluence
Red Mesa Plateau	2,105	1,052	Ridges Basin	La Plata at state lines
Kirtland, NM	7,016	3,508	Farmington M&I Div	San Juan above Hogback
Aztec, NM	4,911	2,456	Aztec M&I Div	Animas R. at Farmington
Less - ALP Water Cons. Allocat.	-5,200	-2,600		
San J. Water Comm. Allocat.	-20,800	-10,400		
Total Regional Water Supply	**43,292**	**21,646**[5]		
Total Ute Settlement	***79,050***	***39,525***		
Other Uses				
Navajo Nation	4,680	2,340	Farmington M&I Div	Shiprock below gage
ALP water conservancy	5,200	2,600	See Regional Water Supply	
San Juan Water Commission	20,800	10,400	See Regional Water Supply	
Ridges Basin Evaporation	2,235	2,235	Ridges Basin	none
Total Other Uses	**32,915**	**17,575**		
			Range of depletions at Four Corners, New Mexico 8,200 - 100,500 acre-feet/year	
Total Water Use	***111,965***	***57,100***		
Design total	***111,965***	***57,100***		
Design - Calculated Use	***(0)***	***(0)***		

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[4] Includes water supply for Durango already consulted on between Durango/Corps of Engineers/Service.

[5] The Colorado Ute Tribes acknowledge that they have not satisfied the present legal requirements necessary to serve regional needs in New Mexico.

Conservation Measures

Conservation measures are actions that the action agency agrees to implement to further the recovery of the species under review. The beneficial effects of conservation measures were taken into consideration for determining both jeopardy and incidental take analyses and all hydrology analyses considered in this biological opinion assume implementation of these conservation measures, including the reoperation of Navajo Dam. Reclamation agrees that failure to implement the conservation measures will be grounds for reinitiation of consultation.

1. Under this conservation measure, Reclamation is committing to operate Navajo Reservoir to mimic the natural hydrograph of the San Juan River to benefit endangered fishes and their critical habitat. Mimicry of the natural hydrograph will be achieved by following the San Juan River flow recommendations (Holden 1999, see Tables 2 and 3) and subject to completion of the Navajo Operations EIS and execution of a Record of Decision. The flow recommendations provide recommended reservoir operating rules that were developed in cooperation with Reclamation (see Tables 4 and 5, and Figure 1). Reclamation is in the process of preparing an EIS addressing the operation of Navajo Reservoir to meet the flow recommendations. After completion of the Navajo Reservoir EIS, if Reclamation determines that the existing or future revised flow recommendation cannot be met, reinitiation of section 7 consultation will be required on the Animas-La Plata Project[6] (see reinitiation notice). The San Juan River Basin Recovery Implementation Program uses an adaptive management process that involves annual monitoring and continued research, so the flow recommendations may be refined in response to new information. The Service will periodically review operation of Navajo Dam to determine if the flow recommendations are being met.

The Service anticipates that flows provided through the implementation of the existing or future revised flow recommendations and other recovery actions (such as, but not limited to, fish passage, nonnative fish control, habitat restoration as described in the San Juan River Recovery Implementation Program's Long Range Plan) will provide a positive population response for Colorado pikeminnow and razorback sucker. The Service is currently developing recovery goals for the Colorado pikeminnow and razorback sucker. Information from the recovery goals will be used to determine a positive population response. If a population meets or exceeds the recovery goals for the San Juan River, it will be considered to exhibit a positive population response. However, prior to meeting recovery goals, criteria for determining a positive population response must be established. Therefore, before construction of Ridges Basin Reservoir or within one year of the date of this biological opinion (which ever comes first), Reclamation will develop criteria to determine a positive population response for concurrence by the Service. Reclamation will consult with the Biology Committee of the San Juan River Recovery Implementation Program in developing the criteria.

A monitoring plan is being developed by the Program and will be used to track the status and trends of endangered fishes. The monitoring plan will determine the relative annual reproductive success of Colorado pikeminnow and razorback sucker, determine size-structure of adult and juvenile fishes, track changes in abiotic parameters (water quality, channel morphology, and habitat) and provide detailed analyses of data collected to help determine progress toward recovery in 2003 and every 5 years thereafter. Information from the San Juan River Monitoring Program will be used to determine population responses. If the flow recommendations or other recovery actions do not result in a positive population response for both species within the time frames established in the criteria and as determined by the Service, reinitiation of section 7 consultation will be required[6] (see reinitiation notice).

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[6]Numerous section 7 consultations in the San Juan River Basin rely on the operation of Navajo Dam to remove jeopardy; therefore, this requirement would apply to many section 7 consultations.

2. Conservation measure number one and many other projects in the San Juan River Basin rely on the hydrology modeling that was done for the San Juan flow recommendations (Holden, 1999) and for the Animas-LaPlata Project. RiverWare was selected as the model to simulate flows in the San Juan River and to model the effects of water development in the basin. Modification of the model to simulate the effects of the Animas-La Plata Project was an extension of the RiverWare model. The San Juan River Recovery Implementation Program recently designated the responsibility of maintaining and updating the model to Reclamation. Reclamation is now the "keeper" of the model. As such, Reclamation would be responsible for maintaining the model and its data, within the guidelines provided by the Recovery Program's committees.

The model is also one of the tools being used in preparation of the Navajo Operation EIS. A Modeling Group, consisting of people trained and experienced in hydrology, has been established to help on the operation EIS and includes the Corps of Engineers, New Mexico Interstate Stream Commission, San Juan Water Commission, Bureau of Indian Affairs, City of Farmington, Jicarilla Apache Tribe, the Navajo Nation, Southwestern Water Conservation District, Fish and Wildlife Service, and the Colorado Water Conservation Board. Many of the same people serve on the Recovery Program committees. This group of hydrologists provides the expertise and appropriate forum to continually peer review the model and its results from many perspectives.

In order to insure the accuracy of the model, Reclamation will take actions necessary to have an independent review of the model conducted. Reclamation will coordinate the review with the Service and seek the Service's concurrence with the model results. The review and the coordination will be completed within one year of the date of this biological opinion.

3. A Memorandum of Understanding and Supplemental Agreement to protect the releases for endangered fishes made from the Navajo Reservoir to and through the endangered fish habitat of the San Juan River to Lake Powell was signed in October 1991. This MOU remains in effect.

4. The Durango Pumping Plant will be operated in a manner that insures that its operations do not interfere with meeting the target flows recommended for the San Juan River. Pumping would be decreased or stopped during certain periods in order to meet the recommended target flows. If there have been no endangered fish releases from Navajo Dam for two consecutive years and the planned release for the current year is the minimum release specified in the flow recommendation report, the Durango pumping plant would be turned off during June, allowing an additional 280 cfs to help meet flow recommendations for endangered fish in the San Juan River. After satisfying all downstream senior water rights demands and downstream Animas-La Plata Project water demands, pumping will be further limited to allow the following bypass flows in the Animas River at the pumping Plant intake; October through November - 160 cfs, December through March - 125 cfs, and April through September - 225 cfs.

5. Reclamation will implement all actions necessary to prevent escapement of nonnative fishes from Ridges Basin Reservoir in any water leaving the reservoir. Reclamation will consider the escapement of eggs and larvae in the design of a escapement devise or method. Reclamation will monitor any water leaving Ridges Basin Reservoir to determine if escapement of nonnative fishes is occurring. If escapement is occurring, Reclamation will develop and implement a plan to stop escapement. The plan will be approved by the Service prior to implementation.

6. Reclamation will develop and implement a monitoring program for potential adverse bioaccumulation of trace elements in bald eagle food items in Ridges Basin Reservoir. If the monitoring program identifies a problem with trace elements, Reclamation will develop and implement an action plan to minimize impacts to bald eagles.

7. Reclamation will incorporate bypass flows into ALP project operations to promote natural recruitment of cottonwood trees along the Animas River. These flows are compatible with the San Juan River flow recommendations for endangered fishes. This should avoid impacts to future bald eagle habitat.

8. All electrical transmission lines associated with the project will be designed to avoid injury to raptors, including bald eagles.

Table 2
Summary of flow recommendation for critical habitat of the endangered fish in the San Juan River (see Holden 1999 for full recommendations).

A.	Category:	Flows > 10,000 cfs during runoff period (March 1 to July 31)
	Duration:	**5 days minimum**, natural variability maintained by meeting the conditions in Table 3.
	Frequency:	**20 percent on average**. Minimum frequency for other durations listed in Table 3. Maximum period without meeting at least 97 percent of the specified conditions is 10 years.
B.	Category:	Flow > 8,000 cfs during runoff period.
	Duration:	**10 days minimum**, natural variability maintained by meeting the conditions in Table 3.
	Frequency:	**33 percent on average**. Minimum frequency for other durations listed in Table 3. Maximum period without meeting at least 97 percent of the specified conditions is 6 years.
C.	Category:	Flow > 5,000 cfs during runoff period.
	Duration:	**21 days minimum,** natural variability maintained by meeting the conditions in Table 3.
	Frequency:	**50 percent on average**, minimum frequency for other durations listed in Table 3. Maximum period without meeting at least 97 percent of the specified conditions is 4 years.
D.	Category:	Flow >2,500 cfs during runoff period.
	Duration:	**10 days** minimum, natural variability maintained by meeting the conditions in Table 3.
	Frequency:	**80 percent on average**, minimum frequency for other durations listed in Table 3. Maximum period without meeting at least 97 percent of the specified conditions is 2 years.
E.	Category:	Peak timing similar to historical conditions, including variability.
	Timing:	Mean peak with operation to be within 5 days ± of historical period mean.
	Variability:	Standard deviation of date of peak to be 14 to 25 days.
F.	Category:	Target Base Flow (mean weekly non-spring runoff flow).
	Level:	500 cfs from Farmington (measured as the average of any two of the following gages: Farmington, Shiprock, Four Corners, and Bluff) to Lake Powell, with 250 cfs minimum from Navajo Dam. The target flow should be maintained between 500 and 600cfs in critical habitat, attempting to maintain target flow closer to 500 cfs.
G.	Category:	Flood Control Releases (incorporated in operating rule).
	Control:	Handle flood control releases as a spike (high magnitude, short duration) and release when flood control rules require, except that the release shall not occur earlier than September 1. If an earlier release is required, extend the duration of the peak of the release hydrograph. A ramp up and ramp down of 1,000 cfs per day should be used to a maximum release of 5,000 cfs. If the volume of water to release is less than that required to reach 5,000 cfs, adjust the magnitude of the peak accordingly, maintaining the ramp rates. Multiple releases may be made each year. These spike releases shall be used in place of adjustments to base flow.

