

SAN JUAN RIVER BASIN  
RECOVERY IMPLEMENTATION  
PROGRAM

ANNUAL BUDGET AND WORK PLAN

FISCAL YEAR 2000

PREPARED FOR  
SJRIP COORDINATION COMMITTEE

PREPARED BY  
SJRP BIOLOGY COMMITTEE

December 23, 1999

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**SAN JUAN RIVER BASIN RECOVERY IMPLEMENTATION PROGRAM  
ANNUAL BUDGET  
FISCAL YEAR 2000**

San Juan River Basin Recovery Implementation Program - Budget for FY2000

	Agency	Program	BIA Direct	Other Direct
<b>I. <u>Monitoring</u></b>				
Adult Fish Community Monitoring	USFWS, G.J.	\$ 43,900		
Larval Drift - Colorado Pikeminnow	UNM	\$ 35,834		
Larval Drift - Razorback	UNM	\$ 21,965		
Specimen ID	UNM	\$ 35,938		
YOY/Small Bodied fish monitoring	NMDGF	\$ 57,200		
Adult/YOY monitoring participation	Utah	\$ 0	(carryover adequate)	
Videography	USBR	\$ 0	(carryover from '99)	
Channel Morphology	KB		\$ 111,595	
Habitat Mapping	KB/ERI		\$ 42,000	
Water Temperature Monitoring	KB		\$ 6,013	
Water Quality Monitoring	KB		\$ 22,920	
Maintain GIS Database	KB		\$ 24,024	
			<hr/>	
Subtotal		\$ 194,837	\$ 206,552	
<b>II. <u>Program Management/Reporting</u></b>				
Program Management	USBR	\$ 30,000		
Program Coordination	USFWS, ABQ	\$ 62,115		
Electronic Capture of the 1987-1989 San Juan River Research Program Database	UNM	\$ 18,400		
Complete the Synthesis report	BioWest	\$ 55,000 <sup>1</sup>		
Peer Review (carried over from '99 budget)	BioWest	\$ 0		
			<hr/>	
Subtotal		\$ 165,515	\$ 0	

San Juan River Basin Recovery Implementation Program - Budget for FY2000

	Agency	Program	BIA Direct	Other Direct
<b>III. Research Activities</b>				
Suppression of Red Shiner	UNM/NMDGF	\$ 36,250		
Population estimates at five locations	Miller	\$ 22,227		\$ 14,655 <sup>2</sup>
Population estimates at five locations	KB/ERI		\$ 91,936	
Larval pikeminnow drift-netting	UNM	\$ 26,220		
Evaluation of stocked larval pikeminnow	Utah	\$ 4	(carryover adequate)	
Develop optimized Navajo operating rules	KB	\$ 0	funds not available	
Develop optimized Navajo operating rules	USBR	\$ 0	funds not available	
PAH Study	BLM, FM			\$ 50,000 <sup>3</sup>
Subtotal		\$ 84,701	\$ 91,936	\$ 64,655
<b>IV. Recovery Efforts</b>				
Catfish removal	USFWS, ABQ	\$ 34,000		
Evaluation of Stocked Razorback Sucker	USFWS, G.J.	\$ 39,040		
Larval Razorback Collection	USFWS, G.J.	\$ 12,200		
PIT Tags*	USBR	\$ 40,000		
Subtotal		\$ 125,240	0	
<b>TOTAL - ALL CATEGORIES</b>		<b>\$ 570,293</b>	<b>\$ 298,488</b>	<b>\$ 64,655</b>
<b>Funding Sources</b>				
Southern Ute Tribe				\$ 14,655 <sup>2</sup>
BLM				\$ 50,000 <sup>3</sup>
USBR (Preliminary assesement of availability)		\$ 265,000		
BIA/NIIP		\$ 120,000	\$ 298,488	
BIA/Albuquerque		\$ 50,000		
USFWS		\$ 126,500		
<b>TOTAL AVAILABLE</b>		<b>\$ 561,500</b>	<b>\$ 298,488</b>	<b>\$ 64,655</b>
Balance (shortfall) for total request		\$ (8,793)	\$ 0	\$ 0

San Juan River Basin Recovery Implementation Program - Budget for FY2000

	Agency	Program	BIA Direct	Other Direct
Totals by Entity				
USFWS - Grand Junction		\$ 95,140		
USFWS - Albuquerque		\$ 96,115		
USBR		\$ 70,000		
NMGF		\$ 93,450		
UNM		\$ 138,357		
Utah (carry-over from 1999 is adequate)		\$ 0		
Bio/West		\$ 55,000		
Miller		\$ 22,227		\$ 14,025 <sup>2</sup>
KB/ERI		\$	\$ 298,488	
BLM - Farmington				\$ 50,000 <sup>3</sup>
Total		\$ 570,289	\$ 298,488	\$ 64,025

\* Purchased items - no specific work plan shown.

<sup>1</sup> Total FY-2000 Budget of \$90,000 with a carry over of \$35,000 from the '99 Budget

<sup>2</sup> Funding is through Southern Ute Tribe

<sup>3</sup> Funding is through BLM - Farmington

<sup>4</sup> Total FY - 2000 Budget of \$43,595, including \$7,000 for UNM for fish ID, is covered by carryover from 1999.

## **I. MONITORING**

**Adult/Juvenile Fish Community Monitoring  
Fiscal Year 2000 Project Proposal**

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**Background:**

Studies performed before 1991 documented a native San Juan River fish fauna of eight species, including Colorado pikeminnow (previously known as Colorado squawfish), razorback sucker, and roundtail chub and provided baseline information on distribution and abundance of native and introduced fish species in the San Juan River. Main channel fish community monitoring studies (known as "adult monitoring") performed from 1991 to 1998 refined this baseline data and provided data on specific habitat usage by rare fish species. Adult monitoring has proven to be the most effective tool for monitoring populations of stocked razorback sucker and recently stocked adult Colorado pikeminnow. In addition adult monitoring has recently captured numerous stocked, early life stage Colorado pikeminnow. Information gathered during adult monitoring also aided in the selection of specific sites for detailed hydrologic measurements and larval drift sampling. Integration of adult monitoring data with data from Colorado pikeminnow macrohabitat studies, razorback sucker experimental stocking studies, tributary and secondary channel studies, fish health studies, contaminants studies, habitat mapping studies, and non-native species interaction studies, helped provide data to make flow recommendations for reoperation of Navajo Reservoir.

Thirty-one intensive electrofishing surveys conducted from 1991 to 1998 have expanded our baseline knowledge on the distribution and abundance of the San Juan River fish community. As of October 1998, nineteen wild Colorado pikeminnow have been collected and PIT-tagged; 13 of the 19 Colorado pikeminnow were radio-tagged. In addition, 10 adult and 179 juvenile, experimentally-stocked Colorado pikeminnow have been recaptured. Ninety-five of these fish, including the only recapture to date, were captured on the October 1998 adult monitoring trip. Twenty-two roundtail chub were collected, 18 of these were PIT-tagged. No wild razorback sucker were collected, however 68 of 74 recaptured, stocked razorback sucker have been recaptured during adult monitoring trips. The September/October 1999 main channel fish community monitoring trip has not yet taken place (scheduled for 20 September through 8 October 1999).

The need for a long-term, standardized monitoring program, such as the adult monitoring study is addressed in objective 5.7.1, a Milestone in the San Juan River Long Range Plan. These need has been recognized in the development of the Draft Long Term Monitoring Program. Additionally, future monitoring will help determine fish community response to reoperation flows from Navajo Dam (objective 5.2.10), as well as monitoring both wild and augmented populations of Colorado

squawfish and razorback sucker (objective 5.3.9). The methods described here follow those developed for the Long Term Monitoring Plan.

Adult monitoring will continue with one trip in fall 1999, to measure fish community response to reoperation flows from Navajo Dam, monitor populations of experimentally-stocked Colorado pikeminnow and razorback sucker, and assess impacts of instream diversion structures to native fish species. In support of objective #4 below, nonnative fish removal will continue to be done on all adult monitoring trips. The study design for adult monitoring is based upon the latest draft criteria for long-term monitoring of the San Juan River main channel fish community. These criteria are being evaluated on the September/October 1999 main channel fish community monitoring trip and will be finalized by the San Juan River Biology Committee at a later date.

### **Description of Study Area:**

The study area for adult monitoring extends from river mile (RM) 180.0 (Animas River confluence) in Farmington, New Mexico, downstream to RM 2.9 (Clay Hills Landing) just above Lake Powell in Utah. The entire reach of river from RM 180.0 to RM 2.9 will be sampled in the fall of every year (probably second to third week in September).

### **Objectives:**

- 1.) Determine shifts in fish community structure, abundance and distribution, and length/weight frequencies under the reoperation flow regime.
- 2.) Monitor Colorado pikeminnow population trends (spawning and staging areas, habitat needs).
- 3.) Monitor experimentally stocked razorback sucker and Colorado pikeminnow (growth rates, dispersal patterns and habitat use).
- 4.) Remove nonnative fish species which prey upon and compete with native fish species in the San Juan River.
- 5.) Finalize report for results and findings for 1991-1997 adult monitoring studies. Produce an "annual" report for results and findings of 1998 and 1999 adult monitoring field work.

### **Methods:**

Objectives 1-5: One adult monitoring trip will take place in fall 2000. The fall trip will sample from the Animas River confluence in New Mexico (RM 180.0) to Clay Hills Landing in Utah (RM 2.9). Electrofishing will be the primary sampling technique, although seining and trammel netting may also be employed.

Two oar-powered rafts, with one netter each, will electrofish in a continuous downstream fashion, with one raft on each far shoreline. No outboard motors will be used. Sampling crews will consist of approximately 8-9 people (4 for electrofishing, 2 for baggage rafts, and 2-3 for other research elements that are being done simultaneously with our sampling). Electrofishing will be conducted in a continuous downstream fashion, sampling two out of every three miles (approximately 120 total sampled miles). All fish collected will be enumerated by species and life stage every sampled mile. Every fifth sampled mile (designated mile), all fish collected will be weighed, measured, and sexed if possible. All native fish collected will be returned alive to the river. All nonnative fish collected will be removed from the river. All predatory lacustrine fishes (i.e. - walleye, striped bass, largemouth bass, small mouth bass, etc.) collected will be weighed, measured, and have stomach contents taken, before being removed from the river. Tag numbers, total length, and weight will be recorded on all recaptured, FLOY-tagged fish (both native and nonnative), as well as any rare fish collected. Colorado pikeminnow and wild razorback sucker greater than 200 mm TL will be implanted with PIT (Passive Integrated Transponder) tags. Wild, adult Colorado pikeminnow will also be implanted with radio transmitters. Wild, adult razorback sucker will be removed from the river and taken into captivity for use in captive broodstock development. Notes will be kept on any parasites and/or abnormalities observed on collected fishes.

Radio tag implantation and fish transport will follow the protocols attached to the San Juan River Seven Year Research Plan (1991). Electrofishing will follow the methods set forth above and in the long term monitoring plan. Seining and trammel netting will be done where suitable habitat is available at the sampling crews' discretion. The Service will have the lead for these adult monitoring trips and other cooperating agencies will provide personnel and equipment as needed. Costs for cooperating agencies are not included in this budget.

### **Products:**

The first draft of the final report for the 1991-1997 adult monitoring study has already been circulated. A re-draft of this report is expected to be available by early September 1999 with a final version expected by January 2000. A draft "annual" report for adult monitoring trips conducted in 1998 and 1999 is scheduled to be available by 31 March 2000. Finalization of the 1998-1999 "annual" report is scheduled to be completed by 1 June 2000. Costs for the finalization of the 1991-1997 adult monitoring report and producing a draft of and finalizing the 1998-1999 adult monitoring report are included in the budget for this workplan. At present, all DBASE IV files containing information on total catch and length/weight data gathered on adult monitoring trips through April 1999 have been submitted to Keller-Bliesner Engineering for inclusion on the San Juan River Recovery Implementation Program integrated database CD-ROM. Data collected after April 1999 will be submitted for inclusion on the database CD-ROM by 31 March 2000.

**Budget FY-2000:**

Personnel costs	
1 GM-13 Supervisor	\$ 5,000
1 GS-11 Fishery Biologist	\$ 15,000
1 GS- 7 Administrative Support	\$ 1,500
Data analysis and final report costs	\$ 5,000
Travel-Per Diem	\$ 6,500
Equipment and Supplies	<u>\$ 3,000</u>
Subtotal	\$ 36,000
Service Administrative Overhead (22.00%)	<u>\$ 7,900</u>
TOTAL	\$ 43,900

**San Juan River Larval Fish Passive Drift-netting  
Fiscal Year 2000 Project Proposal**

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**Background:**

Beginning in spring 1995, personnel from the Division of Fishes, Museum of Southwestern Biology (MSB), at the University of New Mexico assumed responsibility for the San Juan River larval fish passive drift-netting study. This project, formerly conducted by the Utah Division of Wildlife Resources, continued with only minor changes in sampling protocol. Data collected from this research activity provided several discrete types of information on the fishes of the San Juan River. Data that can be obtained on the endangered fishes of the river include determining approximate spawning period, identifying approximate location of spawning sites, and assessing effects of annual hydrology (and temperature) on their reproductive activities. Similar data could also be obtained for other members of the ichthyofaunal community and contrasted with previous drift-net sampling to assess the effects of that year's flow regime on fish reproduction. Samples collected during this research program were and will continue to be processed and curated by Fish Division personnel at the University of New Mexico.