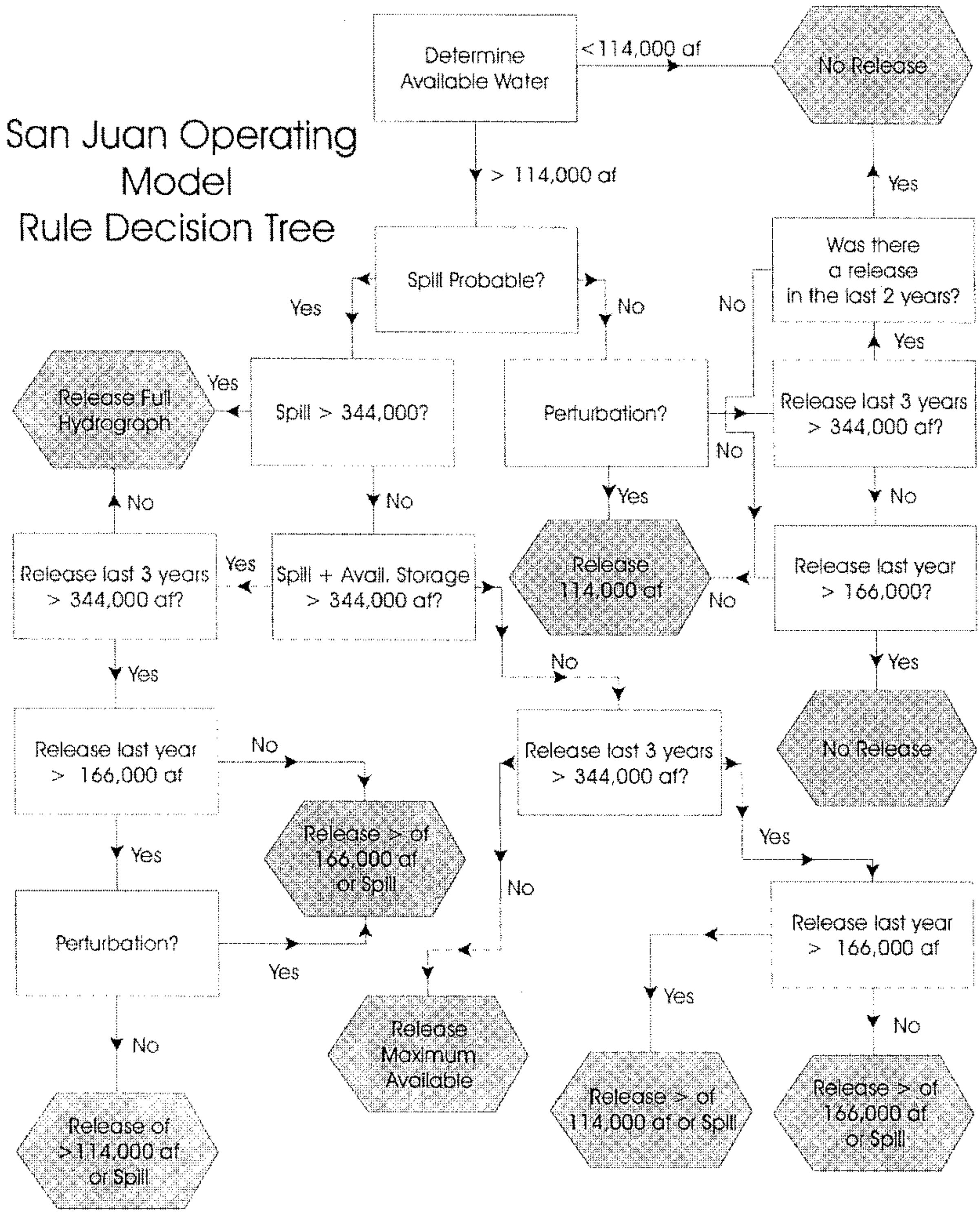
Table 3 Frequency Distribution Table for Flow/duration Recommendations				
	Discharge			
	>10,000 cfs	**>8,000 cfs**	**>5,000 cfs**	**>2,500 cfs**
Duration	**Average Frequency**			
1 day	30%	40%	65%	90%
5 days	20%	35%	60%	82%
10 days	10%	33%	58%	80%
15 days	5%	30%	55%	70%
20 days		20%	50%	65%
30 days		10%	40%	60%
40 days			30%	50%
50 days			20%	45%
60 days			15%	40%
80 days			5%	25%
Note: Primary criteria shown in shaded cells.				

Table 4. Flow Recommendation Operating Rules - 5,000 cfs Peak (See Holden 1999 for 6,000 acre-feet peak)
Minimum peak release consists of 1 week ramp up to 5,000 cfs, 1 week at 5,000, and 1 week ramp down. Daily flow rates for ramping are given in Table 5. Volume is 114,000 acre-feet above average base release of 600 cfs.
Primary peak release hydrograph consists of 4 week ramp up to 5,000 cfs, 3 weeks at 5,000 cfs, and 2 weeks ramp down. Ramp rates are given in Table 5. Volume is 344,000 acre-feet above average base release of 600 cfs.
The peak release is to be centered on June 4 of each year.
Use the decision tree shown in Figure 1 to determine magnitude of release. Available water on the chart is defined as: "*predicted inflow less base release plus available storage,*" where available storage is reduced from full storage by the amount of carry over storage necessary to prevent shortages in future years. "*Release last 3 years > 344,000 acre-feet,*" means that a release of at least 344,000 acre-feet occurred at least once out of the last 3 years.

Table 5
Recommended Daily Ramp Rates for 1-week, 2-week, 3-week, and 4-week Ramps for 5,000 cfs Peak Release

Day	Flow Rate (cfs)			
	1 Week	2-week	3 Week	4 Week
1	1,000	1,000	1,000	1,000
2	1,500	1,000	1,000	1,000
3	2,000	1,500	1,000	1,000
4	2,500	1,500	1,000	1,000
5	3,000	2,000	1,500	1,000
6	3,500	2,000	1,500	1,000
7	4,000	2,500	1,500	1,000
8	5,000	2,500	2,000	2,000
9		3,000	2,000	2,000
10		3,000	2,000	2,000
11		3,500	2,000	2,000
12		4,000	3,000	2,000
13		4,000	3,000	2,000
14		4,500	3,000	2,000
15		5,000	3,000	3,000
16			4,000	3,000
17			4,000	3,000
18			4,000	3,000
19			4,000	3,000
20			4,000	3,000
21			4,000	3,000
22			5,000	4,000
23				4,000
24				4,000
25				4,000
26				4000
27				4,000
28				4,000
29				5,000

Figure 1.


San Juan Operating Model Rule Decision Tree
Determine Available Water
<114,000 af
No Release
> 114,000 af
Yes
Was there a release in the last 2 years?
Spill Probable?
Yes
No
No
Yes
Release Full Hydrograph
Yes
Spill > 344,000?
Perturbation?
Release last 3 years > 344,000 af?
No
No
No
Yes
No
Release last 3 years > 344,000 af?
Yes
Spill + Avail. Storage > 344,000 af?
Release 114,000 af
No
Release last year > 166,000?
Yes
No
Yes
Release last year > 166,000 af
No
Release last 3 years > 344,000 af?
No Release
Yes
Release > of 166,000 af or Spill
Yes
No
Release last year > 166,000 af
Perturbation?
Yes
Yes
No
No
Release Maximum Available
Release of >114,000 af or Spill
Release > of 114,000 af or Spill
Release > of 166,000 af or Spill

STATUS OF THE SPECIES AND CRITICAL HABITAT

Colorado Pikeminnow

Species/Critical Habitat Description

The Colorado pikeminnow is the largest cyprinid fish (minnow family) native to North America and it evolved as the main predator in the Colorado River system. It is an elongated pike-like fish that during predevelopment times, may have grown as large as 1.8 meters (6 feet) in length and weighed nearly 45 kilograms (100 pounds) (Behnke and Benson 1983). Today, fish rarely exceed one meter (approximately 3 feet) in length or weigh more than 8 kilograms (18 pounds); such fish are estimated to be 45-55 years old (Osmundson et al. 1997). The mouth of this species is large and nearly horizontal with long slender pharyngeal teeth (located in the throat), adapted for grasping and holding prey. The diet of Colorado pikeminnow longer than 80 to 100 mm (3 or 4 inches) consists almost entirely of other fishes (Vanicek and Kramer 1969). Males become sexually mature earlier and at a smaller size than do females, though all are mature by about age 7 and 500 mm (20 inches) in length (Vanicek and Kramer 1969, Seethaler 1978, Hamman 1981). Adults are strongly countershaded with a dark, olive back, and a white belly. Young are silvery and usually have a dark, wedge-shaped spot at the base of the caudal fin.

Critical habitat is defined as the areas that provide physical or biological features that are essential for the recovery of the species. Critical habitat has been designated within the 100-year floodplain of the Colorado pikeminnow's historical range in the following section of the San Juan River Basin (59 F.R. 13374) (Fish and Wildlife Service 1993 and 1994).

> New Mexico, San Juan County; and Utah, San Juan County. The San Juan River from the State Route 371 Bridge in T. 29 N., R. 13 W., section 17 to Neskahai Canyon up to the full pool elevation in the San Juan arm of Lake Powell in T. 41 S., R. 11 E., section 26.

The Service has identified water, physical habitat, and the biological environment as the primary constituent elements of critical habitat. 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. The physical habitat includes areas of the Colorado River system 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, nursery, feeding, and rearing habitats. Food supply, predation and competition are important elements of the biological environment.

Status and Distribution

Based on early fish collection records, archaeological finds, and other observations, the Colorado pikeminnow was once found throughout warmwater reaches of the entire Colorado River Basin down to the Gulf of California, and including reaches of the Upper Colorado River and its major tributaries, the Green River and its major tributaries, the San Juan River and the Gila River system in Arizona (Seethaler 1978). Colorado pikeminnow apparently were never found in colder, headwater areas. Seethaler (1978) indicates that the species was abundant in suitable habitat throughout the entire Colorado River Basin prior to the 1850's. By the 1970's they were extirpated from the entire lower basin (downstream of Glen Canyon Dam) and from portions of the upper basin as a result of major alterations to the riverine environment. Having lost some 75-80 percent of its former range, the Colorado pikeminnow was federally listed as an endangered species in 1967 (Miller 1961, Moyle 1976, Tyus 1991, Osmundson and Burnham 1998). Platania and Young (1989) summarized historic fish collections in the San Juan River drainage which indicate that Colorado pikeminnow once inhabited reaches above what is now the Navajo Dam and Reservoir near Rosa, New Mexico. Since closure of the dam in 1962 and the accompanying fish eradication program, physical changes (flow, temperature, and the impoundment of water) associated with operation and presence of the Navajo Project have eliminated Colorado pikeminnow in the upper San Juan River, both from the reservoir basin as well as from several miles of river downstream of the dam. Habitat has been significantly degraded to where it injures Colorado pikeminnow by impairing the essential functions such as reproduction and recruitment into the adult population.

Major declines in Colorado pikeminnow populations occurred during the dam-building era of the 1930's through the 1960's. Behnke and Benson (1983) summarized the decline of the natural ecosystem, pointing out that dams, impoundments, and water use practices drastically modified the river's natural hydrology and channel characteristics throughout the Colorado River Basin. Dams on the mainstem broke the natural continuum of the river ecosystem into a series of disjunct segments, blocking native fish migrations, reducing temperatures downstream of dams, creating lacustrine habitat, and providing conditions that allowed competitive and predatory nonnative fishes to thrive both within the impounded reservoirs and in the modified river segments that connect them. The highly modified flow regime in the lower basin coupled with the introduction of nonnative fishes decimated populations of native fish.

Major declines of native fishes first occurred in the lower basin where large dams were constructed from the 1930's through the 1960's. In the upper basin, the following major dams were not constructed until the 1960's; Glen Canyon Dam on the mainstem Colorado River, Flaming Gorge Dam on the Green River, Navajo Dam on the San Juan River, and the Aspinall Unit Dams on the Gunnison River. To date, some native fish populations in the upper basin have managed to persist, while others have become nearly extirpated. River segments where native fish have declined more slowly than in other areas are those where the hydrologic regime most closely resembles the natural condition, where adequate habitat for all life phases still exists, and where migration corridors are unblocked and allow connectivity among habitats used during the various life phases.

Life History

The life-history phases that appear to be most critical for the Colorado pikeminnow include spawning, egg hatching, development of larvae, and the first year of life. These phases of Colorado pikeminnow development are tied closely to specific habitat requirements. Natural spawning of Colorado pikeminnow is initiated on the descending limb of the annual hydrograph as water temperatures approach or exceed 20 °C (Vanicek and Kramer 1969, Hamman 1981, Haynes et al. 1984, Tyus 1990, McAda and Kaeding 1991). Temperature at initiation of spawning varies somewhat by river: in the Green River, spawning begins as temperatures exceed 20-23 °C; in the Yampa River, 16-23 °C (Bestgen et al. 1998); in the Colorado River, 18-22 °C (McAda and Kaeding 1991); in the San Juan River temperatures were estimated to be 16-22 °C. Spawning, both in the hatchery and under natural riverine conditions, generally occurs in a 2-month time frame between late June and late August. However, in the natural system, sustained high flows during wet years may suppress river temperatures and extend spawning into September (McAda and Kaeding 1991). Conversely, during low flow years, when the water warms earlier, spawning may commence in mid-June.