Since the initiation of this research program, five larval Colorado pikeminnow have been collected. The two YOY Colorado pikeminnow collected in 1993 (at Mexican Hat) were the same length (9.2 mm TL; MSB 18098, 18099) and were taken on consecutive days in late July (26-27). From these two individuals, we determined the date of spawning to be about 8-9 July 1995.

Two larval Colorado pikeminnow were taken at Mexican Hat during the 1995 larval fish passive drift-netting study. The first specimen, 9.5 mm TL mesolarvae (MSB 26187) was taken between 2114-2310 hours on 2 August 1995. The next morning (3 August 1995) between 0531-0800 hours, a second Colorado pikeminnow, 9.0 mm TL mesolarvae (MSB 26191) was collected. The similar size and developmental stage of these two individuals, in combination with the fact that the two fish were collected within 12 hours of each other, strongly suggest that they were cohorts from a spawning event. From these two individuals, a spawning date between 15-17 July was determined.

A single YOY Colorado pikeminnow was collected in 1996. That specimen was a 8.6 mm TL yolker-mesolarvae taken on 2 August 1996 in a drift net at the Mixer sampling locality (RM 128.0). That individual represents the only larval Colorado pikeminnow collected during drift net sampling at the Mixer. The 1996 back-calculated spawning date for Colorado pikeminnow (18 July 1996) was similar to that predicted in 1995 despite considerable difference in spring peak discharge (1995 - 12,100 cfs; 1996 - 3,450 cfs) and total annual discharge. The 1997 drift netting samples did not yield any Colorado pikeminnow and the 1998 samples are still being processed (>500 bags of drift debris).

A comparison of 1995 and 1997 morning versus evening drift-net sampling indicated no significant differences in catch rate or ichthyofaunal composition. However, the supplemental data produced by evening sampling provided additional resolution to questions concerning drift patterns. Given the relative rarity of target species in the San Juan River and the extremely limited number of larval Colorado pikeminnow and roundtail chub collected, we redesigned passive drift-netting protocol so that sampling can be conducted during both morning and evening. In addition, we instituted a sampling regime to be conducted during the first week of August with nets to be set every other hour when hydrologic and weather conditions allow.

The lack of adult Colorado pikeminnow with functioning radio tags had, until 1998, precluded our attempts to sample the drift below the putative spawning bar during the presumed period of spawning by this species. During August 1998, we conducted an intensive six day sampling effort (ca. 14 hours/day) employing drift-nets and the Moore Egg Collector (MEC) in an area immediately downstream of a putative Colorado pikeminnow spawning bar. Researchers from Miller Ecological Associates had been tracking radio-tagged adult Colorado pikeminnow in that area for at least a week and, given the behavior of the fish, believed that spawning had occurred. Our sampling effort (conducted several days after the hypothesized initiation of spawning) yielded 152 collections and as many sample bags of debris (n=238) as was collected at either of the two drift netting sites during the tenure of drift sampling. Those samples failed to yield larval Colorado pikeminnow.

Table 1. Summary of larval and YOY Colorado pikeminnow collected in the San Juan River during larval drift-netting (1993-1998) and back-calculated dates of spawning.

Field Number	MSB Catalog Number	Number specim.	Total Length	Date Collected	Date Spawned	River Mile	Sampling Method
MH72693-2	18098	1	9.2	26 Jul 93	08 Jul 93	53.0	drift netting
MH72793-2	18099	1	9.2	27 Jul 93	09 Jul 93	53.0	drift netting
JPS95-205	26187	1	9.2	02 Aug 95	15 Jul 95	53.0	drift netting
JPS95-207	26191	1	9.0	03 Aug 95	17 Jul 95	53.0	drift netting
WHB96-037	29717	1	8.6	02 Aug 96	18 Jul 96	128.0	drift netting
TOTAL		5					

### **Study Area:**

The two drift-netting stations for this study will be the San Juan River between RM 128 and Mexican Hat (RM 53). If adult Colorado pikeminnow are tracked to presumed spawning bars, we will establish study sites immediately downstream of those areas. In 1998, that locality was near RM 167. Under this scope of this project, we do not anticipate making any collections in the reach of the San Juan River under the jurisdiction of the National Park Service.

### **Objectives:**

- 1.) Determine the temporal distribution of San Juan River ichthyoplankton in relation to the hydrograph
- 2.) Provide comparative analysis of the reproductive success of San Juan River fishes
- 3.) Attempt to characterize downstream movement of ichthyoplankton
- 4.) Attempt to validate presumed spawning period of Colorado River pikeminnow
- 5.) Institute a short-term but intensive sampling regime in the proximity of the presumed Colorado pikeminnow spawning bed using the MEC as the principal collecting device.

### **Methods:**

Daily drift samples will be collected at two predetermined localities (Four Corners and Mexican Hat) starting in early July and continuing until the end of August. Collections will be made using MEC each day at dawn and dusk for about two-hours. The amount of water filtered by each net ( $m^3$ ) will be measured by mechanical flow-meters suspended in the center of the nets. This information ( $m^3$ ) will allow us to determine catch per unit effort based on volume of water sampled versus time sampling. At the end of each sampling period, the collections will be labeled with unique field numbers and preserved in 5% buffered formalin.

All fish specimens will be identified and counted. In addition, specimens will be assigned to more coarse categories such as "drift" and "incidental". The former category refers to individuals with minimal or no control over their longitudinal movement. The latter classification refers to individuals whose developmental stage should have allowed them to avoid capture in passive drift nets.

Collection data will be converted to catch rate and compared across and within sites by species. In addition, catch rate between and within sites will be compared across time. Specimens will be distinguished and compared by residence status (native versus non-native) and catch rate over-laid with the annual hydrograph.

**Products:**

Separate draft reports for the 2000 passive larval drift sampling activities and collection efforts downstream of the putative spawning bar will be prepared and distributed (under a mutually agreed time-frame) to the San Juan River Biology Committee for review. Upon receipt of written comments, that report will be finalized and disseminated to members of the San Juan River Biology Committee. Fish collected from those studies will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico. Original field notes will be retained in the Division of Fishes and collection information will be electronically stored in a permanent MSB database program. Electronic copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed. A Draft Annual Report and electronic data files will be delivered by March 31, 2001.

**Budget FY-2000:**

Personnel

Field Research Associate	\$ 8,000
Field Research Technicians	\$ 14,400
	<hr/>
Subtotal	\$ 22,400

Travel and per diem

Travel	\$ 2,160
Field per diem	\$ 3,600
	<hr/>
Subtotal	\$ 5,760

Equipment and Supplies

Equipment upkeep	\$ 500
Sampling/Field Gear	\$ 1,500
Laboratory Equipment/supplies	\$ 1,000
	<hr/>
Subtotal	\$ 3,000

Total	\$ 31,160
Overhead (15%)	\$ 4,674
	<hr/>

**GRAND TOTAL**

**\$ 35,834**

**San Juan River Larval Razorback Sucker Survey  
Fiscal Year 2000 Project Proposal**

Principal Investigators: Steven P. Platania  
Division of Fishes - Museum of Southwestern Biology  
University of New Mexico  
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and

Principal Investigators: David L. Propst  
Conservation Services Program  
New Mexico Department of Game and Fish  
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**Background:**

In 1994, the first series of razorback sucker (n=672) were stocked in the San Juan River between Bluff, Utah and the Hogback, New Mexico. Mean length and mass of those individuals, at the time of stocking, was about 400 mm TL and 710 g, respectively. In 1995, 13 of the recaptured razorback sucker were tuberculate males and six of those individuals were ripe. Four recaptured 1995 razorback sucker were determined to be female but, unlike the males, none were sexually mature. In their 1995 report of activities, Ryden and Pfeifer (1996) suggested that the majority of the experimentally stocked San Juan River razorback sucker reached sexual maturity in 1995-96 and that spawning of these individuals might begin in the next two years.

The UNM-NMGF larval fish drift study, whose primary focus was determining spawning period, identifying approximate location of spawning sites, and assessing effects of annual hydrology (and temperature) on Colorado pikeminnow reproductive activities, provided similar information for other members of the ichthyofaunal community. At the November 1996 San Juan River Biology Committee integration meeting, it was suggested that a portion of the larval fish drift study be expanded to allow for documentation of razorback sucker spawning. However, because reproduction by razorback sucker (March-May) occurred considerably earlier than Colorado pikeminnow (June-July), separate investigations of spawning periodicity and magnitude were necessary for each species.

The most significant potential difference identified between the two studies, besides temporal differences in spawning, was that we were attempting to provide the first documentation of reproduction by individuals (razorback sucker) whose spawning potential had not been determined. Sampling for larval razorback sucker was being conducted with no assurance that the stocked population of adult razorback sucker would spawn in this system. Conversely, we knew from previous studies that Colorado pikeminnow reproduction had and was still occurring in the San Juan

River and, because of this certainty, our larval fish sampling efforts for this minnow could be different than those for razorback sucker.

As numerous Upper Colorado River basin researchers had reported light-traps as one of the best means of collecting larval razorback sucker, we too elected to use that sampling procedure during the first year (calendar year 1997) of sampling. The only previous San Juan River fish investigation that employed light-traps was in 1994-1995 (conducted by the National Park Service) near the San Juan River-Lake Powell confluence. The 1994 sampling effort produced an extremely large number of larval fish (ca. 25,000) from a modest number of samples ( $n=20$ ), of which over 99% were red shiner. Similar sampling in 1995 yielded 25,455 specimens in 47 light-traps samples and as in 1994, red shiner numerically dominated the catch. No Colorado pikeminnow or razorback sucker were taken in the 1994-1995 light-trap sampling efforts.

During the 1997 razorback sucker larval fish survey, light traps were set nightly in low-velocity habitats between Aneth and Mexican Hat from late March through mid-June 1997. The traps were distributed at dusk and retrieved about four hours later. Fish taken in those samples were preserved in the field. Sampling success during the 1997 razorback sucker larval fish study was quite poor. While there were over 200 light-trap sets, those sampling efforts produced only 297 fish. Of those, about 200 (66%) were larval suckers (either flannelmouth sucker or bluehead sucker). Larval razorback sucker were not present in the 1997 sampling survey. While there were probably several factors to account for the poor light trap catch rate, a principal factor was the limited access to suitable habitats. Light traps are most effective when set in habitats with little or no water velocity. During our driving survey of riverine habitats in the region (March 1997), we identified numerous locations that appeared to be suitable sites for light trap sampling. However, we found that high flow in the San Juan River eliminated virtually all previously identified low velocity habitats. Further driving reconnaissance failed to yield additional locations to set light traps. Being tied to specific collecting sites was not the most efficient means of collecting large numbers of individuals.

In 1998 we modified our sampling technique to allow for the sampling of a greater portion of the San Juan River and the collection of a significantly larger number of larval fish over a wider reach of the river. We conducted sampling forays ( $n=6$ ) at approximately bi-weekly intervals from 17 April (first trip - no larval suckers) to 6 June 1998 between the Four Corners drift-net station (RM 128) and Bluff (RM 80) and used both active and passive sampling techniques to collect larval fish. The primary sampling method was a fine mesh larval seine (in 1998, we collected more larval sucker in a single seine sample than in all of the 1997 light trap samples). Passive sampling techniques were both drift-netting and the use of light-traps. Drift-nets were set periodically to determine if larval sucker comprised a significant portion of the drift community while light-traps were set adjacent to campsites if appropriate aquatic mesohabitats could be located. An inflatable raft was used to traverse this river reach and allow investigators the opportunity to sample habitats that were either not formerly accessible or observable under the constraints of the previous sampling protocol.

The 1998 sampling protocol resulted in the collection of over 13,000 specimens, the majority of which were larval catostomids. This 43-fold increase in number of specimens, as compared with 1997, provided substantially better resolution of spawning periodicity of the sucker community. In addition, the 1998 samples produced enough individuals for investigators to determine, with a high

degree of confidence, if razorback sucker reproduction occurred in the San Juan River during that period. None of the aforementioned information was obtainable from 1997 light-trap samples. In 1998, two larval razorback sucker were collected. These specimens provide verification of spawning by the re-established population.

### **Study Area:**

The principal sampling area for this study will be the San Juan River between RM 128 and Mexican Hat (RM 53). We will attempt to make one sampling foray in 2000 between Mexican Hat (RM 53) and the Clay Hills boat landing (RM 2.9) just above Lake Powell in Utah. If conducted, this latter sampling effort would include making collections in reaches of the San Juan River under the jurisdiction of the National Park Service. Flow condition in 1999 were such that there were few low-velocity habitats available during the sampling period.