Temperature also has an effect on egg development and hatching success. In the laboratory, egg development was tested at five temperatures and hatching success was found to be highest at 20 °C, lower at 25 °C, and mortality was 100 percent at 5, 10, 15, and 30 °C. In addition, larval abnormalities were twice as high at 25 °C than at 20 °C (Marsh 1985).

Experimental tests of temperature preference of yearling (Black and Bulkley 1985a) and adult (Bulkley et al. 1981) Colorado pikeminnow indicated that 25 °C was the most preferred temperature for both life phases. Additional experiments indicated that optimum growth of yearling Colorado pikeminnow also occurs at temperatures near 25 °C (Black and Bulkley 1985b). Although no such tests were conducted using adults, the tests with yearlings supported the conclusions of Jobling (1981) that the final thermal preferendum provides a good indication of optimum growth temperature, i.e., 25 °C.

Most information on Colorado pikeminnow reproduction was gathered from spawning sites on the lower 20 miles of the Yampa River and in Gray Canyon on the Green River (Tyus and McAda 1984; Tyus 1985; Wick et al 1985; Tyus 1990). Colorado pikeminnow spawn after peak runoff subsides and is probably triggered by several interacting variables such as photoperiod, temperature, flow level, and perhaps substrate characteristics. Spawning generally occurs from late June to mid-August with peak activity occurring when water temperatures are between 18 ° and 23 °C (Haynes et al. 1984; Archer et al. 1985; Tyus 1990, Bestgen et al. 1998).

Known spawning sites in the Yampa River are characterized by riffles or shallow runs with well-washed coarse substrate (cobble containing relatively deep interstitial voids (for egg deposition) in association with deep pools or areas of slow nonturbulent flow used as staging areas by adults (Lamarra et al. 1985, Tyus 1990). Recent investigations at a spawning site in the San Juan River by Bliesner and Lamarra (1995) and at one in the upper Colorado River (USFWS unpublished data) indicate a similar association of habitats. The most unique feature at the sites actually used for spawning, in comparison with otherwise similar sites nearby, is the degree of looseness of the cobble substrate and the depth to which the rocks are devoid of fine sediments; this appears consistent at the sites in all three rivers (Lamarra et al. 1985, Bliesner and Lamarra 1995).

Data indicates that clean cobble substrates that provide interstitial spaces for eggs are necessary for spawning and egg incubation (Tyus and Karp 1989). Several studies on the cobble cleaning process have been conducted at a known spawning location in Yampa Canyon. O'Brien (1984) studied the hydraulic and sediment transport dynamics of the cobble bar within the Yampa River spawning site and duplicated some of its characteristics in a laboratory flume study. O'Brien (1984) concluded that incipient motion of the cobble bed is required to clean cobbles for spawning and estimated that this takes discharges of about 21,500 cfs. However, Harvey et al.(1993) concluded that since flows required for incipient motion of bed material are rare (20 year return period event) and spawning occurs annually, another process must be cleaning the cobbles. Their study found that in Yampa Canyon recessional flows routinely dissect gravel bars and thereby produce tertiary bars of clean cobble at the base of the riffles. These tertiary bars are used by Colorado pikeminnow for spawning. The importance of high magnitude, low frequency discharges is in forming and maintaining the midchannel bars. Dissection of bars without redeposition by high magnitude flows would lead to conditions where spawning habitat is no longer available (Harvey et al. 1993).

Collections of larvae and young-of-year downstream of known spawning sites in the Green and Yampa Rivers indicates that downstream drift of larval Colorado pikeminnow occurs following hatching (Haynes et al. 1984; Nesler et al. 1988; Tyus 1990, Tyus and Haines 1991). During their first year of life, Colorado pikeminnow prefer warm, turbid, relatively deep (averaging 1.3 feet) backwater areas of zero velocity (Tyus and Haines 1991). After about 1 year, young are rarely found in such habitats, though juveniles and subadults are often located in large deep backwaters during spring runoff (USFWS, unpublished data; Osmundson and Burnham 1998).

Colorado pikeminnow often migrate considerable distances to spawn in the Green and Yampa Rivers (Miller et al.1982, Archer et al.1986, Tyus and McAda 1984, Tyus 1985, Tyus 1990), and similar movement has been noted in the main stem San Juan River. A fish captured and tagged in the San Juan Arm of Lake Powell in April 1987, was later recaptured in the San Juan River approximately 80 miles upstream in September 1987 (Platania 1990).

Two locations in the San Juan River have been identified as potential spawning areas based on radio telemetry and visual observations (Ryden and Pfeifer 1994; Miller and Ptacek 2000). Both locations occur within the "Mixer" (river mile133 to 129.8), a geomorphically dynamic reach of the San Juan River. The upper spawning location is located at RM 132. The lower spawning location is located at approximately RM 131.1. Both locations consist of complex habitat associated with cobble bar and island complexes. Habitat at these locations was similar to spawning habitats described for the Yampa River and is composed of side channels, chutes, riffles, slow runs, backwaters and slackwater areas near bars and islands. Substrate in the riffle areas is clean cobbles. Specific spawning habitat at the lower spawning area, based on radio telemetry and visual observations, is a fast narrow chute with a small adjacent eddy. Cobble was primary 3 to 4 inches in diameter (Miller and Ptacek 2000).

During 1993, radio tagged Colorado pikeminnow were observed moving to suspected spawning locations in the "Mixer" beginning around July 1. Fish were on suspected spawning areas between approximately July 12 to July 25. During this period flows in the San Juan River were on the descending limb of the spring runoff. Temperatures increased from approximately 20 ° to 25 °C (68 ° to 77 °F) during the same time period. Observations in other years show a similar pattern. However, specific spawning times and duration of the spawning period appear to vary from year to year.

Information on radio-tagged adult Colorado pikeminnow during fall suggests that fish seek out deep water areas in the Colorado River (Miller et al. 1982, Osmundson and Kaeding 1989), as do many other riverine species. River pools, runs, and other deep water areas, especially in upstream reaches, are important winter habitats for Colorado pikeminnow (Osmundson et al. 1995).

Very little information is available on the influence of turbidity on the endangered Colorado River fishes. Osmundson and Kaeding (1989) found that turbidity allows use of relatively shallow habitats ostensibly by providing adults with needed cover; this allows foraging and resting in areas otherwise exposed to avian or land predators. Tyus and Haines (1991) found that young Colorado pikeminnow in the Green River preferred backwaters that were turbid. Clear conditions in these shallow waters might expose young fish to predation from wading birds or introduced, sight-feeding, piscivorous fish. It is unknown whether the river was as turbid in the past as it is today. For now, it is assumed that these endemic fishes evolved under natural conditions of high turbidity; therefore the retention of these highly turbid conditions is probably an important factor in maintaining the ability of these fish to compete with nonnatives that may not have evolved under similar conditions.

Population Dynamics

Due to the low numbers of Colorado pikeminnow collected in the San Juan River, it is not possible to quantify population size or trends.

The ability of the Colorado pikeminnow as a species to withstand adverse impacts to its populations and its habitat is difficult to discern given the longevity of individuals and their scarcity within the San Juan River Basin. Effects to reproduction and recruitment of young may be masked by the presence of older specimens more capable of withstanding impacts. At this stage of the investigations on the San Juan River, the younger life stages of the species is considered the most vulnerable to predation, competition, and habitat degradation through contamination. Response times to rebound from these impacts at a population level are lengthy.

Tissue samples from Colorado pikeminnow caught during research conducted under the Program have been analyzed as part of a basin-wide analysis of endangered fish genetics. The results of that analysis indicated that the San Juan River fish exhibited less genetic variability than the Green River and Colorado River populations, likely due to the small population size in the San Juan (Morizot in litt. 1996), but were very similar to Colorado pikeminnow from the Green, Colorado, and Yampa Rivers, suggesting that the San Juan population is probably not a separate stock (Holden and Masslich 1997).

Analysis of Species/Critical Habitat Likely to be Affected

The San Juan River currently flows approximately 225 river miles from the Navajo Dam downstream to Lake Powell. The reach of known occupied Colorado pikeminnow habitat extends from Lake Powell upstream to RM 158.4. Of the 225 miles, about 159 of those are potentially available to the Colorado pikeminnow. Ryden and Pfeifer (1993) identified five diversion structures between Farmington, New Mexico, and the Utah state line that potentially act as barriers to fish passage at certain flows (Cudei, Hogback, Four Corners Power Plant, San Juan Generating Station, and Fruitland Irrigation Canal diversions). Since radio telemetry studies were initiated on the San Juan River in 1991, only one radio-tagged fish has been recorded moving upstream past one of the diversions. In 1995, an adult Colorado pikeminnow moved above the Cudei Diversion and then returned back downstream (Miller 1995). Other native fish have been found to move either upstream or downstream over all five of the weirs (Buntjer and Brooks 1997, Ryden 2000a).

Colorado pikeminnow adults primarily use the San Juan River between RM 119 (Four Corners) and RM 148 (Cudei Diversion) (Ryden and Pfeifer 1993, 1994, 1995a, 1996). The multi-threaded channel, habitat complexity, and mixture of substrate types in this area of the river appear to provide a diversity of habitats favorable to Colorado pikeminnow on a year-round basis (Holden and Masslich 1997).

Based on radio telemetry studies and visual observations, two potential spawning areas have been located at RM 132.0 and 131.15 (Miller 1994, Ryden and Pfeifer 1995a). Both of these sites are located in an area of the river known as the "Mixer" (RM 133.4 to RM 129.8). Ryden and Pfeifer (1995a) report that a Colorado pikeminnow captured at RM 74.8 (between Bluff and Mexican Hat) made a 50-60 mile migration to the Mixer during the suspected spawning season in 1994. The fish then returned to within 0.4 river miles of its original capture location.

Successful reproduction was documented in the San Juan River in 1987, 1988, 1992, 1993, 1994, 1995, and 1996 by the collection of larval and young-of-year Colorado pikeminnow. Majority of the young-of-year pikeminnow were collected in the San Juan River inflow to Lake Powell (Archer et al. 1995, Buntjer et al. 1994, Lashmett 1994, Platania 1990). Some young-of-year pikeminnow have been collected from the vicinity of the Mancos River confluence in New Mexico and in the vicinity of the Montezuma Creek confluence near Bluff, Utah, and at a drift station near Mexican Hat, Utah (Buntjer et al. 1994, Snyder and Platania 1995). The collection of such young fish (only a few days old) at Mexican Hat during 2 years suggests that perhaps another spawning area for Colorado pikeminnow exists somewhere below the Mixer (Platania 1996). Capture of a larval Colorado pikeminnow at RM 128 during August 1996 was the first larvae collected below the suspected spawning site in the Mixer (Holden and Masslich 1997).

Platania (1990) noted that, during the 3 years of studies on the San Juan River (1987-1989), spring flows and Colorado pikeminnow reproduction were highest in 1987. He further noted catch rates for channel catfish were lowest in 1987. Subsequent studies (Brooks et al 1994) found declines in channel catfish in 1993; declines that have been attributed to a successive series of higher than normal spring runoffs beginning in spring 1991 through 1993. Recent studies also found catch rates for young-of-year Colorado pikeminnow to be highest in high water years, such as 1993 (Buntjer et al. 1994, Lashmett 1994).

Between 1991 and 1995 nineteen (17 adult and 2 juvenile) wild Colorado pikeminnow were collected in the San Juan River by electrofishing (Ryden 2000a). Adult Colorado pikeminnow are most abundant between Cudei Diversion and Four Corners.