### **Objectives:**

- 1.) Determine the spawning periodicity of catostomids between mid-April-early June and examine potential correlations with temperature and discharge.
- 2.) Determine if reproduction by razorback sucker occurred in the San Juan River (upstream of Mexican Hat, UT)
- 3.) Provide comparative analysis of the reproductive effort of catostomids.
- 4.) Attempt to validate presumed spawning period of San Juan River catostomids using data from the razorback sucker and Colorado pikeminnow larval fish studies.

### **Methods:**

Sampling for razorback sucker larvae will be conducted in the San Juan River between Four Corners (RM 128) and Mexican Hat (RM 53) from mid-April through early June using sampling techniques that will provide sufficient number of individual fish necessary to meet study objectives. Access to the river shall be acquired through the use of either rafts or canoes. The tentative sampling schedule will be on a bi-weekly (approximately) interval.

Sampling efforts for larval fish will be concentrated in low velocity habitats. Samples in those habitats will be collected with small mesh seines and light-traps. Habitat type, length, maximum depth and substrate of the habitat will be recorded. For seine samples, length and number of each seine haul will be determined. Specimens will be preserved in the field for future laboratory processing. Catch per unit effort will be determined as the number of fish per m<sup>2</sup> sample for seine samples and the number of fish per hour for individuals collected in light-traps.

Catch rate data and compared across and within sites by species. In addition, catch rate between and within sites will be compared temporally (1997 & 1998 samples). Specimens will be distinguished

and compared by residence status (native versus non-native) and catch rate over-laid with the annual hydrograph.

**Products:**

A draft report for the 2000 razorback sucker sampling activities will be prepared and distributed (under a mutually agreed time-frame) to the San Juan River Biology Committee for review. Upon receipt of written comments, that report will be finalized and disseminated to members of the San Juan River Biology Committee. Fish collected from this study will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico. Original field notes will be retained in the Division of Fishes and collection information will be electronically stored in a permanent MSB database program. Electronic copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed. A Draft Annual Report and electronic data files will be delivered by March 31, 2001.

**Budget FY-2000:**

Personnel

Field Research Associate	\$ 8,000
Field Research Technician	\$ 5,000
Subtotal	\$ 13,000

Travel and per diem

Travel	\$ 1,600
Field per diem	\$ 1,000
Non-Field per diem (meeting attendance)	\$ 500
Subtotal	\$ 3,100

Equipment and Supplies

Rafting Equipment upkeep	\$ 2,000
Sampling/Field Gear	\$ 500
Laboratory Equipment/supplies	\$ 500

Subtotal \$ 3,000

Total \$ 19,100

Overhead (15%) \$ 2,865

**GRAND TOTAL \$ 21,965**

**San Juan River Specimen Curation And Larval Fish Identification  
Fiscal Year 2000 Project Proposal**

Principal Investigators: Steven P. Platania and Alexandra M. Snyder  
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**Background:**

Personnel from the Division of Fishes, Museum of Southwestern Biology (MSB), at the University of New Mexico are responsible for two inter-related programs on the San Juan River. The Fish Division is the repository for specimens collected and retained by researchers. Fish taken under these programs are initially sorted by the principal investigator, held until they have submitted their yearly-progress report, and then received by MSB personnel. The collection is accessioned, specimens transferred from formalin to alcohol, identifications verified, individuals enumerated, length ranges recorded (largest and smallest specimen in a collection), collection data verified and transferred to wet labels, and incorporated into a database. Changes in species identifications are noted and returned to the principal investigator along with the entire data set (listing of collection locality, collectors, date, original field number, species, number of specimens, length ranges, and museum catalog number). In addition to performing duties associated with collections curation, we are also responsible for complete processing (sorting, identifying, counting, curating, and reporting) of selected San Juan River collections (larval drift netting samples, razorback sucker larval fish sampling, spawning bar fish collections). The samples (almost 600) generated by the aforementioned three studies resulted in the collection of over 20,000 larval fish during 1998 (this is an estimate as all samples have not been processed - at present we have sorted and identified over 15,000 larval fish).

In 1998, we processed almost 50,000 larval and juvenile fishes collected by the Utah Division of Wildlife Resources (during 1996) and University of New Mexico-N.M. Game and Fish researchers (during 1997). The 1998-99 Utah Division of Wildlife Resources and New Mexico Department of Game and Fish low-velocity habitat samples will be processed beginning in the summer 2000. As in the past, deviations in the identifications of those samples will be noted and forwarded to the principal investigators.

**Study Area:**

This project does not involve the collection of specimens but instead the processing and curation of samples gathered by the different research components of the San Juan River Research program. The collective sampling area for other researchers will be the San Juan River between Farmington and the Clay Hills boat landing (RM 2.9) just above Lake Powell in Utah.

### **Objectives:**

- 1.) Sort, identify, enumerate, and report on larval fish drift collections
- 2.) Verify species identifications
- 3.) Provide a permanent repository for San Juan River fish collections, field notes, and associated data
- 4.) Assist principal investigators with collection sorting and identifications

### **Methods:**

Larval fish drift collections generated by UNM-NMGF research projects (Colorado pikeminnow drift-netting study, razorback sucker larval fish survey, Colorado pikeminnow spawning bar larval fish sampling) are received unsorted and processed as stated above. In addition to recording the length ranges for each species in each collection, we also note the presence of larval, juvenile, and adult specimens in the samples. The annual report for the larval fish portion of the study will be prepared by UNM personnel, as it has been since 1995.

We have assisted principal investigators by taking on the responsibility of processing unsorted collections. Specimens are sorted, identified, counted, measured, catalogued, and data submitted to the principal investigator for inclusion in reports. In the past, this work has had to be done on relatively short notice.

Samples from projects are received after the principal investigator has completed their work and prepared the necessary annual report. This means that there will be a lag of one year in reference collection of specimens and processing of those samples. All collections are matched with the appropriate data-sheet, transferred from formalin to alcohol, stored in museum quality jars, re-identified, counted, measured (range), labeled, and catalogued into the permanent MSB Fish Division collection.

### **Products:**

A draft report of the 2000 San Juan River specimen curation and larval fish identification sampling activities will be prepared and distributed (under a mutually agreed time-frame) to the San Juan River Biology Committee for review. Upon receipt of written comments, that report will be finalization and disseminated to members of the San Juan River Biology Committee. Fish collected from this study will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico. Original field notes will be retained in the Division of Fishes and collection information will be electronically stored in a permanent MSB database program. Electronic copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed. A Draft Annual Report and electronic data files will be delivered by March 31, 2001.

**Budget FY-2000:**

Personnel

Research Associate	\$ 20,000
Laboratory Technician	\$ 7,200

Subtotal	\$ 27,200
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Travel and per diem

Travel	\$ 600
Per diem	\$ 450

Subtotal	\$ 1,050
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Equipment and Supplies

Laboratory Equipment/supplies	\$ 2,000
Computer supplies	\$ 1,000

Subtotal	\$ 3,000
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Total	\$ 31,250
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Overhead (15%)	\$ 4,688
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<b>GRAND TOTAL</b>	<b>\$ 35,938</b>
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**YOY/Small Bodied Fish Monitoring  
Fiscal Year 2000 Project Proposal**

Principal Investigators: David L. Propst and Amber L. Hobbes  
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**Study Area:**

The study area for YOY/small bodied fish monitoring extends from river mile (RM) 180.0 (Animas River confluence) in Farmington, New Mexico, downstream to RM 2.9 (Clay Hills Crossing) just above Lake Powell in Utah.

**Collections:**

Specimens collected will be inspected to determine if any rare fishes (Colorado pikeminnow, roundtail chub, and razorback sucker) are present in the seine. All identifiable rare fish and all large-bodied native fish (i.e., flannelmouth and bluehead suckers) > 150 mm TL will be released. All other specimens will be preserved in 10% formalin and returned to the New Mexico Department of Game and Fish Laboratory for identification, enumeration, and measurement (total length and weight).

**Background:**

As set forth in Section 5.7 of the San Juan River Basin Recovery Implementation Program (SJRIP) Long-Range Plan, a long-term monitoring program "to identify changes in the endangered and other native species populations, status, distributions and habitat conditions" is to be developed by the SJRIP Biology Committee. The Ichthyofaunal Monitoring Program document (draft) monitoring was divided into three primary areas, larval fish, young-of-year/small bodied, and subadult and adult/large-bodied fishes. The portion of the San Juan River to be monitored extends from the confluence of the Animas and San Juan rivers (Farmington) to Lake Powell (Clay Hills Crossing). The following work proposal for 2000 is to conduct the young-of-year/small-bodied fishes monitoring effort per the protocols set forth in the draft SJRIP Monitoring Plan.

In addition to accomplishing work (field, laboratory, data analysis, and report writing) specific to the young-of-year/small-bodied fish monitoring effort, this proposal includes work that is devoted to other aspects of the San Juan River Basin Recovery Implementation Program.

## **Objectives:**

The objectives of this portion of the San Juan River monitoring effort are to obtain data that will aid in the evaluation of the response (e.g., reproduction, recruitment, and growth) of native and nonnative fishes to different flow regimes and other management actions (e.g., impediment modification), track trends in species populations (e.g., abundance and relative condition) and characterize patterns of habitat use. The data will also be available to all researchers and may be used in conjunction with data obtained in other studies to evaluate future management activities.

## **Methods:**

The study reach (Farmington to Clay Hills Crossing) includes geomorphic reaches 1 through 6, with Reach 1 being the most downstream. As determined by the SJRIP Biology Committee in the draft SJRIP Monitoring Plan, sampling will occur every third mile within the study reach. Secondary channels are defined as channels having less than 25% of the volume of flow at the time of sampling and are at least 300 m in length. Inflow at the top of a channel is not necessary for it to be classified as a secondary channel. If any portion of a secondary channel (except mouth) is within a designated sample mile, the secondary channel will be sampled. Young-of-year/small-bodied fish monitoring will occur in conjunction with the large-bodied fish monitoring effort. All secondary channels in each third-mile will be sampled. Primary channel shoreline habitats will be sampled in 3-mile increments.

Primary channel and secondary channel sampling sites will be within the same river mile. In addition to structured primary channel sampling, all backwaters and embayments (>25 m<sup>2</sup>) associated with the primary channel within each third-mile will be sampled.

Sample sites within secondary channels will be a sufficient distance from the inflow to and outflow from the secondary channel to minimize primary channel faunal and physiochemical influences. Secondary channel sample sites will be at least 100 and not more than 200 m in length. All mesohabitats (e.g., pool, riffle, riffle-eddy, and shoal) within the site will be sampled in approximate proportion to their availability within the site; typically, at least five mesohabitat types will be sampled in each secondary channel. Each mesohabitat will be sampled separately with 3.2 x 1.6 m (4 mm mesh) drag seines. Each secondary channel sampling effort will be a minimum of 5 seine hauls. The number of seine hauls, total area (m<sup>2</sup>) seined, and types of mesohabitats sampled will be recorded on standard field forms. Specimens collected in each mesohabitat will be inspected to determine if any rare fishes (Colorado pikeminnow, roundtail chub, and razorback sucker) are present in the seine. If a rare fish is captured, it will be identified, total length ( $\pm 1$  mm) and weight ( $\pm 1$  g) determined, and released. Any rare fish >150 mm TL will be scanned to determine presence of a PIT tag. If none is present, the specimen will be implanted with a PIT tag having a unique alphanumeric code. All pertinent data (i.e., total and standard lengths, weight, PIT tag code, mesohabitat, water depth, substrate, and cover) on rare fish captured will be recorded. All large-bodied native fish (i.e., flannelmouth and bluehead suckers) will be weighed, measured, and released. All other specimens will be preserved in 10% formalin and returned to the New Mexico Department of Game and Fish Laboratory for identification, enumeration, and measurement (total length and weight). Field collection number, habitat number, and river mile will be recorded on a

water-proof label and placed in each specimen container. Location of site (latitude and longitude) will be determined with a GPS unit. Identification of all retained rare fishes will be confirmed by personnel of the Museum of Southwestern Biology. Preserved specimens will be accessioned to the New Mexico Department of Game and Fish Collection of Fishes or the Museum of Southwestern Biology.

Within each third-mile, shoreline habitats of the primary channel will be sampled. At each designated mile, all mesohabitats (e.g., riffle, debris pool, and shoal) along 200 m (near center of mile) of shoreline will be sampled. All mesohabitats present will be sampled in approximate proportion to their availability within the site. Regardless of the number of mesohabitats present at a primary channel site, at least 5 seine hauls will be made with a drag seine (3.2 x 1.6 m, 4 mm mesh). The shoreline (river right or left) sampled will be dependent upon accessibility of the shoreline. Where more than one shoreline is accessible (and can be seined efficiently), that with greater habitat diversity/complexity will be sampled. Location (latitude and longitude) will be determined with a GPS unit. Specimen and habitat data will be obtained and recorded as required for secondary channel sampling. All retained specimens from primary channel sampling will be preserved separately from the adjacent secondary channel collection. All retained specimens will be accessioned to the New Mexico Department of Game and Fish Collection of Fishes or the Museum of Southwestern Biology.