Experimental stocking of 100,000 young-of-year Colorado pikeminnow was conducted in November 1996 to test habitat suitability and quality for young life stages of this species (Lentsch et al. 1996). Monitoring in late 1996 and 1997 found these fish scattered in appropriate habitats from just below the upstream stocking site at Shiprock, New Mexico, to Lake Powell. During the fall of 1997, the fish stocked in 1996 were caught in relatively high numbers and exhibited good growth rates as well as good survival rates (Holden and Masslich 1997). In August 1997, an additional 100,000 young-of-year Colorado pikeminnow were stocked in the river. In October 1997, the young-of-year stocked two months previously were found distributed below stocking sites and relatively large numbers also nearly 10 miles above the Shiprock stocking location. The 1997 stocked fish were smaller than those stocked in 1996, but apparently could move about the river to find acceptable habitats (Holden and Masslich 1997).

Razorback Sucker

Species/Critical Habitat Description

The razorback sucker, an endemic species unique to the Colorado River Basin, was historically abundant and widely distributed within warmwater reaches throughout the Colorado River Basin. The razorback sucker is the only sucker with an abrupt sharp-edged dorsal keel behind its head. It has a large fleshy subterminal mouth that is typical of most suckers. Adults often exceed 3 kg (6lbs) in weight and 600 mm (2 ft) in length.

Historically, razorback suckers were found in the main stem Colorado River and major tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and in Mexico (Ellis 1914; Minckley 1983). Bestgen (1990) reported that this species was once so numerous that it was commonly used as food by early settlers and; further, that commercially marketable quantities were caught in Arizona as recently as 1949. In the upper basin, razorback suckers were reported in the Green River to be very abundant near Green River, Utah, in the late 1800's (Jordan 1891). An account in Osmundson and Kaeding (1989) reported that residents living along the Colorado River near Clifton, Colorado, observed several thousand razorback suckers during spring runoff in the 1930's and early 1940's. In the San Juan River drainage, Platania and Young (1989) relayed historical accounts of razorback suckers ascending the Animas River to Durango, Colorado, around the turn of the century.

A marked decline in populations of razorback suckers can be attributed to construction of dams and reservoirs, introduction of nonnative fishes, and removal of large quantities of water from the Colorado River system. Dams on the main stem Colorado River and its major tributaries have segmented the river system, blocking migration routes. Dams also have drastically altered flows, temperatures, and channel geomorphology. These changes have modified habitats in many areas so that they are no longer suitable for breeding, feeding or sheltering. Major changes in species composition have occurred due to the introduction of numerous nonnative fishes, many of which have thrived due to man-induced changes to the natural riverine system. Habitat has been significantly degraded to where it injures razorback sucker by impairing the essential functions such as reproduction and recruitment into the adult population.

Critical habitat was designated in 1994 within the 100-year floodplain of the razorback sucker's historical range in the following area of the Upper Colorado River (59 F.R. 13374). The primary constituent elements are the same as critical habitat for Colorado pikeminnow described above.

> New Mexico, San Juan County; and Utah, San Juan County. The San Juan River from the Hogback Diversion in T. 29 N., R. 16 W., section 9 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.

Status and Distribution

The current distribution and abundance of the razorback sucker have been significantly reduced throughout the Colorado River system, due to lack of recruitment to the adult population (McAda 1987; McAda and Wydoski 1980; Holden and Stalnaker 1975; Minckley 1983; Marsh and Minckley 1989; Tyus 1987). The only substantial population exists in Lake Mohave with a current estimated population of less than 9,000 adults (Chuck Minckley, pers. comm.) down from the estimated 25,000 adult razorback suckers in 1995 (Chuck Minckley, pers. comm.) which is down from an earlier estimate of 60,000 adult razorback suckers (Minckley et al. 1991). They do not appear to be successfully recruiting. While limited numbers of razorback suckers persist in other locations in the lower Colorado River, they are considered rare or incidental and may be continuing to decline.

In the upper basin, above Glen Canyon Dam, razorback suckers are found in limited numbers in both lentic and lotic environments. The largest population of razorback suckers in the upper basin is found in the upper Green River and lower Yampa River (Tyus 1987). Lanigan and Tyus (1989) estimated that from 758 to 1,138 razorback suckers inhabit the upper Green River. Modde et al. (1996) report no significant decrease in the population between 1982 and 1992, and the continued presence of fish smaller than 480 mm during the study period suggest some level of recruitment. In the Colorado River, most razorback suckers occur in the Grand Valley area near Grand Junction, Colorado; however, they are increasingly rare. Osmundson and Kaeding (1991) report that the number of razorback sucker captures in the Grand Junction area has declined dramatically since 1974. In 1991 and 1992, 28 adult razorback suckers were collected from isolated ponds adjacent to the Colorado River near De Beque, Colorado (Burdick 1992). The existing habitat has been modified to the extent that it impairs essential behavior patterns, such as breeding, feeding, and sheltering.

Razorback suckers are in imminent danger of extirpation in the wild. The razorback sucker was listed as endangered October 23, 1991 (56 FR 54957). As Bestgen (1990) pointed out:

> "Reasons for decline of most native fishes in the Colorado River Basin have been attributed to habitat loss due to construction of mainstream dams and subsequent interruption or alteration of natural flow and physio-chemical regimes, inundation of river reaches by reservoirs, channelization, water quality degradation, introduction of nonnative fish species and resulting competitive interactions or predation, and other man-induced disturbances (Miller 1961, Joseph et al. 1977, Behnke and Benson 1983, Carlson and Muth 1989, Tyus and Karp 1989). These factors are almost certainly not mutually exclusive, therefore it is often difficult to determine exact cause and effect relationships."

Extremely limited recruitment suggests a combination of biological, physical, and/or chemical factors that may be affecting the survival and recruitment of early life stages of razorback suckers. Within the upper basin, recovery efforts include the capture and removal of razorback suckers from all known locations for genetic analyses and development of discrete brood stocks if necessary. These measures have been undertaken to develop refugia populations of the razorback sucker from the same genetic parentage as their wild counterparts such that, if these fish are genetically unique by subbasin or individual population, then separate stocks will be available for future augmentation. Such augmentation may be a necessary step to prevent the extinction of razorback suckers in the upper basin.

Life History

McAda and Wydoski (1980) and Tyus (1987) reported springtime aggregations of razorback suckers in off-channel habitats and tributaries; such aggregations are believed to be associated with reproductive activities. Tyus and Karp (1990) and Osmundson and Kaeding (1991) reported off-channel habitats to be much warmer than the main stem river and that razorback suckers presumably moved to these areas for feeding, resting, sexual maturation, spawning, and other activities associated with their reproductive cycle. Prior to construction of large main stem dams and the suppression of spring peak flows, low velocity, off-channel habitats (seasonally flooded bottomlands and shorelines) were commonly available throughout the upper basin (Tyus and Karp 1989; Osmundson and Kaeding 1991). Large main stem dams changed riverine ecosystems into lakes by impounding water, which eliminated these off-channel habitats within the inundated areas created by the reservoirs. Reduction in spring peak flows eliminates or reduces the frequency of inundation of off-channel habitats. The absence of these seasonally flooded riverine habitats is believed to be a limiting factor in the successful recruitment of razorback suckers in their native environment (Tyus and Karp 1989; Osmundson and Kaeding 1991). Wydoski and Wick (1998) identified starvation of larval razorback suckers due to low zooplankton densities in the main channel and loss of floodplain habitats which provide adequate zooplankton densities for larval food as one of the most important factors limiting recruitment.

While razorback suckers have never been directly observed spawning in turbid riverine environments within the upper basin, captures of ripe specimens, both males and females, have been recorded (Valdez et al. 1982; McAda and Wydoski 1980; Tyus 1987; Osmundson and Kaeding 1989; Tyus and Karp 1989; Tyus and Karp 1990; Osmundson and Kaeding 1991; Platania 1990, Ryden 2000b) in the Yampa, Green, Colorado, and San Juan Rivers. Sexually mature razorback suckers are generally collected on the ascending limb of the hydrograph from mid-April through June and are associated with coarse gravel substrates.

Outside of the spawning season, adult razorback suckers occupy a variety of shoreline and main channel habitats including slow runs, shallow to deep pools, backwaters, eddies, and other relatively slow velocity areas associated with sand substrates (Tyus 1987; Tyus and Karp 1989; Osmundson and Kaeding 1989; Valdez and Masslich 1989; Osmundson and Kaeding 1991; Tyus and Karp 1990).

Habitat requirements of young and juvenile razorback suckers in the wild are not well known, particularly in native riverine environments. Prior to 1991, the last confirmed documentation of a razorback sucker juvenile in the upper basin was a capture in the Colorado River near Moab, Utah (Taba et al. 1965). In 1991, two early juvenile (36.6 and 39.3 mm TL) razorback suckers were collected in the lower Green River near Hell Roaring Canyon (Gutermuth et al. 1994). Juvenile razorback suckers have been collected in recent years from Old Charley Wash, a wetland adjacent to the Green River (Modde 1996). Between 1992 and 1995 larval razorback suckers were collected in the middle and lower Green River and within the Colorado River inflow to Lake Powell (Muth 1995). No young razorback suckers have been collected in recent times in the Colorado River.

Population Dynamics

There are no population estimates of razorback sucker in the San Juan River because of the low number of wild fish. Between March of 1994 and October 1996 a total of 939 hatchery raised razorback suckers were stocked in the San Juan River (Ryden 2000b). Some fish that were stocked in 1994 are still being collected during annual sampling (Ryden 2000b). Larval razorback suckers were collected in 1998 and 1999, indicating that the stocked fish are successfully spawning in the San Juan River (Ryden 2000c).

Analysis of Species/Critical Habitat Likely to be Affected

In the San Juan River subbasin, small concentrations of razorback suckers have been reported at the inflow area in the San Juan arm of Lake Powell, Utah (Meyer and Moretti 1988), and one specimen was captured in the San Juan River near Bluff, Utah, in 1988 (Platania 1990; Platania et al. 1991). In Bestgen (1990) additional captures of small numbers of razorback suckers also were reported from the Dirty Devil and Colorado River arms of Lake Powell.

Beginning in May 1987 and continuing through October 1989, complementary investigations of fishes in the San Juan River were conducted in Colorado, New Mexico, and Utah (Platania 1990;

Platania et al. 1991). In 1987, a total of 18 adult razorbacks (six recaptures) were collected on the south shore of the San Juan arm of Lake Powell (Platania 1990; Platania et al. 1991). These fish were captured near a concrete boat ramp at Piute Farms Marina and were believed to be either a spawning aggregation or possibly a staging area used in preparation for migration to some other spawning site. Of the 12 individual razorbacks handled in 1987, eight were running ripe males while the other four specimens were females that appeared gravid.

In 1988, a total of 10 razorback suckers were handled at the same general location, 5 of which were in reproductive condition (Platania et al. 1991). Six of the ten individual specimens in the 1988 samples were recaptures from 1987. Also, in 1988, a single adult tuberculate male razorback sucker was captured at approximately RM 80 on the San Juan River near Bluff, Utah. Particularly noteworthy is that this is the first confirmed record of this species from the main stem San Juan River. The presence of this reproductively mature specimen suggests that the razorback may be attempting to spawn in some unknown location within the riverine portion of the San Juan drainage. No razorback suckers were captured in 1989.

The existing scientific literature and historic accounts by local residents strongly suggests that razorback suckers were once a viable, reproducing member of the native fish community in the San Juan River drainage. Currently, the razorback sucker is rare throughout its historic range and extremely rare in the main stem San Juan River. There is no evidence from anywhere in the Colorado River system that indicates significant recruitment to any population of razorback sucker (Bestgen 1990, Platania 1990, Platania et al. 1991, Tyus 1987, McCarthy and Minckley 1987, Osmundson and Kaeding 1989).