Backwaters and embayments (>25 m<sup>2</sup>) not located within structured primary channel sampling sites also will be sampled. During periods of low flow, secondary channel mouths frequently function as backwaters or embayments. In this monitoring effort, secondary channel mouths without surface inflow from upstream will be treated as backwater/embayment habitat. The maximum number of backwaters or embayments sampled will be one per mile. Three seine hauls will be made in each backwater or embayment sampled. All specimens collected, except rare fishes, will be retained and returned to the laboratory for identification and enumeration. All rare fish will be measured and released; those >150 mm will be PIT tagged. Data collection and recording of relevant information (including GPS determined location) will be the same as for secondary and primary channels.

Water quality data (ambient temperature, water temperature, dissolved oxygen, conductivity, and salinity) will be measured in each sampled secondary channel, at primary channel sites and in backwaters/embayments. Secondary channel water quality data will be obtained a sufficient distance from the inflow to the secondary channel to minimize primary channel influences. All water quality data for each sample will be recorded on standard field forms.

### **Products:**

Data collected during the autumn 1998 and 1999 inventories will be reported by 31 March 2000 (as described below for 2000 data). Data for the October 2000 monitoring effort will be summarized by geomorphic reaches. Minimally, the annual report will report density per species (number/m<sup>2</sup>) per geomorphic reach, size-structure of commonly-collected species populations by geomorphic reach, and rare fishes and the mesohabitats each was found in. Data obtained from secondary and primary channel sampling will be reported separately. Backwater and embayment data will be reported in the primary channel portion of the annual report. Community-comparison metrics, such as the

Shannon-Wiener Index and Morisita's Index of Diversity, will be used for longitudinal and annual comparisons. River discharge data (Four Corners gage) will be used to assess the effect of discharge volume on species density estimates. All data obtained during 2000 monitoring activities will be electronically recorded in a format to be determined by the SJRIP Biology Committee. The annual report (including electronic database) will be submitted to the SJRRIP Biology Committee by 31 March 2001.

**Budget<sup>1</sup> FY-2000:**

Young-of-year/small-bodied Monitoring	
Personnel	\$ 8,000
Travel and per diem	4,000
Data Compilation	
Personnel	15,000
Report Preparation	
Personnel	10,000
Administrative Support	2,000
	\$ 39,000
Study Reports and Data Integration	
Personnel	7,000
Travel and Per Diem	5,000
Administrative Support	1,000
	\$ 13,000
TOTAL	\$ 52,000
Indirect Costs	5,200
GRAND TOTAL	\$ 57,200

<sup>1</sup>Budget does not include in-kind contributions

**Long Term Monitoring - Channel Morphology  
Fiscal Year 2000 Project Proposal**

Principle Investigator: Ron Bliesner  
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**Study Area:**

The study area consists of the San Juan River and its flood plain from RM 180 (Farmington, NM) to RM 3 (Clay Hills Crossing).

**Collections:**

There are no collections associated with this study.

**Background:**

There are presently 25 river transects that have been established between RM 180 and RM 3 in the San Juan River for purposes of measuring channel scour and deposition. Additionally, substrate composition (sand or cobble/gravel) has been identified during each survey. These cross-sections have been surveyed before and after runoff since 1992. The data from these surveys was used to examine channel scour and deposition, determine change in channel capacity and track change in substrate material. Flow statistics for 8,000 cfs flows identified in the *Flow Recommendation Report* were based, in part, on these data.

Maintenance of cobble bars with open interstitial space has been determined to be important for spawning of Colorado Pikeminnow. Four of the sites (RM 173.7, 168.4, 132, 131) that have been identified in the San Juan River as having characteristics suitable for spawning have been monitored since 1995. The results of the surveys at these sites were used as part of the basis of the flow recommendation at 8,000 cfs. To verify or adjust this recommendation, these sites will continue to be monitored.

The flow-habitat area model for backwaters is based on the ability of the channel to clean sediment from the system and the rate at which the sediment accumulates in the backwaters after runoff. The amount of perturbation (loss of habitat) due to summer and fall storms has been estimated based on analysis of habitat area data collected before and after storm events. Equivalent data on change in depth of backwaters and depth of sediment have not been analyzed. It is proposed that sediment depth and water depth be measured in backwaters twice yearly at the end of runoff in late July or early August and again in October to assess change. The second sampling will be completed during the fall habitat mapping exercise.

## Objectives:

- 1.) River Geometry Monitoring. Determine short term and long term change in river cross sections at key locations and the relationship of this change to spring runoff and summer/fall storm events.
- 2.) Cobble Bar Monitoring. Determine short term and long term change in cobble bar characteristics in response to spring runoff and summer/fall storm events.
- 3.) Backwater Perturbation Monitoring. Monitor effect of spring runoff and summer/fall storm events on sediment accumulation in backwaters and backwater depth.

## Methods:

- 1.) River Geometry Monitoring. The 14 cross-sections identified in 1999 as part of the long term monitoring plan will be surveyed pre- and post-runoff for analysis of annual change and compared to previous surveys to determine trends. Analysis of the change in cross-section geometry and substrate in relation to hydrographic conditions will be completed to monitor response of the system to flow recommendations.
- 2.) Suspended Sediment Analysis. Continuous turbidity monitors are installed at Montezuma Creek Bridge. The data will be used to qualitatively assess sediment transport in relation to the flow regime, in addition to identification of storm events.
- 3.) Cobble Bar Monitoring. Topographic surveys will be completed for each of the four sites (RM 173.7, 168.4, 132, 131) utilizing total station or gps survey equipment with control provided by the established bench marks at each site. Surveys will be completed as soon as practical after spring runoff, usually during the end of July or early August. The same area will be surveyed each year to allow comparison to previous years. Flows must be below 1,200 cfs to accomplish these surveys.

At the same time, the structure of the bar will be assessed by completing point counts of the surface bed material (n=200 per sample or more) at each bar. Particles will be selected by the point count method over the full extent of the bar within the survey boundary. Size is determined by placing the rocks through a square hole in an aluminum plate, cut to represent an equivalent screen size from 1 cm through 10 cm at 1 cm increments, then 2 cm increments through 20 cm. Those larger than 20 cm are recorded as greater than 20 cm. Interstitial material smaller than 1 cm is not recorded.

Depth of open interstitial space (depth to embeddedness) will be measured on a 5 or 10-ft grid over the extend of the bar. Measurement will be made by working a hand between rocks until the fingers touch the sand embedded depth. The depth of

penetration below the average top of cobble immediately adjacent to the sample point will be measured and recorded as the depth of open interstitial space.

Change in bar morphology will be determined by producing three-dimensional plots of the surveyed surface and subtracting the resulting surface from the surface generated from the previous survey. The amount of change will be correlated to the flow conditions for the year.

The size distribution of cobble at each bar is computed and the  $D_{16}$ ,  $D_{50}$  and  $D_{84}$  sizes reported and compared to previous years. Depth of open interstitial space will be computed as actual depth and multiples of mean cobble diameter.

- 4.) Backwater Perturbation Monitoring. To characterize the relative quality of backwaters, five representative backwaters within each geomorphic reach will be measured for water and sediment depth. Measurements will be made annually between September 15 and Nov 1 per the long term monitoring plan. These sites will remain the same from year-to-year to the extent possible. If a backwater is "lost," another will be selected for sampling and retained in the sampling regime until it is lost. Depth of sediment will be measured and recorded for "lost" backwaters. All measurements will be made at flows between 500 and 1,000 cfs, if possible, and at the same flow from year-to-year, if possible. Sediment and water depths will be measured at three points in each backwater (mouth, 1/3 and 2/3 of length). The backwaters sampled will be marked on digital aerial imagery.

Storm events will be determined by changes in flow and turbidity at USGS gages located near Shiprock and Montezuma Creek.

The annual report will include a summary of backwater measurement data for each site, including site location, water and sediment depth, flow at sampling, flow and turbidity data. Every five years the runoff/storm event/backwater habitat relationships will be analyzed.

#### **Products:**

An annual report and data files for inclusion in the GIS database will be produced under this task. The annual report will include a summary of backwater measurement data for each site, including site location, water and sediment depth, flow at sampling, flow and turbidity data.

**Budget FY-2000 (Funded by BIA):**

<u>Category</u>	<u>Cost</u>
Labor	\$ 92,120.00
Travel, per diem	\$ 14,445.00
Vehicle/Equipment Use	\$ 1,930.00
Supplies	\$ 2,500.00
Overhead	\$ 600.00
TOTAL	\$ 111,595.00

**Habitat Mapping  
Fiscal Year 2000 Project Proposal**

Principle Investigator: Ron Bliesner  
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and

Principle Investigator: Vince Lamarra  
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975 South State Highway  
Logan, UT 84321  
(435) 752-2580 vincel@ecosysres.com

**Study Area:**

The study area consists of the San Juan River from RM 180 (Farmington, NM) to RM 3 (Clay Hills Crossing).

**Collections:**

There are no collections associated with this study.

**Background:**

Habitat mapping completed during the period 1992 - 1997 has been used to develop flow/habitat relationships used in the flow recommendation process. To verify and refine these relationships and examine long term trends, habitat mapping will be continued on an annual basis during the low flow period in the fall per the long range plan.

**Objectives:**

- 1.) Main River Habitat Mapping. Map San Juan River habitat from RM 180 to RM 0 during September-October. This objective is a continuation of the 1999 work as described in the long term monitoring program.
- 2.) Digitize and process data utilizing GIS. Habitat mapping data will be digitized and entered into the ArcCAD system.

**Methods:**

- 1.) Habitat mapping (San Juan River). One flight to collect digital aerial photography or videography will be completed for the San Juan River from RM 180 to RM 0 and printed at an approximate scale of 200 ft/inch. Thirty-eight categories of aquatic habitat will be mapped in the field utilizing the digital imagery as a base map. The flights and mapping will be completed as soon after runoff as flows reach 1,000 cfs or less and weather will allow. Field mapping will be completed at flows between 500 and 1,000 cfs if possible.

Two of every three miles will be mapped through the full reach, corresponding with the miles designated for sampling under the other long term monitoring plans.

- 2.) Digitize and process data utilizing GIS. Upon completion of each habitat mapping program (Objectives 1 and 2), the field maps will be rectified and digitized into ArcCAD.

**Products:**

An annual report and GIS coverages for inclusion in the GIS database will be produced under this task. The annual report and coverages will be for the 1999 mapping. Reporting for the 2000 mapping will be in the 2001 budget.

**Budget FY-2000 (Funded by BIA):**

<u>Category</u>	<u>Cost</u>
Labor	\$ 35,000.00
Travel, per diem	\$ 3,035.00
Vehicle/Equipment Use	\$ 700.00
Supplies	\$ 1,187.00
Overhead	\$ 2,078.00
TOTAL	\$ 42,000.00

**Water Temperature Monitoring  
Fiscal Year 2000 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center  
Logan, UT 84321  
(435) 753-5651 bliesner@kelbli.com

**Study Area:**

Temperature recorders are installed from RM 224 (Navajo Dam) to RM 92.5 (Montezuma Creek Bridge).

**Collections:**

None.

**Background:**

Water temperature recorders were installed in 1992. This work element is a continuation of the original work, with station servicing and data extraction.

**Objective:**

- 1.) Collect Water Temperature Data at 7 locations

**Methods:**

- 1.) Collect Water Temperature Data at 7 locations. Temperature recorders are located at Navajo Dam, Archuleta, Farmington, Shiprock, Four Corners and Montezuma Creek and on the Animas River at Farmington. These recorders will be serviced twice and the data extracted and plotted for the annual report.

**Products:**

An annual report and data files for inclusion in the GIS database will be produced under this task.

**Budget FY-2000 (Funded by BIA):**

<u>Category</u>	<u>Cost</u>
Labor	\$ 5,343.00
Travel, per diem	\$ 270.00
Vehicle/Equipment Use	\$ 200.00
Supplies	\$ 200.00
Overhead	\$ 0.00
TOTAL	\$ 6,013.00

**Water Quality Monitoring  
Fiscal Year 2000 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center  
Logan, UT 84321  
(435) 753-5651 bliesner@kelbli.com

**Study Area:**

Water samples will be taken at 12 locations along the San Juan River or tributaries between RM 219 (Archuleta) and RM 52 (Mexican Hat).

**Collections:**

Water samples only

**Background:**

Monthly water samples during 1991-1998 have been collected at about 30 different sites in the San Juan River and its tributaries within the study area. The results of the water-quality analyses have shown that most concentrations are replicated between months and among nearby stations. The results of these analyses were used to identify the stations, set the timing and parameters of analysis.

**Objective:**

- 1.) Collect Quarterly Water Samples at 12 Locations.

**Methods:**

- 1.) Collect Quarterly Water Samples at 12 Locations. Depth integrated water samples will be collected at the 12 locations listed in Table 1. Samples will be taken quarterly in February, May, August and November of each year near mid-month. The chemical analyses most relevant to the long-term monitoring goals are listed in Table 2. The concentration of the parameters listed in the first column will be determined every sampling period. In addition field measurements of temperature, pH, redox potential, electrical conductivity and dissolved oxygen will be taken. Annually, during low flow periods in February, the water samples should analyzed for all the parameters listed in Table 2. Field data collection and laboratory analysis will be completed by standard EPA methods, where applicable.