Because razorback sucker are so rare in the San Juan River, an experimental stocking program was initiated. In March 1994, fifteen radio-tagged razorback sucker were stocked in the San Juan River at Bluff, Utah (RM 79.6); near Four Corners Bridge (RM 117.5); and above the Mixer in New Mexico (RM 136.6). In November 1994 an additional 15 radio-tagged adults were stocked as well as 656 PIT-tagged fish in the same locations as well as an additional site just below the Hogback Diversion in New Mexico (RM 158.5). Monitoring found that these razorback suckers used slow or slackwater habitats such as eddies, pools, backwaters, and shoals in March and April and fast water 92.2 percent of the time in June and August (Ryden and Pfeifer 1995b). During 1995, both radio-tagged fish and PIT tagged fish were contacted or captured. Razorback suckers were found in small numbers from the Hogback Diversion (RM 158.6) to 38.1 river miles above Lake Powell (Dale Ryden, USFWS, pers. comm.). Results of the monitoring efforts indicate that the San Juan River provides suitable habitat to support subadult and adult razorback sucker on a year-round basis (Ryden and Pfeifer 1996). Four ripe male razorback sucker were found in spring 1997 that appeared similar to a spawning aggregation. Several of the fish had moved up or down the river to the general location of the aggregation, suggesting some focus, such as spawning, for the aggregation (Ryden 2000b). In 1998, two larval razorback sucker were collected between Montezuma Creek and Bluff, Utah, downstream of the 1997 aggregation site (Ryden 2000c). In April of 1999, two ripe male razorback sucker and one gravid female were collected within a few feet of the 1997 aggregation. All three fish were from the November 1994 stocking. Between May 4 and June 14, 1999, 7 larval razorback sucker were collected below the suspected spawning site (Ryden 2000c).

The results of the experimental stocking discussed above led the Program to initiate a 5-year augmentation program for the razorback sucker in 1997 (Ryden 1997). In September 1997, as the initial step of that augmentation program, 2,885 subadult razorback sucker were stocked below Hogback Diversion Dam.

Bald Eagle

Species/Critical Habitat Description

The bald eagle is the only species of sea eagle native to North America. Adults are distinguished by a white head and tail and a dark brown body. Immature bald eagles are dark brown with white mottling, with the white head and tail apparent by age five. No critical habitat has been designated for the bald eagle.

Status and Distribution

The bald eagle south of the 40th parallel was listed as endangered under the Endangered Species Act of 1966 on March 11, 1967 (Federal Register 32(48):4001). It was reclassified to threatened status on July 12, 1995 (Federal Register 50(17):35999-36010). On July 6, 1999, the bald eagle was proposed for removal from the list of endangered and threatened wildlife (Federal Register 64 (128) 36454-36464). A final decision on the delisting proposal is expected in July of 2000. The bald eagle historically ranged throughout North America except Hawaii, extreme northern Alaska and Canada and central and southern Mexico. Bald eagles nested on both coasts of the United States, from Florida to Baja California in the south and from Labrador, Newfoundland, to the Aleutian Islands, Alaska, in the north.

There were an estimated one-quarter to one-half million bald eagles on the North American continent when Europeans first arrived. Initial population declines probably began in the late 1800s, and coincided with declines in the number of waterfowl, shorebirds, and other prey species. Direct killing of bald eagles was also prevalent. Additionally, there was a loss of nesting habitat. These factors reduced bald eagle numbers until the 1940s when protection for the bald eagle was provided through the Bald Eagle Protection Act (16 U.S.C. 668). This act accomplished protection and slowed decline in bald eagle populations by prohibiting numerous activities adversely affecting bald eagles and increasing public awareness of bald eagles. The widespread use of dichloro-diphenyl-trichloroethane and other organochlorine compounds in the 1940s for mosquito control and as a general insecticide caused additional declines in bald eagle populations. DDT accumulated in individual birds following ingestion of contaminated food. DDT breaks down into dichlorophenyl-dichloroethylene and accumulates in the fatty tissues of adult females, leading to impaired calcium release necessary for egg shell formation. Thinner egg shells led to reproductive failure, and is considered a primary cause of declines in the bald eagle population. DDT was banned in the United States in 1972 (Service 1995).

There are five recovery regions in the lower 48 States: Chesapeake, Northern States, Pacific, Southeastern, and Southwestern. Each recovery region has its own recovery plan, with recovery goal specific to that region. Since development and implementation of the recovery plans, population growth has exceeded most of the goals established. From 1974 to 1994, the number of occupied breeding areas increased by 462 percent. In the last 10 years, nesting populations have increased at an average rate of 8 percent per year. These dramatic increases in populations are what prompted the Service to propose removing the bald eagle from the list of endangered and threatened wildlife.

Life History

Bald eagles are often found in association with open water along seacoasts, large lakes and rivers. Their diet consists largely of fish and waterfowl, but also includes upland birds, small mammals, and carrion. In southwest Colorado, castings from one nest were made up of entirely prairie dog remains (Jerry Craig, CDOW, pers. comm.). Bald eagles are skilled hunters but also have been observed stealing prey captured by other raptors.

Survival of individual eagles, particularly those in their first year of life, probably depends heavily on conditions they encounter during the wintering period. The physiological condition of adults at the beginning of each breeding season, an important factor influencing reproductive success, is also affected by how well their energy demands are met in wintering areas. Thus, the survival and recovery of nesting populations depend on eagles having suitable wintering areas with an adequate prey base (U.S. Fish and Wildlife Service 1983). During the primary wintering period of December to March, suitable roosting and foraging habitat is important to eagles (U.S. Fish and Wildlife Service 1992, Harmata 1984, Stalmaster et al. 1979, U.S. Fish and Wildlife Service 1983).

Population Dynamics

Since listing, bald eagles have increased in number and expanded in range due to the banning of DDT and other persistent organochlorine compounds, habitat protection, and recovery efforts. Surveys in 1963 indicated 417 active nests in the lower 48 states with an average of 0.59 young produced per nest. In 1994, 4,450 occupied breeding areas were reported with an estimated average of 1.17 young produced per occupied nest (Service 1995). In 1998, the Service estimated the breeding population in the lower 48 States exceeded 5,748 occupied breeding areas (Service 1999). The bald eagle population has essentially doubled every 7 to 8 years during the past 30 years.

In the Northern States Recovery Region, including Colorado, bald eagle nesting activity has increased from fewer than 700 occupied breeding areas in 1985 to more than 2,204 areas in 1998. In Colorado, the Colorado Division of Wildlife reported 8 or 9 nesting pairs in the late 1980's, and 29 pairs in 1999 (Jerry Craig, CDOW, pers. comm.). Of those 29 pairs, 17 are located west of the continental divide.

In the Southwestern Recovery Region, including New Mexico, 40 breeding territories were occupied in 1998; four were in New Mexico.

Analysis of the Species likely to be affected

Colorado is a popular wintering area for bald eagles (U.S. Fish and Wildlife Service 1992, Harmata 1984). In 1993-1994, 1,235 bald eagles were counted by the Colorado Division of Wildlife during midwinter counts, and 969 were counted in 1999 (Jerry Craig and Lyn Stevens, CDOW, pers. comm.). In New Mexico, during the winter of 1994-1995, the New Mexico Department of Fish and Game counted 402 bald eagles state wide, with 35 occurring in the San Juan Basin (John Pittenger, NMDFG, pers. comm.). Winter surveys have not been conducted by the New Mexico Department of Fish and Game since 1995 (Nick Medley NMDFG, pers. comm.).

As part of the conservation recommendations of the 1991 biological opinion, Reclamation has conducted wintering bald eagle surveys since1993. Results of the surveys show that the Animas and La Plata Rivers are important wintering areas for bald eagles. Bald eagles arrive in the floodplain areas in mid-November and leave by late March or early April. Numbers of wintering eagles fluctuate from year to year depending on weather patterns. Reclamation found most bald eagles in mature cottonwood stands in areas relatively free from human disturbance. Reclamation surveys documented two communal roosts on the La Plata River and one in the San Juan Arm of Navajo Reservoir. Bald eagles in the project vicinity rely on mammalian carrion, especially deer.

There are currently no known active nests within the project area, however, there are two nest sites on the Animas River downstream of Basin Creek.

ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, and private actions and other human activities in the action area; the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal section 7 consultation; and the impact of State or private actions contemporaneous with the consultation process.

In formulating this opinion, the Service considered adverse and beneficial effects likely to result from cumulative effects of future State and private activities that are reasonably certain to occur within the Project area, along with the direct and indirect effects of the Project and impacts from actions that are part of the environmental baseline (50 CFR 402.02 and 402.14 (g)(3)).

Status of the Species Within the Action Area

An action area is defined as the entire area that is affected by the action. For the Animas-La Plata Project the action area includes all of the designated habitat critical habitat on the San Juan River for the Colorado pikeminnow and razorback sucker. Therefore, the status of the Colorado pikeminnow and razorback sucker within the action area is described above under the analysis of species and critical habitat likely to be affected are part of the baseline. The status of the bald eagle within the action area is also described above under the analysis of species likely to be affected are part of the baseline.

Factors Affecting Species Environment Within the Action Area

Critical habitat has been designated for the Colorado pikeminnow and razorback sucker within the 100-year floodplain in portions of their historic range (59 F.R. 13374). 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. 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 without consideration of land or water ownership or management. 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. Water depletions reduce the ability of the river system to provide the required water quantity and hydrologic regime necessary for recovery of the fishes. 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 important habitats. 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 reduction of high spring flows brought about by water depletions. Predation and competition from nonnative fish species has been identified as a factor in the decline of the endangered fishes. Water depletions contribute to alterations in flow regimes that favor nonnative fishes.

Water Quantity

In the San Juan River, the magnitude of spring flows has declined by 45 percent since Navajo Dam was built. Such flow reductions negatively affect Colorado pikeminnow and razorback sucker in four ways: (1) reducing the river's ability to build and clean cobble bars for spawning; (2) reducing the dilution effect for waterborne contaminants from urban and agricultural sources that may interfere with reproductive success; (3) reducing the connectivity of main-channel and bottomland habitats needed for habitat diversity and productivity; and (4) providing a more benign environment for nonnative fish and invasive, nonnative, bank-stabilizing shrubs (salt cedar) to persist and flourish (Osmundson and Burnham 1998). In general, the existing habitat has been modified to the extent that it significantly impairs essential behavior patterns, such as breeding, feeding, and sheltering and injures the endangered fish species.

Water depletions in the San Juan River Basin have been recognized as a major source of impact to 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. In 1963, the Navajo Dam was closed, and Navajo Reservoir began to fill with water from the San Juan River. Historically, flows in the San Juan River prior to the Navajo Dam were highly variable and ranged from a low of 44 cubic feet per second (cfs) in September 1956 to a high of 19,790 cfs in May 1941 (mean monthly values) at the U.S. Geological Survey Station 93680000, Shiprock, New Mexico. Conversely, post-Navajo Dam flows in the San Juan River have ranged from a low of 185 cfs in July 1963, while the reservoir was filling, to a high of 9,508 cfs in June 1979. Since 1963, 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 resulting in an average decrease in spring peak flows of 45 percent, while approximately doubling winter base flows at the Bluff gauge in Utah. Similar comparisons can be made 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. At the current level of development, average annual flows at Bluff, Utah, already have been depleted by 30 percent. By comparison, the Green and Colorado Rivers have been depleted approximately 20 percent (at Green River) and 32 percent (at Cisco), respectively. These depletions, along with a number of other factors, have resulted in such drastic reductions in the populations of Colorado pikeminnow and razorback sucker throughout their ranges that the Service has listed these species as endangered and has implemented programs to prevent them from becoming extinct.

The environmental baseline for water depletions for the Animas-La Plata Project is shown in Table 6. As explained above, the environmental baseline includes the past and present impacts of all Federal, State, and private actions and other human activities in the action area; the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal section 7 consultation; and the impact of State or private actions contemporaneous with the consultation process.