Table 1. Proposed Sampling Stations along San Juan River between Navajo Dam and Mexican Hat.

Station Name	Station ID	USGS Sampling In Period	BIA Sampling Period
SAN JUAN RIVER NR ARCHULETA BRIDGE	9355500	1958-1984	1991-1998
GALLEGOS CANYON NR FARMINGTON, NM	9357255	1979-1981	1991-1998
ANIMAS RIVER AT FARMINGTON, NM	9364500	1958-1992	1991-1998
SAN JUAN RIVER AT FARMINGTON, NM	9365000	1974-1991	1991-1998
LA PLATA RIVER NR FARMINGTON, NM	9367500	1977-1991	1994-1998
OJO AMARILLO CANYON	9367536		1993-1998
SAN JUAN RIVER AT SHIPROCK, NM	9368000	1958-1992	1991-1998
MANCOS RIVER NR FOUR CORNERS	9371005		1991-1998
SAN JUAN RIVER AT FOUR CORNERS, CO	9371010	1977-1990	1991-1998
SAN JUAN RIVER AT MONTEZUMA CREEK BRIDGE	9378610		1991-1998
SAN JUAN RIVER AT BLUFF BRIDGE (HIGHWAY 191)	9379495		1991-1998
SAN JUAN RIVER NR BLUFF, UT (AT MEXICAN HAT)	9379500	1974-1993	1991-1998

Table 2. Water quality parameters for analysis

Quarterly	Annually
Arsenic (total and dissolved)	Aluminum (total and dissolved)
Calcium (dissolved)	Barium (total and dissolved)
Copper (total and dissolved)	Manganese (total and dissolved)
Lead (total and dissolved)	Nickel (total and dissolved)
Magnesium (dissolved)	Potassium (total and dissolved)
Mercury (total and dissolved)	Strontium (total and dissolved)
Sodium (dissolved)	
Selenium (total, dissolved, total recoverable)	
Zinc (total and dissolved)	Chloride (dissolved)
	Ammonia (dissolved)
Alkalinity(HCO <sub>3</sub> )	Nitrate (dissolved)
Hardness	Nitrite (dissolved)
TDS	Silica (total and dissolved)
TSS	Sulfate (dissolved)
Turbidity	Orthophosphate (dissolved)

**Products:**

An annual report and data files for inclusion in the GIS database will be produced under this task.

**Budget FY-2000 (Funded by BIA):**

<u>Category</u>	<u>Cost</u>
Labor	\$ 4,520.00
Travel, per diem	\$ 1,000.00
Vehicle/Equipment Use	\$ 900.00
Supplies	\$ 15,000.00
Overhead	\$ 1,500.00
TOTAL	\$ 22,920.00

**GIS Based Integrated Database Maintenance  
Fiscal Year 2000 Project Proposal**

Principle Investigator: Ron Bliesner  
Keller-Bliesner Engineering  
78 East Center  
Logan, UT 84321  
(435) 753-5651 bliesner@kelbli.com

**Study Area:**

The study area for this task is for the San Juan Basin below Navajo Dam.

**Collections:**

None.

**Background:**

In 1996 a GIS database was developed to provide a tool for compiling, maintaining and analyzing all data collected as a part of the San Juan River Basin Recovery Program. All updates will be coordinated through FWS-Region 2, the main repository for the data.

**Objective:**

- 1.) Update and Maintain GIS Database.

**Methods:**

- 1.) Prepare Standardized Data Formats. Utilizing data provided in the past, each researcher will be provided a requested data format for data inclusion to match previous data sets. For new data sets, the format will be developed based upon researcher input.
- 2.) Update and Maintain GIS Database. Datasets provided by each researcher will be added as coverages to the existing GIS database. A CD-ROM will be produced and distributed to researchers by June of each year containing data collected in all previous years. For inclusion, data must be received by March 31. All updates will be coordinated through FWS-Region 2, the main repository for the data.

**Products:**

A CD-ROM containing all data supplied by researchers by the cutoff date will be produced and copies distributed to all researchers.

**Budget FY-99 (Funded by BIA):**

<u>Category</u>	<u>Cost</u>
Labor	\$ 22,014.00
Travel, per diem	\$ 0.00
Vehicle/Equipment Use	\$ 0.00
Supplies	\$ 1,000.00
Overhead	\$ 1,010.00
TOTAL	<u>\$ 24,024.00</u>

## **IV. RECOVERY EFFORTS**

stored on ice and shipped within 48 hours for analysis.

Aerial sampling will consist of five locations providing broad coverage of the San Juan Basin but with an emphasis on the river corridors. Each location will consist of the deployment of five SPMDs contained within one protective cylinder that allows for ample air flow and circulation, shaded from the direct sunlight and one trip blank. Exposure time will be for 30 days. After the SPMDs are collected they will be chilled and shipped within 48 hours for analysis. Our office will be working with the U.S. Geological Survey, Environmental and Contaminates Research Center and others for the best possible methods of deployment. A screening battery of toxicity tests prior to and perhaps in lieu of chemical analyses may be conducted. The five aerial sampling sites include the "Mixer Area", De-Na-Zin Wilderness, Bradshaw River Tract (San Juan River), Animas 8 River Tract, and Bloomfield River Tract (San Juan River).

**Products:**

An annual report and electronic data files will be delivered by March 31, 2000.

**Budget FY-2000:**

Labor	\$ 10,000
Travel	\$ 2,000
Vehicle	\$ 1,000
Supplies	\$ 2,000
Overhead	\$ 5,000
Procurement	\$ 30,000
TOTAL	<u>\$ 50,000</u>

total of 50 days and mounted in a manner that allowed for air to move freely over the SPMD. After 50 days the SPMDs were removed and shipped over night to EST for dialysis and then shipped to Quanterra Labs for the final PAH analysis. Quanterra Labs has completed the laboratory analysis and is in the process of preparing their report on the analytical results. The FFO is awaiting this report. The FFO anticipates that interpretation of the laboratory results will be necessary by experts in the field of SPMD development and technology.

### **Objective**

Preliminary conclusions, based on the soil and water data collected over the past five years in the San Juan Basin suggests that the oil and gas leasing program is not imputed to be contributing PAHs to the Colorado pikeminnow and razorback sucker habitat via surface run-off. Airborne contamination study results are still pending and may affect the preliminary conclusions of the soil and water data.

The sediment and water sampling program has been relatively ineffective. Reasons for this may be attributed to the short life of PAHs which are quickly partitioned either to sediment or biota, sediment cycling and removal, the complete absence of PAHs from the San Juan or Animas Rivers, or a combination of all these factors. Upon review of the water and sediment data, discussions and e-mail correspondences between the BLM and the USFWS Ecological Services Field Office, in Albuquerque, New Mexico, a consensus was reached that additional monitoring of river water might not be effective in determining major routes of PAH transport as would other methods, namely storm water collection and additional air monitoring.

Therefore, as a result of discussions and correspondence with the USFWS the BLM will be continuing the Phase III long term monitoring for PAHs by collecting storm water runoff. Air monitoring obligations, as outlined in the Biological Opinion have been fulfilled. However, several problems were encountered with the 1998 SPMD air monitoring program. Modifications to the air monitoring and water and sediment sampling have been made and are outlined below. Sampling will be conducted as follows:

- 1.) Sampling of whole runoff samples (water and sediment) during storm water events, from five contributing ephemeral tributaries that drain into the San Juan and Animas Rivers and are associated with significant oil and gas leasing activities.
- 2.) Conduct aerial sampling using SPMDs with modifications to the deployment and sampling procedures to prevent insect and/or bird damage and shade protection.

### **Method**

Efforts will be made to obtain storm water samples for the identified drainages. However, discretion and flexibility will be exercised by BLM to substitute an alternate drainage in the immediate area in the event that identified drainage can not be sampled or fails to experience a storm water flow event. The five ephemeral tributaries include Canyon Largo, Gobernador Canyon, Shumway Canyon, contributing to the San Juan River and Ditch Canyon and Bohanon Canyon contributing to the Animas River. Water samples will be collected in two liter brown glass bottles at each location,

consisted of three semi-permeable membrane devices (SPMDs): site blank, exposure to direct sunlight, and canopy or shaded cover exposure for a total of 30 SPMD's. The locations selections, developed in conjunction with the USFWS, will provide information not only within the San Juan Basin, but will also provide information on PAHs that might be carried into the basin by prevailing winds. The air monitoring data will provide empirical data and will not provide data on air source locations.

The samples collected (air, water, and sediment) were analyzed by Quanterra Labs in Denver, Colorado using EPA method 8310 for soil and water and EPA method 8270 for air. Detection limits in ug/kg and u/l were as follows:

PAH	Soils	Water
Napthalene	200	0.95
Acenaphthylene	200	0.95
Acenaphthene	200	0.95
Fluorene	40	0.19
Phenanthrene	40	0.19
Anthracene	20	0.095
Fluoranthene	40	0.19
Pyrene	40	0.19
Benzo (a) anthracene	20	0.095
Chrysene	40	0.19
Benzo (b) fluoranthene	20	0.095
Benzo (k) fluoranthene	20	0.095
Benzo (a) pyrene	20	0.095
Dibenz (a,h) anthracene	40	0.19
Benzo (g,h,I) perylene	40	0.19
Indeno (1,2,0-cd) pyrene	40	0.19

Soil and water samples were collected and stored on ice in the field. The samples are transferred to a refrigerator at the FFO. All samples were shipped within 48 hours of collection. The samples were packed in cooler with ice and shipped to the Quanterra Lab overnight. Data reports were submitted directly to BLM along with an electronic copy.

The SPMDs air monitoring devices were developed and assembled by Environmental Sampling Technologies (EST) in Saint Joseph, Missouri. The SPMDs were exposed to the ambient air for a

to develop a database identifying the locations of possible sources and occurrences of PAHs. In order to achieve this goal, BLM developed maps of the sample collection locations, as well as an electronic data base of all locations, sample types, and concentrations levels. This data is continually refined to include additional data, sample location data, newly collected analytical data, and other information that may be pertinent to evaluating the PAHs found.

The goals of Phase II and III focused on the locations that demonstrated measurable levels of PAHs and to try to determine if chemical migration was occurring from the locations. River monitoring was increased to both spring and fall to determine seasonal effects of high flows associated with spring run-off and low flows associated with the cessation of irrigation return flows in the fall.

BLM's data collection activities included surface run-off and oil and gas well locations located in the focused vulnerable area because of the concern that PAHs may be discharged to the surface water system via unlined pits associated with production activities. Types of waste discharges that are collected in pits in the basin include: condensate from pipeline drip, separator discharges, dehydrator drip, and brine water collection. The State of New Mexico Oil Conservation Commission initiated regulations for pit closures in 1988. Following the Oil Conservation Commissions pit closure regulations, the BLM implemented a pit remediation program designed to clean up potential groundwater contamination sources and replace the unlined pits with lined pits and/or tanks to prevent further releases on federal leases. BLM's pit remediation program has been successful in the elimination of waste discharges into unlined pits located within and outside the focused vulnerable area.

Sampling of well locations included collecting a sample from within the pit, and another sample off-site and hydrologically downgradient. Samples were collected with an Oakfield stainless steel soil core sampler. The sampling depths varied depending on the accessibility to the pit, as well as sediment compaction. Generally, sample depths in the pits ranged from two to three feet while those collected down gradient were collected at a shallower depth of one to two feet.

Ephemeral streams were sampled throughout the basin in order to determine migration of PAHs via the ephemeral drainage system. Soil moisture was encountered from one inch to over two feet, depending on the size and location of the stream bed. Sample collection was done with an auger and core sampler similar to the well location samples. Depth for sample collection in the ephemeral streams ranged from six inches to two and one half feet.

Water and sediment samples were collected in twenty five locations throughout the San Juan River Basin. Locations were chosen based on possible drainage and contaminant loading sources such as municipal discharges, industrial discharges, large ephemeral stream drainages and known agricultural return flow locations. In 1998, sample locations were expanded from twenty five to twenty seven locations. Water samples were collected in the water column by cross sectional and vertical stratification in two liter brown glass bottles at each location. Sediment samples were collected with a Weldco Hand Core Sediment Sampler to an average depth of two to six inches.

Air monitoring was conducted at ten deployment locations in the summer of 1998. Five locations were identified in upland areas and five were identified along river tracts. Each deployment site

**Polynuclear Aromatic Hydrocarbon (PAH) Study  
Fiscal Year 2000 Project Proposal**

Principal Investigator: Dale Wirth  
U. S. Bureau of Land Management  
1235 La Plata Highway  
Farmington, New Mexico 87401  
(505) 599 6320    dwirth@nm.blm.gov

**Background**

In July of 1991, the Albuquerque District Office of the Bureau of Land Management (BLM) issued a Draft Resource Management Plan Amendment (RMP)/Environmental Impact Statement (EIS) regarding oil and gas leasing in San Juan, McKinley, Sandoval and Rio Arriba Counties. The main land mass affected by the RMP is the under the management of the Farmington Field Office (FFO).