Table 6. Environmental Baseline for the Animas-La Plata Project

DEPLETIONS BY STATE	AVERAGE ANNUAL DEPLETION(AC-FT)	DEPLETION RANGE (1929 TO 1993) (MAX AC-FT)	(MIN AC-FT)
New Mexico Depletions			
Navajo Lands Irrigation Depletion			
Navajo Indian Irrigation Project	280,600[7]	297,203	224,796
Hogback	12,100	14,216	9,592
Fruitland	7,898	9,279	6,432
Cudei	900	1,058	687
Subtotal	**301,499**		
Non-Navajo Lands Irrigation Depletion			
Above Navajo Dam - Private	738	1,040	504
Above Navajo Dam - Jicarilla	2,190	3,086	1,494
Animas River	36,711	42,671	29,418
La Plata River	9,739	11,272	7,516
Upper San Juan	9,137	10,735	7,347
Hammond Area	10,268	12,063	8,256
Farmers Mutual Ditch	9,532	11,272	5,894
Jewett Valley	3,088	3,757	2,604
Westwater	110		
Subtotal	**81,513**		
Total NM Irrigation Depletion	**383,012**		
Non-Irrigation Depletions			
Navajo Reservoir Evaporation	27,694	32,099	19,733
Utah International	39,000	39,000	39,000
San Juan Power Plant	16,200	16,200	16,200
Industrial Diversions near Bloomfield	2,500		
M&I Uses	8,454		
Scattered Rural Domestic Uses	1,400[8]		
Scattered Stockponds & Livestock Uses	2,200[8]		
Fish and Wildlife	1,400[8]		
Total NM Non-Irrigation Depletion	**98,848**		
San Juan Project Exportation	107,514	201,047	23,457
Unspecified Minor Depletions	4,488[9]		
Total NM Depletions	**593,863 (Excluding ALP)**		

[7]Includes 10,600 acre-feet of annual groundwater storage, which drops the depletion figure to 270,000 acre-feet at equilibrium.

[8]Indicates offstream depletion accounted for in calculated natural gains.

[9]1,500 acre-feet of depletion from minor depletions approved of SJRIP in 1992. 3,000 acre-feet from 1999 intra-service consultation, a portion of which may be in Colorado.

Table 6. Environmental Baseline for the Animas-La Plata Project (continued)

DEPLETIONS BY STATE	AVERAGE ANNUAL DEPLETION(AC-FT)	DEPLETION RANGE (1929 TO 1993) (MAX AC-FT)	(MIN AC-FT)
Colorado Depletions			
Upstream of Navajo			
Upper San Juan	10,858	13,905	7,341
Navajo-Blanco	7,865	10,345	5,015
Piedra	8,098	13,196	2,935
Pine River	71,664	96,692	53,174
Subtotal	**98,485**		
Downstream of Navajo			
Florida	28,538	33,137	15,688
Animas	25,113[10]	32,354	19,659
La Plata	13,049	23,647	1,548
Mancos	19,530	24,339	14,257
Subtotal	**86,032**		
Total CO Depletions	**184,714 (Excluding ALP)**		
CO & NM Combined Depletions	778,577		
Subtotal	778,577		
McElmo Basin Imports	-11,990	-17,969	7,756
Utah Depletions	**9,140**[11]	1,705	1,705
Arizona Depletions	**10,010**[8]		
NET NM, CO, UT, AZ Depletion	**785,736**		
NM Off River Depletions			
Chaco River	2,832[8]		
Whiskey Creek	523[8]		
GRAND TOTAL	**789,091**		

Water Quality

Surface and ground water quality in the Animas, La Plata, Mancos, and San Juan River drainages have become significant concerns (Brogden et al. 1979). Changes in water quality and contamination of associated biota are known to occur in Reclamation projects in the San Juan drainage (i.e., irrigated lands on the Pine and Mancos Rivers) where return flows from irrigation make up a portion of the river flow or other aquatic sites downstream (Sylvester et al. 1988). Increased loading of the San Juan River and its tributaries with soil salts, elemental contaminants, and pesticides from irrigation return flows has degraded water quality of the San Juan River in critical habitat.

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[10]Includes 1,439 acre-feet for the City of Durango pumping station biological opinion (GJ-6-CO-97-F-026).

[11]1,705 acre-feet San Juan River depletion, 9,224 acre-feet offstream depletion.

Information on existing water quality, summarized in Abell (1994), in the San Juan River 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 northeastern New Mexico (Blanchard et al. 1993), results from Reclamation's water quality data for the Animas-La Plata project, and ongoing contaminant monitoring and research conducted as part of the Program.

Concentrations of selenium in water samples collected from the mainstem of the San Juan River exhibited a general increase in concentration levels with distance downstream from Archuleta, New Mexico, to Bluff, Utah, (<1 µg/l to 4 µg/l) (Wilson et al 1995). The safe levels of selenium concentrations for protection of fish and wildlife in water are <2µg/l and toxic levels are considered >2.7 µg/l (Lemly 1993, Maier and Knight 1994, Wilson et al. 1995). 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 ground water to the mainstem of the river along its course.

Sediments and biota associated with the San Juan River have also showed elevated selenium levels. 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 from Bloomfield to Farmington, New Mexico (Blanchard et al. 1993). Subsequent investigations (Wilson et al. 1995) have detected elevated levels of selenium in habitats associated with irrigation drainage returns and in the Mancos River. Selenium levels in whole body fish occasionally exceeded concentrations reported to be associated with reproductive failure and may pose a threat to predatory fish that consistently feed in the regions with elevated selenium.

The other contaminants of concern are polycyclic aromatic hydrocarbons (PAHs), also known as polynuclear aromatic hydrocarbons (PNAs). These compounds may reach aquatic environments in domestic and industrial sewage effluents, in surface runoff from land, from deposition of airborne particulates, and particularly from spillage of petroleum and petroleum products into water bodies (Eisler 1987). PAHs were the first compounds known to be associated with carcinogenesis (Lee and Grant 1981). Wilson et al. (1995) reported that concentrations of PAHs were elevated in the Animas River, but no identification of source location or activity has been made. The San Juan River below Montezuma Creek also had elevated levels of PAHs; and seasonal increases in PAH concentrations were detected in the "Mixer" area of the river. PAH levels in the bile of common carp and channel catfish sampled were high in one fish captured below Cudei Diversion and moderate in several fish captured near Bluff, Utah, above Cudei Diversion, and near Mexican Hat, Utah. The presence of PAH metabolites in bile of every fish sampled suggested some level of exposure to hydrocarbons (Wilson et al. 1995). Service analyses of PAH contamination of aquatic biota of the San Juan River and hepato-histological examinations of fish in the river raised concerns regarding the exposure of these organisms to contaminants introduced into the basin through the intensive development of energy resources in the area. Analyses of bile samples taken from fish in the San Juan River in 1991 indicated that these organisms were being exposed to high levels of three PAH compounds.

Physical Habitat

The quantity and timing of flows influence how various habitats are formed and maintained. Water depletions reduce the ability of the river to create and maintain backwaters, secondary channels, and cobble bars; degradation of water quality lessens the ability of endangered species to survive in these habitats.

Osmundson and Kaeding (1991) reported observations on the Colorado River (15-mile reach) during the drought years of 1988 -1990, that backwaters were filling in with silt and sand because spring flows were not sufficient to flush out the fine sediment. Also they reported that tamarisk colonized sand and cobble bars, stabilizing the river banks. On the San Juan River, lack of flooding since Navajo Dam was completed has caused establishment of exotic riparian vegetation (tamarisk and Russian olive) that has armored the channel banks resulting in a narrowing of the channel with reduced flood capacity (Bliesner and Lamarra 1994).

As previously stated, Colorado pikeminnow spawn July 1 to September 1 in cobble/gravel areas typically found in riffle/run habitats. Following hatch, larval Colorado pikeminnow drift downstream to low velocity habitats. Important habitats during summer low flow (August) are the San Juan's backwaters and secondary channels, used by larvae and young Colorado pikeminnow. Razorback sucker spawning aggregations have been observed in the San Juan River on the ascending limb of the hydrograph over cobble bars.

Biological Environment

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 nonnative fishes has been identified as a factor in the decline of the endangered fishes. Depending upon species-specific tolerance levels, nonnative fishes may have competitive advantages in habitats damaged by the presence of contaminants and altered flow regimes.

Riparian Habitat

Bald eagles winter in the riparian corridors of the rivers in the project vicinity. The primary habitat used for perching, roosting, and nesting are the mature cottonwood trees associated with the riparian corridors of these rivers. Reduction in spring flows can affect recruitment of cottonwood trees, and over the long term affect bald eagle habitat.

Human disturbance has increased in the Animas and La Plata River corridors in recent years. During Reclamation's bald eagle surveys, it was noted that houses are being constructed and cottonwood trees are being cut down in the floodplains of the Animas and La Plata Rivers. Reclamation's surveys found bald eagles avoid areas where human disturbance is greatest.

EFFECTS OF THE ACTION

Factors to be Considered

The Service believes that water depletions are a major factor contributing to the reductions in the populations of the Colorado pikeminnow and razorback sucker. Other major factors include impacts of dams, competition from and predation by nonnative fishes, changes in flow and temperature regimes, and changes in river channel (which are also related to water depletions). These reductions in population and loss of habitat have caused the Service to list these species as endangered and to implement programs to conserve the species. The operation of Navajo Dam to mimic the natural hydrograph by following the San Juan River flow recommendations, as a conservation measure, is expected to provide flows needed for the survival and recovery of the Colorado pikeminnow and razorback sucker. However, until a biological response is detected according to the criteria that will be developed by the Biology Committee, this will not be known.

Analyses for Effects of the Action

Water Quantity

Water depletions cause discrete, identifiable, additive, adverse impacts to the Colorado River endangered fishes. As shown in the following flow analysis, the action subject to consultation will cause flow depletions that alter baseline flow regimes. The proposed action will result in a new average annual depletion of 57,100[12] acre-feet of water from the San Juan River at Four Corners. Depletions are greater upstream of Four Corners before all return flows enter the San Juan River. Between the confluence of the Animas and La Plata Rivers depletions could be up to 80,700 acre-feet/year. The implementation of the San Juan River flow recommendations, and modeling shows that the minimum flow targets for endangered fishes will be met under all project conditions. The hydrological analysis of the project is based on the conditions with the flow recommendations in place. Table 7 and Figure 2 show modeled flow conditions at Shiprock, New Mexico, with and without the proposed project for the period 1929-1993. The greatest reduction in flows occurs during September when maximum mean monthly flows are reduced by less than 9 percent. During the driest conditions (minimum mean monthly flows), there is no change in flow conditions at Shiprock because the project would not be pumping water from the Animas River under these conditions. Table 8 and Figure 3 show modeled flow conditions at Four Corners for the 1929-1993 period. The greatest reduction in flows at Four Corners is in June when the minimum mean monthly flows are reduced by more than 13 percent. The Figures show that there is some reduction in spring peak flow, but there is still a mimicry of a natural hydrograph. Table 9 compares the following flow scenarios with the flow recommendations: pre-Navajo Dam conditions (1929-1961), post-Navajo Dam conditions (1962-1991), current conditions (the amount of water in the river today), Animas-La Plata Project environmental baseline (includes water for projects that have completed section 7 consultation), and conditions with the Animas-La Plata Project in place. With the Animas-La Plata Project in place, the flow recommendations can be met. There are only small changes in flow conditions between the environment baseline and with the Animas-La Plata Project in place.

[12] 1,439 acre-feet/year is an existing depletion by the City of Durango.