July 20, 1993, the United States Fish and Wildlife Service (USFWS) issued a Formal Section 7 Consultation and Biological Opinion on the RMP/EIS. The Biological Opinion stated that "...the ongoing and proposed oil and gas leasing and development activities are likely to jeopardize the continued existence of the Colorado pikeminnow (formerly Colorado squawfish) and the razorback sucker by reducing the likelihood of both the survival and recovery of the species through degradation of the aquatic habitat in the San Juan River."

In order to define parameters for the study, USFWS and BLM agreed to develop a project that would investigate possible sources of PAHs due to the federal oil and gas leasing program. These sources include water and sediment from the San Juan, La Plata, and Animas Rivers, ephemeral washes, and discharge pits located on and directly associated with well locations. In addition, BLM and USFWS have agreed to work cooperatively to establish baseline air quality data that addresses possible impacts from the gas and oil production industry under the jurisdiction of the FFO.

The biological opinion that was published July 20, 1993 contained three phases for the PAH study to be conducted by the BLM. Phase I, conducted in 1994, established a baseline data set for the FFO for both streams and ephemeral, well locations in the vulnerable zone and in-stream semi-permeable membrane device placement to determine total cumulative exposures (performed by FWS).

Phase II of the Opinion calls for any identifiable sources to be further investigated and remediated, and for continued monitoring throughout the basin, while Phase III calls for long term monitoring of PAHs throughout the District. In actuality, Phases II and III have been integrated and are considered as on-going processes.

The major problem concerning the issue of PAH contribution by oil and gas development is the lack of surface water systems data within the Basin, PAH mobility data, a lack of information regarding toxicological effects, and possible PAH contributions from other likely sources within the Basin.

Due to the lack of data concerning the distribution of PAHs, one of the main goals of Phase I was

All fish collected, in addition to released Colorado pikeminnow, will be retained, preserved in the field and returned to the laboratory for processing. Catch rate data will be compared within and across sites and models of downstream transport rates of both Colorado pikeminnow and artificial eggs will be generated.

**Products:**

A draft report of the 2000 study to determine downstream transport rates of hatchery-reared and stocked Colorado pikeminnow in the San Juan River will be prepared and distributed (under a mutually agreed time-frame) to the San Juan River Biology Committee for review. Upon receipt of written comments, that report will be finalized and disseminated to UDWR (for incorporation into their summary report of the overall project) and to members of the San Juan River Biology Committee. Fish collected from this study will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), Department of Biology, at the University of New Mexico. Original field notes will be retained in the Division of Fishes and collection information will be electronically stored in a permanent MSB database program. Electronic copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed.

**Budget FY-2000:**

Personnel:

Field Technicians	\$ 12,000
Field Research Associate	\$ 3,000

Subtotal	\$ 15,000
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Travel and Per Diem:

Travel	\$ 2,000
Field per diem	\$ 2,800

Subtotal	\$ 4,800
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Equipment and Supplies:

Artificial eggs (4 bags)	\$ 1,400
Mechanical Flow Meters (4)	\$ 1,300
Laboratory Equipment/supplies	\$ 300

Subtotal	\$ 3,000
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Total	\$ 22,800
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Overhead (15%)	\$ 3,420
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TOTAL	\$ 26,220
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of larval Colorado pikeminnow. This will require continuous sampling, during the two week period immediately following the release of hatchery reared larval Colorado pikeminnow, at several locations between the release point and Lake Powell. In addition, we propose to use this opportunity to compare the results of our 1998 study (which employed artificial drift materials) with the drift dynamics of natural material (larval Colorado pikeminnow). This latter portion of the study would be performed concurrent with the assessment of downstream drift of Colorado pikeminnow and not involve additional cost except for the purchase of additional quantities of the artificial drift material.

**Study Area:**

We will establish at least four sampling stations between the release site (immediately downstream of the Hogback Diversion; RM 158.6) and Clay Hills Boat Landing (RM 2.9). We anticipate that the other two sampling stations will be at RM 128 (just upstream of the Four Corners Bridge) and Mexican Hat (RM 53). If funded, our sampling effort would include making collections in reaches of the San Juan River under the jurisdiction of the National Park Service (Clay Hills Boat Landing; RM 2.9).

**Objectives:**

- 1.) Determine downstream transport rates of hatchery reared Colorado pikeminnow larvae stocked at a single location in the San Juan River.
- 2.) Compare downstream transport rates of hatchery reared Colorado pikeminnow larvae with transport rates of "artificial eggs" (material used in 1998 study)
- 3.) Correlate rates of downstream transport with hydrology and river morphology

**Methods:**

Sampling for drifting hatchery reared larval Colorado pikeminnow will be conducted for up to two weeks after the release of the test specimens. Sampling will occur in the San Juan River at four stations between the release site (immediately downstream of the Hogback Diversion; RM 158.6) and Clay Hills Boat Landing (RM 2.9). The putative release date is not to be prior to mid-June 2000.

Drifting larvae and artificial eggs will be collected with Moore Egg Collectors (MEC). At least one of these collecting devices will be employed at each of the four sampling stations. Collections will be made continuously beginning soon after the simultaneous release of larval Colorado pikeminnow/artificial eggs and continue until field personnel can identify the sustained lack of collection of either larvae or eggs. (This period will probably be 2-3 days at the uppermost site but may be up to 10-days [from the initial appearance of study material] at the lowermost site). Collections will be made in 15-minute periods and the volume of water sampled by each MEC will be measured by mechanical flow-meters suspended in the center of collection devices and quantified as number collected per cubic meter of water sampled ( $m^3$ ). This information ( $\#/m^3$ ) will allow us to determine catch per unit effort based on volume of water sampled versus time sampling.

**Determining Downstream Transport Rates of Hatchery-Reared  
and Stocked Colorado Pikeminnow in the San Juan River  
Fiscal Year 2000 Project Proposal**

Principal Investigators: Steven P. Platania<sup>1</sup>, Robert K. Dudley<sup>1</sup>,  
UDWR<sup>2</sup>, and Melissa Trammell<sup>3</sup>

<sup>1</sup> Division of Fishes - Museum of Southwestern Biology,  
University of New Mexico, Albuquerque, NM 87131  
(505) 277-6667      platania@unm.edu; rdudley@unm.edu

<sup>2</sup> Utah Project Manager: vacant - contact Mike Hudson or Randy Radant  
Utah Wildlife Resources  
1594 West North Temple, Salt Lake City, UT 84114  
(801) 538-4757      nrdwr.mhudson@state.ut.us

<sup>3</sup> Utah Field Coordinator: Melissa Trammell  
Moab Field Station  
1165 South HWY 191 - Suite 4, Moab, UT 84532  
(801) 259-3781      nrdwr.mtrammel@state.ut.us

**Background:**

The Utah Division of Wildlife Resources (UDWR) has proposed, in their FY 2000 San Juan River work plan, the experimental stocking and subsequent monitoring of up to 1,000,000 recently hatched (yolked) larval Colorado pikeminnow. That proposed study is deemed a continuation of their previous investigations of dispersal and habitat use of stocked larval Colorado pikeminnow. The principal difference between UDWR's previous investigations (1996-1998) and the 1999 research was the size of the Age 0 fish to be released. In their previous studies, UDWR released fish  $\bar{x}=55$  mm TL (1996),  $\bar{x}=45$  mm TL (1997), and  $\bar{x}=25$  mm TL (1998). Neither of their three initial investigations employed fish that, when released into the river, would be considered a component of the drift community. Conversely, if the 2000 study is funded, an important issue that must be addressed is the downstream transport of the stocked larval Colorado pikeminnow.

That Colorado pikeminnow drift for a portion of their early life history has been well documented by numerous studies throughout the Upper Colorado River Basin. Larval drift studies in the San Juan River (1992-1997) have documented the dispersal of this and other species via drift. In 1998-99, we (UNM-MSB) conducted a study, using an artificial material, to determine the rate of downstream transport of drift in the San Juan River. That study indicated travel rates ranging between 1.6-2.4 miles per hour. Those data (still in a draft form) provide a means of assessing what proportion of the Colorado pikeminnow reproductive effort is transported into Lake Powell.

We will perform the portion of the UDWR study involving the assessment of downstream transport

UDWR annual report- 3/31/01  
 Electronic Data Submission 3/31/01

**BUDGET FY-2000:**

***Task 1***

(Task 1 costs refer to UDWR involvement in adult/YOY monitoring)

*Personnel*

Biologist (field/reporting)	\$ 1,500	
Technicians (field)	\$ 1,000	
<i>Program Management</i>	<u>\$ 270</u>	
<i>Sub-total</i>	\$ 2,770	(Held over from FY1999)

***Task 2***

(Task 2 costs are covered by University of New Mexico's SOW)

***Task 3***

*Personnel*

Biologist (reporting)	\$ 6,885	
Biologists (field)	\$ 6,300	
Technicians (field)	\$11,195	
Fish sample identification	\$ 7,000 (subcontracted to UNM - Steve Platania)	
<i>Current Expense</i>		
Food	\$ 2,200	
Mileage	\$ 660	
Equipment	\$ 3,500	
<i>Program Management</i>	<u>\$ 3,085</u>	
<i>Sub-total</i>	\$40,825 (heldover from FY1999)	

<i>Total</i>	\$43,595	
<i>heldover funds</i>		-43,595
<i>Adjusted Total</i>	\$	0

**Explanation of Heldover Funds:**

The original budget for FY1999 Task 3 was \$81,650, for 6 field trips, reporting and administration, for a subtotal of \$13,608.33 per trip. Because only three trips were conducted in 1999, and UDWR did not participate in the fall monitoring (task 1), the funds for these trips (\$40,825 + \$2,770 = \$43,595) were heldover to fund the FY2000 stocking, field evaluations and reporting.

### **Task 3 - (Objectives 2-3)**

#### *Research Activities*

##### Distribution and displacement and habitat use of stocked larval Colorado pikeminnow

UDWR will track the 2000 cohort of stocked Colorado pikeminnow by specifically sampling low velocity habitat types at the rate of at least two per mile from Hogback (RM 158) to Clay Hills (RM 3). Two trips will be conducted. The first will commence immediately after stocking. The second will be four weeks after stocking. The standardized monitoring trip in September-October will assess subsequent distribution and displacement. Fish samples will be preserved in formalin. Native fish > 30mm collected will be identified, measured and released. All others and all non-natives will be preserved.

Habitats will be sampled at a minimum of 2 habitats per mile. On the first trip, sampling will be done using both very fine mesh 1-m (1-person) seines in low-velocity shoreline areas and the 'standard' 4m, 1/16" seine in backwaters. Backwater habitats will be sampled with 1-5 seine hauls in each habitat, depending on the size (approximately 1 haul per 30 m of habitat length). Habitats greater than 150 m in length will be sampled with approximately 1 haul per 50 m. Only location of habitats, habitat type, and number of seine hauls will be recorded unless pikeminnow are identified.

Habitats sampled will be recorded on videography prints provided by Keller-Bliesner Engineering. For habitats in which larval pikeminnow are identified in the field; A data sheet (presently prepared by ERI) will be completed describing geomorphic form for each sampling location with pikeminnow. The fluvial-geomorphic basis of habitat feature maintenance will be compared to similar habitat types in the Upper Basin. Habitat length, average width, temperature, and maximum and average depth will be recorded. Seine haul lengths will be recorded for measuring effort.

Data collected during the fall monitoring trip shall be provided by New Mexico Game and Fish for inclusion in the annual report.

- Products:**
- Videography prints recording sampling location will be provided to Keller-Bliesner Engineering for inclusion in the electronic database following each sampling trip.
  - Data sheets describing geomorphic form for each sampling location will be provided to Keller-Bliesner Engineering following each sampling trip.
  - Results of nursery habitat characterization and use by stocked CSF component of study will be incorporated into the UDWR annual report.
  - All data collected will be provided in electronic format for inclusion in the GIS database.

**Timetable:** Sampling trips-

Trip #1: begin next day following stocking  
Trip #2: begin 4 weeks following stocking

**Methods:**

***Task 1 - (Objective 1)***

*Monitoring*

Adult Monitoring

UDWR will provide personnel as requested to assist in the collection of juvenile and adult fish from the Utah portion of the San Juan River according to approved standardized monitoring protocols.

**Products:** UDWR will provide at least one person as requested to assist in the fall monitoring program, the compilation of pertinent data sets, and the eventual submittal of those data to the database manager.

***Task 2 - (Objective 1 and 2)***

*Research Activities*

Experimental Stocking of Larvae and Associated Monitoring

In 2000, up to 1 million (target lot size) larval Colorado pikeminnow will be obtained from Dexter National Fish Hatchery and stocked (preferably no earlier than mid-June and no later than mid July, target date July 5<sup>th</sup>) into the San Juan River immediately downstream of the Hogback Diversions (RM 158.6). Every effort will be made to delay spawning/hatching of Colorado pikeminnow at the Dexter National Fish Hatchery to mimic natural spawning period in the river. If spawning cannot be delayed to normal spawning time in the San Juan River, emphasis will be placed on stocking fish during the larval stage rather than matching timing of natural spawn with larger fish.