	Minimum Mean Monthly CFS					Average Mean Monthly CFS					Maximum Mean Monthly CFS			
	Without	With	Change	Change		Without	With	Change	Change		Without	With	Change	Change
	ALP	ALP		%		ALP	ALP		%		ALP	ALP		%
Oct	535.6	535.6	0.0	0.0		786.6	739.4	-47.2	-6.0		4,216.4	3,929.3	-287.1	-6.8
Nov	541.9	541.9	0.0	0.0		736.2	701.1	-35.1	-4.8		2,793.2	2,723.1	-70.1	-2.5
Dec	541.9	541.9	0.0	0.0		676.1	662.8	-13.3	-2.0		2,253.0	2,235.4	-17.7	-0.8
Jan	541.9	541.9	0.0	0.0		596.4	590.2	-6.1	-1.0		980.5	949.3	-31.2	-3.2
Feb	541.9	541.9	0.0	0.0		638.3	628.6	-9.6	-1.5		1,420.1	1,384.7	-35.4	-2.5
Mar	541.7	541.7	0.0	0.0		1,130.7	1,077.2	-53.4	-4.7		5,599.9	5,464.9	-135.0	-2.4
Apr	530.7	530.7	0.0	0.0		2,226.7	2,054.4	-172.2	-7.7		6,872.4	6,800.8	-71.6	-1.0
May	525.0	525.0	0.0	0.0		4,328.6	4,133.4	-195.2	-4.5		10,472.6	10,329.4	-143.2	-1.4
Jun	525.0	525.0	0.0	0.0		4,895.9	4,639.2	-256.6	-5.2		9,999.8	9,652.5	-347.2	-3.5
Jul	525.0	525.0	0.0	0.0		1,231.2	1,131.6	-99.6	-8.1		4,572.0	4,372.6	-199.5	-4.4
Aug	525.0	525.0	0.0	0.0		708.3	675.8	-32.6	-4.6		2,280.6	2,130.5	-150.1	-6.6
Sep	525.0	525.0	0.0	0.0		690.4	666.7	-23.7	-3.4		2,278.5	2,091.0	-187.6	-8.2

Table 7. Mean monthly flows for the San Juan River at Shiprock, NM, with and without the Animas-La Plata Project. Minimum, Average and Maximum Mean Monthly CFS for the modeled period 1929-1993.

	Minimum Mean Monthly CFS				Average Mean Monthly CFS				Maximum Mean Monthly CFS			
	Without ALP	With ALP	Change	Change %	Without ALP	With ALP	Change	Change %	Without ALP	With ALP	Change	Change %
Oct	536.5	536.5	0.0	0.0	953.9	907.4	-46.4	-4.9	6,423.0	6,136.7	-286.3	-4.5
Nov	541.7	541.7	0.0	0.0	763.6	729.1	-34.5	-4.5	3,147.8	3,078.4	-69.5	-2.2
Dec	541.9	541.9	0.0	0.0	723.5	710.3	-13.2	-1.8	2,346.2	2,328.7	-17.5	-0.7
Jan	541.9	541.9	0.0	0.0	654.1	648.1	-6.0	-0.9	1,085.2	1,041.4	-43.8	-4.0
Feb	541.9	541.9	0.0	0.0	781.8	772.5	-9.3	-1.2	2,001.3	2,012.5	11.3	0.6
Mar	541.5	541.0	-0.5	-0.1	1,218.6	1,165.5	-53.0	-4.4	6,053.8	5,919.3	-134.6	-2.2
Apr	564.1	592.4	28.4	5.0	2,319.5	2,147.8	-171.6	-7.4	7,401.2	7,330.2	-71.0	-1.0
May	755.0	737.9	-17.1	-2.3	4,408.9	4,214.5	-194.4	-4.4	12,261.3	12,118.8	-142.4	-1.2
Jun	945.8	814.6	-131.1	-13.9	5,078.5	4,823.3	-255.3	-5.0	9,761.9	9,416.0	-345.9	-3.5
Jul	636.8	630.7	-6.1	-1.0	1,496.0	1,397.4	-98.5	-6.6	4,833.2	4,634.8	-198.4	-4.1
Aug	540.1	540.1	0.0	0.0	1,026.2	994.8	-31.4	-3.1	4,229.6	4,080.7	-148.9	-3.5
Sep	538.4	538.4	0.0	0.0	903.1	880.4	-22.7	-2.5	3,558.6	3,424.5	-134.1	-3.8

Table 8. Mean monthly flows for the San Juan River at Four Corners, NM, with and without the Animas-La Plata Project. Minimum, Average and Maximum Mean Monthly CFS for the modeled period 1929-1993.

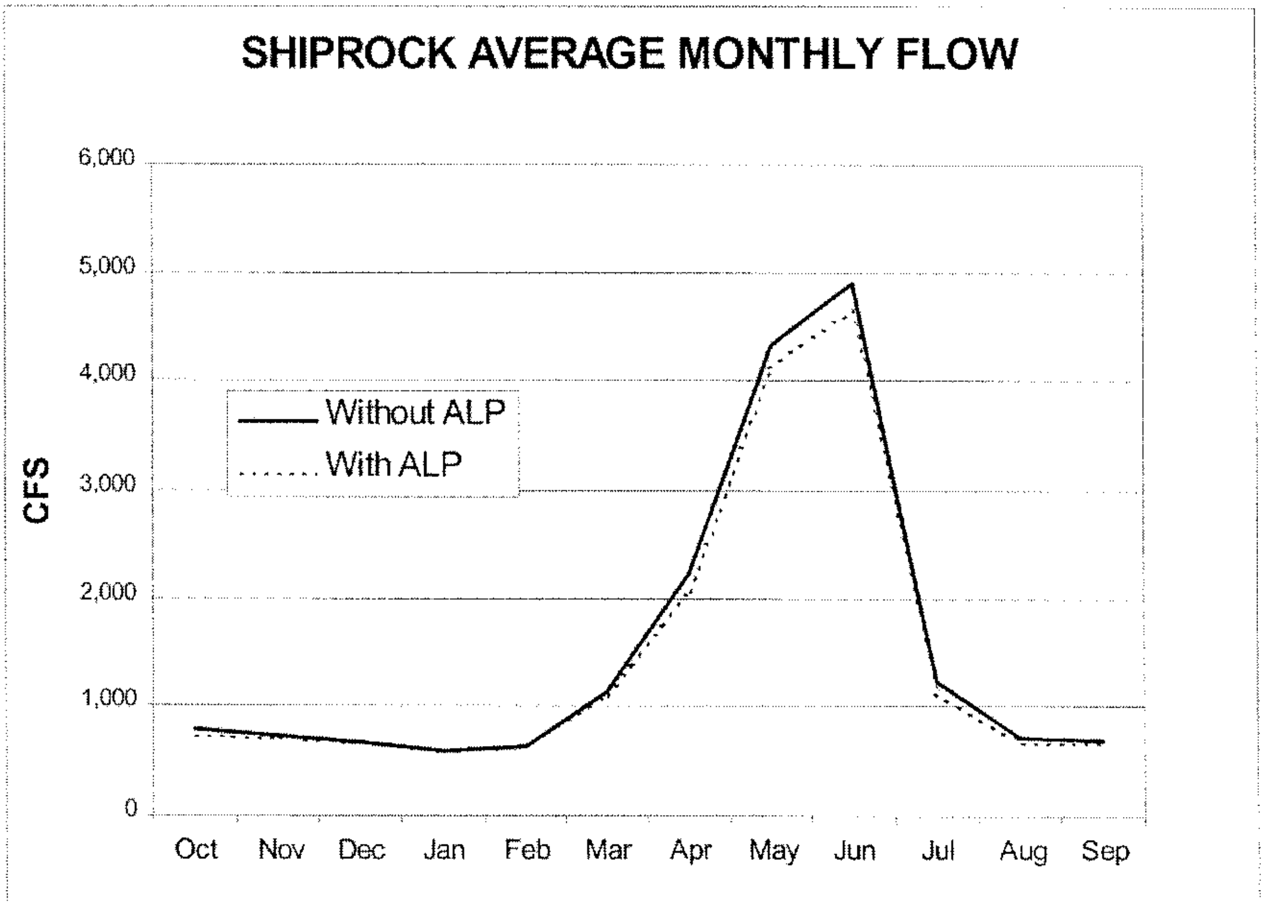

Figure 2. Average monthly flows at Shiprock, New Mexico, with and without the Animas-La Plata Project for the modeled period 1929-1993.

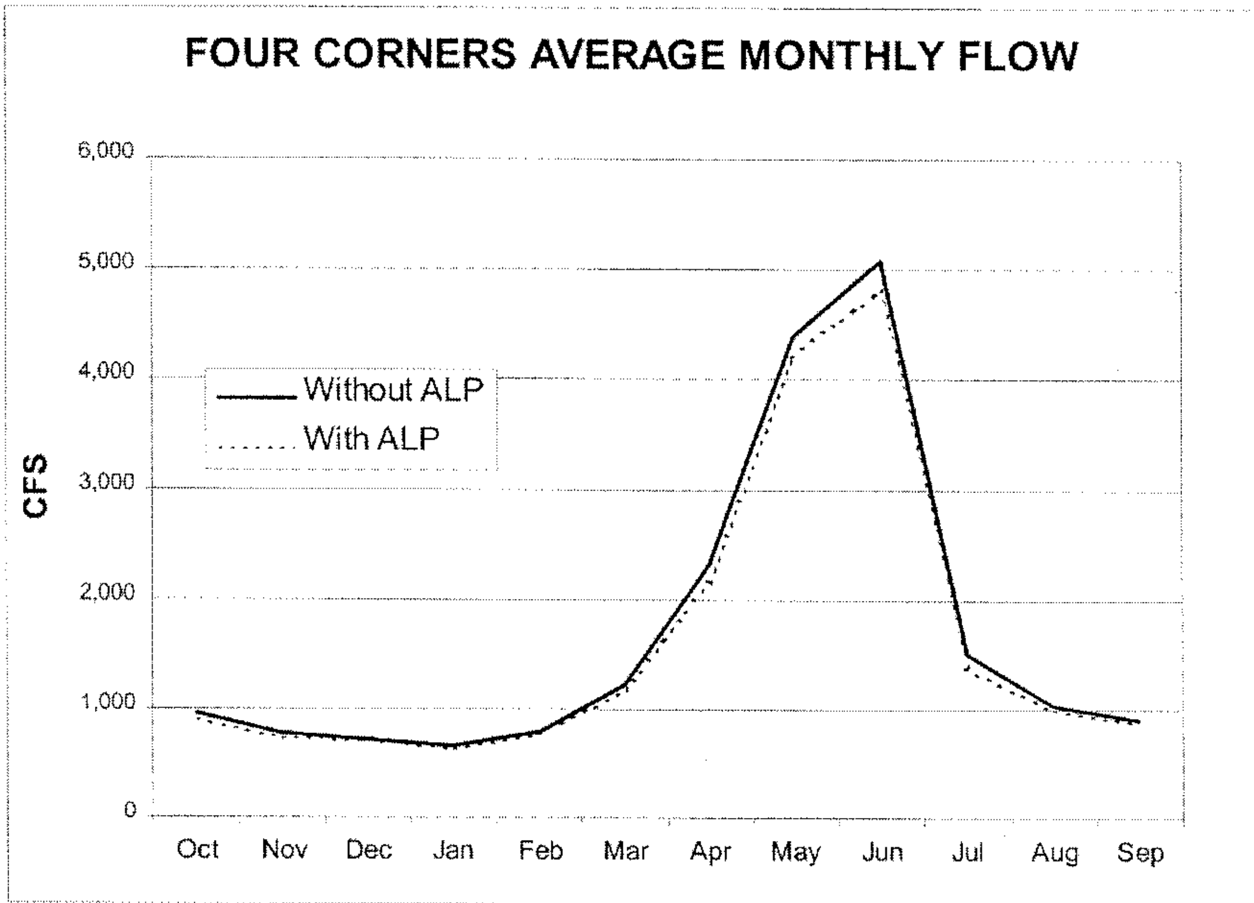

Figure 3. Average monthly flows at Four Corners, with and without the Animas-La Plata Project for the modeled period 1929-1993.