Four larval drift stations will be maintained between the release site and Clay Hills. Sampling will be initiated at the time of stocking, occur daily and will continue for one to two weeks. This portion of the experimental stocking study will be conducted by personnel at University of New Mexico (see pertinent study proposal for sampling specifics and associated budget).

**Products:** Results of the larval drift component of this study will be incorporated in the UDWR annual report.

**Timetable:** Stocking larval CSF- not prior to mid-June 2000.  
Larval drift sampling- continuously for one to two weeks immediately following stocking (University of New Mexico).  
UDWR annual report- 3/31/01

electrofishing efforts.

Approximately 500,000 larval Colorado pikeminnow were released at the Hogback diversion on July 7, 1999 in conjunction with the release of the artificial 'eggs' by the University of New Mexico (UNM - Steve Platania). This release was followed by passive drift sampling at the Cudei diversion to evaluate the loss of both larvae and 'eggs', and downstream sites to evaluate transport rates. Several monitoring trips were scheduled to evaluate dispersal and habitat use of the stocked fish. Of the 6 scheduled monitoring trips, 3 were completed without capturing any stocked pikeminnow.

Although the stocking of larval fish in 1999 was successful, the subsequent monitoring trips were unsuccessful due to the high water conditions and numerous flood events following stocking. No stocked pikeminnow were found in the river as of October, 1999. The water year of 1999 was unusual even for the San Juan River, as Navajo Reservoir received much higher than normal precipitation, resulting in 419 % of normal inflow in August, thereby keeping flow levels in the study area abnormally high throughout the first 4 months of the study. Although the 1999 stocking of larval pikeminnow does appear to have failed due to the unusual conditions, we do not think this was an adequate trial of stocking this size of fish. Recruitment on the Colorado River was also quite low in 1999 because that river also was subject to higher than normal flows throughout the spawning and growing season.

Although the initial introductions provided much useful information, the fish were stocked at a post-drift size, and the question remains if larval fish would also be retained in the river. Most of the stocked Colorado pikeminnow have not yet matured to the adult stage, and therefore their contribution to reproduction in the San Juan cannot yet be evaluated. There is one year remaining before previously introduced fish may begin reproducing. This window of opportunity to stock larval fish and evaluate their success without biasing the potential reproductive success of the older stocked fish should not be missed.

**Objectives:**

- 1.) To determine the ability of the San Juan River to retain larval Colorado pikeminnow within the critical habitat range by simulating spawning with stocked larvae.
- 2.) To determine downstream dispersal, displacement and distribution of larval Colorado pikeminnow following initial drift.
- 3.) To locate and characterize habitats where stocked larval Colorado pikeminnow are collected immediately after stocking and 4 weeks after stocking, using habitat descriptions from Lamarra (1999).

**Evaluation of Stocked Larval Colorado Pikeminnow:  
Dispersal, Survival, Retention, and Characterization of Habitat Used  
Fiscal Year 2000 Project Proposal**

Project Manager: Matthew Andersen  
Utah Division of Wildlife Resources  
1594 West North Temple, Salt Lake City, UT 84114  
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Principal Investigator and Field Coordinator: Melissa Trammell  
Utah Division of Wildlife Resources-Moab Field Station  
1165 South HWY 191 - Suite 4, Moab, UT 84532  
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**Study Area:**

From Hogback, NM (RM 158) to Clay Hills Crossing (RM3).

**Collections:**

Specimens collected will be inspected to determine if any rare fishes (Colorado pikeminnow, roundtail chub, and razorback sucker) are present in the seine. All rare and native fish >30 mm TL (i.e., flannelmouth and bluehead suckers and roundtail chub) will be measured and released. All other native and non-native specimens will be preserved in Formalin.

**Relationship to Long Range Plan:**

- 5.2.5.1. Determine habitat requirements of the endangered fishes by life stage.
- 5.3.6. Identify limiting factors for the endangered fish.
- 5.3.8.1. Evaluate recruitment potential.

**Background:**

The first three years (1996-1998) of experimental stocking of Colorado pikeminnow fry in the San Juan River were successful in providing information on growth, dispersal, habitat use and survival (Archer et al. 1999). We showed that growth of stocked Colorado pikeminnow in the San Juan is equal to or greater than that seen in the Colorado and Green rivers by wild pikeminnow. We showed that the stocked fish dispersed downstream and were retained for longer periods of time in the upper half of the river than in the lower half. Those that were displaced by flood events in the lower half of the river were retained in the final 17 miles of river, where nursery habitat resembles that found in the Green and Colorado rivers. We showed preferred habitat use of large, deep, stable backwaters, similar to that seen in the Green and Colorado rivers. Initial recaptures (survival) were low, but survival from age 1 to age 2, and from age 2 to age 3 was excellent, appearing to be essentially 100% as fish from each of the introductions continue to be collected by the USFWS during their

**Population Model Refinement  
Fiscal Year 2000 Project Proposal**

Principle Investigator: Bill Miller,  
Miller Ecological Consultants, Inc.  
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**Background:**

This scope of work is a continuation of the work tasks initiated in 1992 as part of the San Juan River Seven Year Research Project and now under the San Juan River recovery Implementation program and is funded by the Souther Ute Indian Tribe.

**Objective:**

This task was started in 1998 with funding from BIA. The objective of the 1998 effort is to develop a conceptual model to determine population goals on the San Juan River endangered fishes. This task will require additional work effort in 2000 to further refine the model relationships and model runs. The data collected in 1998, 1999 and under the new monitoring program in 1999 will be used to refine model relationships. The effort will require interaction with other Biology committee members and possible incorporation of additional data for model development.

**Methods:**

This task will include using the population estimates in Reaches 3 – 7 of the San Juan River to refine model parameters. This task will be a joint effort with Ecosystems Research Inc. from Logan, UT. The funding for ERI will be provided by the BIA – NIIP office. In addition, the population effort data will be used to determine the applicability of the single pass electrofishing conducted for the long term monitoring for use as an indication of population levels in the river.

**Budget FY-2000:**

Labor	\$ 13,600
Expenses	\$ <u>1,055</u>
TOTAL	\$ 14,655

Note: funded by the Souther Ute Indian Tribe

needed for MEC to complete the proposed work. We are requesting funding up to the total \$22,227.00 from the program.

The age of each fish would be estimated using either scale annuli or otolith features, as appropriate.

**Schedule:**

Field data collection of scales and otoliths will take place during sampling in October 1999. Age determinations will take place in the first six months of 2000. Field data collection for population model/ monitoring correlations will require approximately one week to complete the fish collections and associated activities. Field work is tentatively scheduled for early September 2000.

**Products:**

A summary report of population estimates and age class structure for each sampling location will be produced by December 2000.

**Budget FY-2000 Requested from Program (Miller Ecological Consultants):**

Miller Ecological Consultants is seeking funding from the recovery program for this effort. This funding request also will be submitted to the Southern Ute Indian Tribe for consideration. Total funding requested is shown in the following table.

<u>Category</u>	<u>Population Estimates</u>	<u>Age Determination Study</u>
Labor	\$ 11,610	\$ 3,240
Travel, per diem	\$ 3,392	
Vehicle/Equipment Use	\$ 1,410	\$ 2,575
TOTAL	\$ 16,412	\$ 5,815
<b>TOTAL FY-2000</b>	<b>\$ 22,227</b>	

**Budget FY-99 (Funded by BIA):**

<u>Category</u>	<u>Cost</u>
Labor	\$ 75,860
Travel, per diem	\$ 6,600
Vehicle/Equipment Use/Supplies	\$ 2,700
Overhead	\$ 6,776
TOTAL	\$ 91,936

Funding for the ERI portion of the work is being funded by BIA. Funding for MEC has been submitted to the Southern Ute Indian Tribe as an addition to the FY2000 budget. Based on past funding requests to the Tribe it is likely that additional funding from the Recovery Program will be

following methods would be employed to develop population estimates.

2.) Specific Habitat Estimates:

In each river reach, two riffles and two shoreline run habitats will be selected as locations for multiple pass removal location for small bodied fish population estimates. Three to five removal passes would be made in each selected habitat. The number of removal runs required will be determined by the number of fish collected each pass. The riffle habitat will be sampled over its entire width. In addition to hand held dip nets, a bag seine will be placed downstream of the electrodes to capture stunned fish. A small mesh seine will be placed parallel to the river bank during sampling of the shoreline run and a bag seine positioned at the downstream end of the blocking net. Surface area sampled and seconds electrofished will be recorded for each habitat. Quantitative periphyton and macroinvertebrate samples will be collected at each riffle and shoreline run sampling location

2.) One Mile River Reaches

A one mile reach will be selected in each of the five river reaches for population estimates. At least four removal passes will be made in each one mile reach using three electrofishing rafts. All removal passes in any one mile reach will be made on the same day. All fish captured, except Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyruachen texanus*) will be retained in separate holding nets and processed after all passes are completed. The rare fish will be weighed measured and released at the end of the pass in which they were collected. Prior to release these fish will be checked for PIT tags and if not tagged, a PIT tag will be placed in all fish of appropriate size.

3.) Age Determination

The population model requires data on age and growth of the species included in the model. The current model configuration contains estimates of age for specific size classes of each species based on literature values and size frequency distributions. The specific tasks for this proposal would be to use hard structures taken from fish of various sizes to verify year classes. This data would be used to better refine the model parameters for growth statistics and estimates of growth rates related to the bioenergetics portion of the model.

Specific growth rate data are needed to refine the population model age class structure and bioenergetic parameters. This effort would include summarizing existing literature data on length at age statistics for native suckers and non-native cyprinid and ictalurid fishes.

Specific methods would include removing hard structures (scales or otoliths) from 10 fish of each size class captured during the population estimates in October 1999.

### **Population Estimate – Relative Abundance Correlation:**

That model formulation effort is ongoing and included a one week effort to make population estimates for the San Juan River fish community at the upper and lower reaches of the expected inhabited range for the Colorado pikeminnow. The population estimates were made using multiple pass removal techniques within specific habitat types and for a one mile reach of river using raft mounted electrofishing equipment. The habitat specific electrofishing was conducted using a barge mounted 5.0 GPP Smith-Root multiple electrode array. Habitat specific collections used blocknets and bag seines to delimit the electrofished areas.

The results of that effort show that population and biomass estimates with reasonable confidence intervals can be obtained using the above methods. Specific population estimates by size class (YOY, juvenile and adult) will be made using the data obtained at the five river reaches. The abnormally high river discharges experienced during the late summer and early fall of 1999 may affect the efficiency compared to data from a more normal flow year. We propose that an additional data set be collected in fall 2000 for further comparison with the monitoring data. This additional population effort is intended to provide additional information for use in refining the correlation between population estimates and relative abundance data.

### **Age Determination:**

The population model also requires data on age and growth of the species included in the model. The current model configuration contains estimates of age for specific size classes of each species based on literature values and size frequency distributions. The specific tasks for this proposal would be to use hard structures taken from fish of various sizes to verify year classes. This data would be used to better refine the model parameters for growth statistics and estimates of growth rates related to the bioenergetics portion of the model.

### **Objectives:**

- 1.) Further refine the correlation between population and abundance of fish using the first pass of population estimate and relative abundance during monitoring surveys.
- 2.) Use standard aging techniques, e.g. scales or otoliths, to determine ages for each size class of native suckers.

### **Methods:**

- 1.) Population Estimates

The specific work tasks for this proposal is an intensive electrofishing effort in two reaches of the San Juan River (Selected from Reaches 3 – 7). The methods for data collection would follow protocols established in 1998 and 1999. In each reach the

**Age Determination for San Juan River Native Fish for Use in  
Population Model Refinements  
Fiscal Year 2000 Project Proposal**

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and

Principle Investigator: Bill Miller,  
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**Background:**

A modeling effort to construct a conceptual framework for the fish community and endangered fishes in the San Juan River began in 1998. This effort relates to Sections 5.1; 5.1.1; 5.1.2; 5.1.3.; 5.1.4 of the Long Range Plan. These models have helped direct a focused field effort with the intent of using key site specific data to determine the carrying capacity of pikeminnow and razorback suckers in the river.

The models as proposed include bioenergetics, population, and trophic components. Data for fish populations by age class and habitats as well as other trophic components are required as model parameters. The intent of the 2000 program is to better parameterize structural and functional components of these conceptual models. Three approaches are currently under investigation each of which is centered on a different hierarchical organization. They are:

- 1.) **BIOENERGETICS** This approach is individual based (structural) and summed for population effects .In addition, functional energetic (ingestion/egestion, assimilation, etc.) are considered.
- 2.) **POPULATIONS** This conceptual approach utilizes densities/biomass, size/age structure, etc of individual populations. The populations sizes will be tiered to habitats and habitat requirements.
- 3.) **TROPHIC STRUCTURE** An attempt is being made to understand the food web structure of the river based upon functional groups. This approach utilizes biomass estimates at all trophic levels and will look at the movement of energy and biomass between trophic groups (I.E. grazers, detritivores )

Propst, D. L. and A. L. Hobbes. 1996. Ichthyological characterization of San Juan River Secondary channels, 1995 annual report. San Juan River Recovery Implementation Program, Annual Research Report, Fiscal Year 1995. U.S. Fish and Wildlife Service, Albuquerque, NM.