Table 9. San Juan River Flow Statistics by Flow scenario for the period 1929-1993[13]

Summary of Flow Statistics for San Juan River at Four Corners, NM for Pre-and Post Dam Historic Flow Current Development Level and Current With ALP Project

Parameters	Pre-Dam 1929-1961	Post-Dam 1962-1991	Current Condition	ALP Baseline	With ALP	Flow Recommendation Threshold
Average Peak Daily Runoff - CFS	12,409	6,749	9,803	8,822	8,375	
Average Runoff - Acre-feet	1,263,890	891,712	968,296	876,681	830,085	
Peak>10,000 - frequency	55%	20%	42%	38%	34%	
Peak>8,000 - frequency	67%	37%	75%	60%	55%	
Peak>5000 - frequency	91%	53%	94%	75%	72%	
Peak>2,500 - frequency	100%	90%	100%	98%	95%	
AF>1,000,000 - frequency	55%	40%	42%	32%	34%	
AF>750,000 - frequency	67%	47%	58%	51%	48%	
AF>5,000,00 - frequency	91%	67%	72%	66%	66%	
AF>10,000 CFS for 5 days - frequency	39%	**13%**	29%	29%	28%	20%
AF>8,000 CFS for 10 days - frequency	45%	**17%**	43%	42%	38%	33%
AF>5,000 CFS for 21 days - frequency	64%	**37%**	60%	58%	52%	50%
AF>2,500 CFS for 21 days - frequency	100%	83%	94%	86%	80%	80%
Maximum years between flow events for minimum duration						
Peak>10,000 for 5 days	4	**14**	9	9	9	10
Peak>8,000 for 10 days	4	**7**	6	6	6	6
Peak>5000 for 21 days	4	**7**	4	4	4	4
Peak>2,500 for 10 days	0	1	1	1	2	2
Non-corrected Perturbation	12%	27%	20%	20%	23%	
Average Date of Peak	31-May	01-Jun	05-Jun	03-Jun	04-Jun	
Standard Deviation of Peak	23	35	12	13	14	
Days>10,000 CFS	14	3	5	4	4	
Days>8,000 CFS	23	8	14	13	12	
Days>5,000 CFS	46	28	38	33	31	
Days>2,500 CFS	82	67	63	57	53	
Meets Recommendation			Yes	Yes	Yes	

Note: Values in **bold** indicate non-compliance with Standard

[13]Source Animas-La Plata Project Water Resources Report 1999

Water Quality

Irrigated agriculture is no longer part of the Animas-La Plata Project, therefore, impacts to water quality from leaching of contaminants from irrigation are no longer anticipated impacts associated with the proposed project. However, water depletions cause existing contaminants to become more concentrated.

Potential heavy metal and/or selenium contamination in the Animas River could be transported to the newly created Ridges Basin Reservoir and bioaccumulation in the food chain could occur. Ridges Basin Reservoir could expand the food base for wintering bald eagles when it is not covered with ice. Studies conducted indicate mercury and selenium levels could impact eagles if they bioaccumulate through the food chain and contaminate fish that bald eagles may feed on. Selenium concentrations in soil and water samples may be of concern, but concentrations in fish tissue did not indicate levels high enough to affect fish-eating birds.

Physical Habitat

Water depletions during spring runoff affect physical habitat in several ways. High spring flows are very important for creating and maintaining complex channel geomorphology and suitable spawning substrates, and in creating and providing access to off-channel habitats. Adequate summer and winter flows are important for providing a sufficient quantity of preferred habitats. The flow targets outlined in the San Juan River flow recommendations are designed to provide sufficient spring flows to create and maintain important habitats including: cobble bar construction; scouring of fine sediment from the interstitial spaces from the cobble so it is suitable for spawning; flushing sediments from backwaters; maintaining channel complexity; overbank flows to provide nursery habitat for razorback sucker; and appropriate water temperatures for spawning.

Biological Environment

Research to date on the San Juan River does not indicate that implementation of the flow regimes outlined in the San Juan River flow recommendations will reduce numbers of nonnative fishes. Implementation of physical means to prevent escapement of nonnative fishes from Ridges Basin Reservoir is part of the proposed project, therefore, there would not be a contribution of nonnatives fishes to the San Juan River from this newly created water body.

Riparian Habitat

While the project will change river flows in the Animas River and potentially in the La Plata River, studies show that these changes are not great enough to affect the riparian habitat (McKee et al. 1995). Also, Reclamation has incorporated bypass flows into the operation of the project to promote natural recruitment of cottonwood trees along the Animas River.

<u>Species and Critical Habitat Response to the Proposed Action</u>

The operation of Navajo Dam to mimic the natural hydrograph by following the San Juan River flow recommendations will result in flow patterns similar to those that occurred prior to 1962. The Animas-La Plata Project would cause water depletions to the San Juan River; however, the target flows outlined in the flow recommendations would still be met with operation of the proposed project. Therefore, the anticipated response of the Colorado pikeminnow and the razorback sucker would be increased population size. The Service anticipates the response of designated critical habitat would be improved habitat conditions, including clean spawning bars, more backwater habitat, and the maintenance of channel complexity.

The Service anticipates that the bald eagle population in the project area would remain the same or increase due to an increased food base provided by Ridges Basin Reservoir. Bald eagle habitat along the Animas and La Plata Rivers is not anticipated to be affected by the proposed project. The Service is concerned that bioaccumultation of trace elements in bald eagle food items in Ridges Basin Reservoir may impact birds that select food items from the reservoir. However, Reclamation will develop and implement a monitoring program for potential adverse bioaccumulation of trace elements. If the monitoring program identifies a problem with trace elements, Reclamation will develop and implement an action plan to minimize impacts to bald eagles.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Coalbed Methane Development

The San Juan Basin in southwestern Colorado and northwestern New Mexico is rich in coalbed methane and development of this resource has increased rapidly in the last ten years. There are currently more than 3,000 coalbed methane wells in the San Juan Basin in the Fruitland coal formation. Currently, one well per 320 acres is allowed; however, the industry has recently filed two applications with the Colorado Oil and Gas Commission to increase the well spacing to one well per 160 acres. If these are approved, potentially more than 700 additional wells may be drilled, approximately 250 could occur on private or State land.

Coalbed methane development requires the extraction of groundwater to induce gas flow. A study was initiated in 1998 to determine the effects of groundwater extraction from the Fruitland formation. The study is called the 3M Project (mapping, modeling, and monitoring) and it is being conducted by the Colorado Oil and Gas Conservation Commission in cooperation with the Southern Ute Indian Tribe, the Bureau of Land Management, the Forest Service and the industry.

Recent data show that coalbed methane wells located within 1.5 miles of the Fruitland coal formation outcrop (located in the northern region of the San Juan Basin) are in hydraulic communication with the shallow groundwater system at the outcrop. The hydraulic communication is likely to extend deeper into the basin in the northern region of the San Juan Basin than in other areas of the Fruitland formation. In general terms, groundwater produced from near-outcrop coalbed methane wells is recent recharge water that would, under pre-coalbed methane conditions, discharge to local rivers and ultimately provide flow to the San Juan River.

Coalbed methane wells occur on Federal, State, tribal, and private lands. The BLM is currently preparing an EIS to address coalbed methane development on the Southern Ute Indian Reservation and they are also preparing a separate EIS to address coalbed methane development on Federal lands. Water depletions associated with coalbed methane development on tribal and Federal lands will be addressed during future section 7 consultation with the BLM. There will not be future section 7 consultations for coalbed methane development on private or State lands if there is no Federal action associated with the wells. Therefore, water depletions associated with coalbed methane development on private and State lands are considered a cumulative effect that is reasonably certain to occur within the Animas-La Plata Project action area.

The 3M Project is using a ground water model and a reservoir model to determine water budgets and therefore, depletions associated with coalbed methane development. The ground water model is relatively simple, accounting for groundwater discharge from the Fruitland formation. The reservoir model is much more complex, as it incorporates two-phase flow characteristics of the geologic and hydrologic reservoir of the Fruitland formation. One of the intended uses is to predict potential impacts from infill drilling and to quantify the current overproduction of water in the northen portion of the basin. Preliminary results of the ground water model is the best scientific information available to date. Results of the reservoir model are not yet available. The preliminary results of the groundwater model show that prior to coalbed methane development, the Fruitland formation discharged approximately 280 acre-feet/year to the San Juan River. Considering current conditions where the wells are extracting approximately 1,200 acre-feet per year in the near-outcrop areas, the 280 acre-feet of recharge at the outcrop have been effectively cut off from discharging to the rivers. The worst case scenario may see a reversal of flow, where the rivers and alluvial aquifers provide the water to the coalbed methane wells. Depletions as high as 2,000 acre-feet/year are plausible, as a worst case. Most water depletions come from the wells north of the Southern Ute Indian Reservation. Approximately 25 percent of the coalbed methane development north of the Reservation is on Federal lands. Therefore, if one assumes the worst case scenario, current and future depletions from State and private lands could deplete 75 percent of the 2,000 acre-feet/year or 1,500 acre-feet/year. New wells would deplete some number less than 1,500 acre-feet/year, since existing wells currently deplete some of this total.

The RiverWare model, which is used to evaluate hydrologic conditions on the San Juan River and its tributaries, requires a defined project to determine project compatibility with the San Juan River flow recommendations. Because future coalbed methane development on State and private land is not a defined project and the depletions associated with it are relatively small and not specifically quantified, the RiverWare model is not an appropriate tool to use to determine the compatibility with the flow recommendations. However, on May 21, 1999, the Service issued a biological opinion that addressed the impacts of future Federal projects that individually involve small water depletions that total 3,000 acre-feet/year. It was determined in this biological opinion that these small depletions would not diminish the capability of the system to meet the flow levels, durations, or frequencies outlined in the San Juan River flow recommendations. While the coalbed methane development on State and private lands was not addressed in the small depletion biological opinion, because this development does not involve future Federal actions, coalbed methane development does involve small individual depletions similar to the projects addressed by the small depletion biological opinion. Therefore, the Service concludes that an additional future depletion of less than 1,500 acre-feet/year from the San Juan River associated with coalbed methane development on State and private land, would not significantly impact the ability to met the San Juan River flow recommendations.

Future section 7 consultations in the San Juan River Basin will need to consider the cumulative effects of coalbed methane development on State and private land using the best scientific information available to determine the water depletions associated with development.

Bald Eagles

The Service anticipates that future development of private property in the floodplain of the Animas and La Plata Rivers could impact bald eagle habitat. Habitat could be affected by removal of all age classes of cottonwood trees and by increase human disturbance.

CONCLUSION

After reviewing the current status of the Colorado pikeminnow, razorback sucker, and bald eagle, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the Animas-La Plata Project, as described in this biological opinion, is not likely to jeopardize the continued existence of the Colorado pikeminnow or razorback sucker, and the proposed project is not likely to destroy or adversely modify designated critical habitat. The Service also concludes that the proposed project is not likely to jeopardize the continued existence of the bald eagle. This conclusion is based on the description of the proposed action contained in this biological opinion, with full implementation of the conservation measures.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 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 to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an incidental take statement.

Incidental take is considered with full implementation of the conservation measures outlined in the description of the proposed action and considering the cumulative effects. The Service does not anticipate that the proposed Animas-La Plata Project will incidentally take any threatened or endangered species.

REINITIATION NOTICE

This concludes formal consultation on the proposed Animas-La Plata Project. As provided in 50 CFR sec. 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect 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 or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

Because Reclamation has committed to operate Navajo Reservoir to benefit endangered fishes as a conservation measure, the Service would consider the inability to met the flow recommendations as a significant modification of the conservation measure that would affect the Colorado pikeminnow and razorback sucker and their designated critical habitat on the San Juan River. Therefore, upon completion of the Navajo Reservoir EIS, the Service in coordination with Reclamation will determine if the San Juan River flow recommendations can be met. If it is determined that the flow recommendations cannot be met, Reclamation is required to reinitiate section 7 consultation on the Animas-La Plata Project.

Following the San Juan River flow recommendations is expected to result in a positive population response for the Colorado pikeminnow and razorback sucker in the San Juan River. If a positive population response for both species is not realized as measured by the criteria developed by Reclamation within the next year, this would be considered new information that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion. Therefore, if the flow recommendations do not result in a positive population response, Reclamation will be required to reinitiate section 7 consultation.

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