Ruppert, J. B., R. T. Muth, and T. P. Nesler. 1993. Predation on fish larvae by adult red shiner, Yampa and Green rivers, Colorado. The Southwestern Naturalist 38:397-399.

**Budget<sup>1</sup> FY-2000:**

Field Studies

Personnel	\$ 12,000
Travel and Per Diem	\$ 2,000
Equipment and Field supplies	\$ 4,000

Data Compilation and Analysis

Personnel	\$ 10,000
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Annual Report and Preparation

Personnel	\$ 3,000
Administrative Support	\$ 1,500

Total	\$ 37,500
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Indirect Costs	\$ 3,750
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<b>TOTAL</b>	<b>\$ 36,250</b>
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<sup>1</sup>Budget does not include in-kind contributions

insights to the response of these species to summer flow spikes.

**Products:**

A Draft Annual Report and electronic data files will be delivered by March 31, 2001.

**Literature Cited:**

- Archer, E., T. Chart, L. Lentsch, and T. Crowl. 1996. Early life history fisheries survey of the San Juan River, New Mexico and Utah, 1995. San Juan River Recovery Implementation Program, Annual Research Report, Fiscal Year 1995. U.S. Fish and Wildlife Service, Albuquerque, NM.
- Bliesner, R. and V. Lamarra. 1996. San Juan River, habitat studies, 1995 Annual Report. San Juan River Recovery Implementation Program, Annual Research Report, Fiscal Year 1995. U.S. Fish and Wildlife Service, Albuquerque, NM.
- Douglas, M.E., P.C. Marsh, and W. L. Minckley. 1994. Indigenous fishes of western North America and the hypothesis of competitive displacement: *Meda fulgida* (Cyprinidae) as a case study. *Copeia* 1994: 9-19.
- Gale, W. F. 1986. Indeterminate fecundity and spawning behavior to captive red shiners--fractional, crevice spawners. *Transactions of the American Fisheries Society* 115:429-437.
- Gido, K. B., D. L. Propst, and M. C. Molles, Jr. 1997. Spatial and temporal variation of fish communities in secondary channels of the San Juan River, New Mexico and Utah. *Environmental Biology of Fishes* 49:417-434.
- Gido, K. B. and D. L. Propst. 1999. Habitat use and associations of native and nonnative fish in the San Juan River, New Mexico and Utah. *Copeia* 1999: 321-331.
- Haynes, C.M., T. A. Lytle, E. J. Wick, and R. T. Muth. 1984. Larval Colorado pikeminnow (*Ptychocheilus lucius*) in the Upper Colorado River basin, Colorado, 1979-1981. *The Southwestern Naturalist* 29:21-33.
- Hubbs, C. L. 1954. Establishment of a forage fish, the red shiner (*Notropis lutrensis*), in the lower Colorado River system. *California Fish and Game* 40:287-294.
- Matthews, W. J. 1980. *Notropis lutrensis* (Baird and Girard) red shiner. P. 285 In D.S. Lee, C. R. Gilbert, C. H. Hocutt, R.E. Jenkins, D. E. McAllister, and J. R. Stauffer, Jr. (eds.). *Atlas of North American freshwater fishes*. North Carolina State Museum of Natural History, Raleigh, NC.
- Minckley, W. L. and J. E. Deacon. 1968. Southwestern fishes and the enigma of "endangered species." *Science* 159:1424-1433.

- 1.) Document the response (spawning success and survival of larvae) of red shiner to elevated flows during its spawning season.
- 2.) Estimate the volume and duration of elevated flows required to have a demonstrable negative impact on red shiner spawning success and abundance.
- 3.) Characterize response of other nonnative and native fishes to elevated flows at each study state.
- 4.) Prepare report (using appropriate uni- and multivariate statistical procedures) detailing results of study and use this information to make recommendations to improve the management of nonnative fishes particularly red shiner, in the San Juan River.

### **Methods:**

Study sites are located on secondary channels at RM 136 and 128.5 (also used in the Gido et al., 1997 and Gido and Propst, 1999). Each site contains a representative mix of mesohabitats (e.g., pools, riffles, and runs). Thermographs were installed at each site prior to cessation of spring runoff. During 1998 and 1999, each site was sampled weekly from the date Navajo Dam releases reached base summer releases (typically mid-June) through 30 September. The same protocol will be followed in 2000. Sampling will be done by mesohabitat, following the protocol of Gido et al. (1997). All specimens will be preserved (10% formalin), measured ( $\pm 1$  mm TL), and a subsample of female and male red shiners collected at each site will be examined to characterize gonadal conditions. A minimum of 12 mesohabitats will be sampled at each site on each date. Specimens collected from each mesohabitat will be preserved separately. Surface area, mean depth, and mean water velocity will be determined for each sampled mesohabitat. Secondary channel discharge will be determined for each secondary channel during each site visit. Time of maximum spawning activity will be related to accumulated degree-days and photo period.

During each year of the study, natural flows will be depended upon to assess their relative impact on red shiner spawning and recruitment success. The weekly sampling schedule ensures that sampling occurs within a few days of any natural flow spike.

For each year of the study, optimal study conditions would include a range of natural summer flow spikes during the presumed peak spawning season of red shiner. However, absence of a flow spike in a particular year would not negate the value of the data collected. A continuum of summer flow patterns from no slow spike through one as high as that during summer 1997 would enable enhanced resolution of the relationship between summer flows and red shiner abundance.

Field work was proposed for 3 years. This year (2000) will be the third year of the study. Data compilation, data analysis, and report preparation will be completed during the fourth year. Although the focus of this study is to characterize the response of red shiner to summer flow spikes, the sampling methodology enables collection of data on all species (native and nonnative) that inhabit secondary channel habitats during summer. These data may also be analyzed to provide

The above provides evidence to support the contention of Gido et al. (1997) that spring runoff tends to reduce the abundance of nonnative fish in secondary channels. However, even high spring runoff does not eliminate nonnatives. The survivors spawn, and can potentially regain abundance (presumably as a consequence of increased survivorship of Age 0 fish) similar to that prior to high spring runoff.

Although high spring runoff appears to be an important factor in suppressing nonnative abundance, data on the red shiner population in the Channel from Hell suggest it is sufficient only for temporary and short term reductions. Given the documented problems that red shiner (as well as other nonnative fishes) presents to native fishes, particularly those that use low-velocity nursery habitats, additional means to suppress nonnative abundance are needed. The data from the Channel from Hell site suggest that flow spikes during the spawning season of red shiner (preferably in concert with high spring runoff) would contribute to reduction or suppression of the abundance of the species. A correctly-timed flow spike (natural or human-caused) would reduce water temperature below optimal spawning temperature and flush larval red shiner from nursery habitats. Ideally, this reduction would be sufficient to reduce red shiner sufficiently that it would not be a problem for larval Colorado Pikeminnow the following year.

A potential problem with a flow spike of sufficient intensity to reduce red shiner spawning success would be its occurrence when larval Colorado pikeminnow are susceptible to displacement. Conversely, if survival of larval Colorado pikeminnow is impaired by high densities of red shiner, a flushing or spawn delaying flow spike would not diminish the ultimate survival of Colorado pikeminnow in the San Juan River. Red shiner is a short-lived species (maximum longevity <30 months) and populations of such species must successfully spawn at least every 2 years to survive. Colorado pikeminnow, however, is a long-lived species (>25 years) and may not have to spawn successfully each year to maintain population viability.

The results of a study such as that proposed herein have implications for the management of undesirable nonnative fishes. If summer flow spikes are demonstrated to have deleterious effects upon red shiner density, particularly in low-velocity habitats, a management option may be to make reservoir releases to mimic summer storm caused flow spikes. A critical issue for such a management option is the volume of water needed to cause the desired effect. This study is designed to identify the threshold flow spike (and thus the volume of water) sufficient to significantly reduce red shiner abundance. During "dry" years, a decision may be made to not use limited water supplies to mimic spring runoff, but to use the available water to reduce red shiner abundance during their spawning season.

### **Objective:**

The overall study objective is to determine if summer storm-caused flow spikes significantly reduce red shiner spawning success and abundance. Data from this study will be used to evaluate the efficacy of using summer reservoir releases to reduce red shiner abundance.

The specific objectives of the study are:

Primary channel (Archer et al., 1996). Although San Juan River secondary channels, after cessation of spring runoff, have mainly low-or zero-velocity habitats, no larval Colorado pikeminnow was captured in secondary channels prior to 1996 (Propst and Hobbes, 1996).

In November 1996 and August 1997, large numbers of Age 0 Colorado pikeminnow and smaller numbers in August 1998 were stocked in the San Juan River in an effort to determine what factors might be limiting recruitment of young Colorado pikeminnow to the adult population (UDWR 1998 Work Plan). Following their stocking, UDWR personnel regularly sampled low velocity habitats to assess Age 0 Colorado pikeminnow survivorship and characterize the habitats they used (E. Archer, pers. comm.). In addition to being found in low-velocity habitats associated with the primary channel, stocked Colorado pikeminnow were also found in secondary channels. During the autumn 1997 secondary channel monitoring, 240 Age 0 Colorado pikeminnow were found in 20 secondary channels. In August 1998, a single Colorado pikeminnow (ca. 140 mm TL) was captured at the Channel from Hell study site.

In the San Juan River, backwater habitats associated with the primary channel, typically represent a small proportion of the total wetted area available as habitat to fishes (Bliesner and Lamarra, 1996). After cessation of spring runoff, secondary channel habitats are primarily low-velocity and provide comparatively large (surface area) potential nursery habitat for Colorado pikeminnow. Prior to stocking Age 0 Colorado pikeminnow in 1996, the apparent absence of the species in secondary channels may have been precluded by the high abundance of nonnative fishes, particularly red shiner. One possible explanation for the high abundance of red shiner in secondary channel habitats (as well as primary channel backwaters) is the ability of an individual female to spawn numerous times over a season, if water temperatures are within the appropriate range (>25 and <35°C; Gale, 1986). Red shiner spawning in San Juan River secondary channels was noted at temperatures between 20 and 25°C (D. L. Propst and K. B. Gido, unpublished data), but most spawning appeared to occur when water temperature was within the range reported by Gale (1986). If red shiners have an extended spawning season in San Juan River secondary channels, this should be reflected in the capture of small larvae (<12 mm SL) for an extended time (ca. 60 to 80 days). However, data from intensively sampled secondary channels indicated that the spawning season for red shiner in the San Juan River is brief. At the Channel from Hell (RM 136) site, Age 0 red shiners were first collected in late-July 1993 and 1994. Length-frequency histograms indicated that the 1993 spawning likely occurred from the second or third week of July through early September (ca. 60 days), but that most spawning occurred during a brief period in late July-early August (ca. 15 days). Data from 1994 indicated that most spawning occurred over a similar or briefer time frame. Fewer red shiner specimens were collected in 1995, but data for that year also suggested a brief spawning season. Greatest density of red shiner at the Channel from Hell site occurred in 1993 when discharge in the channel was very low throughout the presumed spawning season. Spring runoff in 1994 was comparatively low and red shiner density increased with successful spawning and recruitment. In 1995, high spring runoff apparently decreased red shiner density and reduced spawning success. Water temperatures at the Channel from Hell site exceeded 25°C for only 3 weeks or less in 1993, 1994, and 1995. Although Gale (1986) found a strong correlation between red shiner spawning and water temperature and such appears to be indicated by the foregoing data, photo period may also influence time of maximum spawning activity (C. Hubbs, pers. comm.).

**Evaluation of the Effect of Elevated Flows  
on Spawning Success of Red Shiner, *CYPRINELLA LUTRENSIS* (Year 3 of 4)  
Fiscal Year 2000 Project Proposal**

Principal Investigators: David L. Propst  
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and

Principal Investigators: Steven P. Platania  
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**Study Area:**

Study sites are located on secondary channels at RM 136 and 128.5

**Collections:**

Specimens collected will be inspected to determine if any rare fishes (Colorado pikeminnow, roundtail chub, and razorback sucker) are present in the seine. Any rare fish >150 mm TL and all large-bodied native fish (i.e., flannelmouth and bluehead suckers) will be released. All other specimens will be preserved in 10% formalin and returned to the New Mexico Department of Game and Fish Laboratory for identification, enumeration, and measurement (total length and weight).

**Background:**

The red shiner, *Cyprinella lutrensis*, is native to central and southern Great Plains streams of the Mississippi-Missouri and Gulf Coastal drainages (Matthews, 1980). It was first documented in the Colorado River basin near Yuma, Arizona in 1953 (Hubbs, 1954). Since then, the species has become widespread and common in the basin and has been implicated in the decline of several native fishes (Minckley and Deacon, 1968; Douglas et al., 1994; Ruppert et al. 1993). In the San Juan River of New Mexico, Colorado and Utah, red shiner is one of the most common nonnative fish species, particularly in low velocity habitats (Archer et al., 1996; Propst and Hobbes, 1996). These low velocity habitats (backwaters and embayments) are also important nursery areas for larval Colorado pikeminnow (Haynes et al., 1984; Archer et al., 1996). Low numbers of larval (Age "0") Colorado pikeminnow have been captured during most years (1992-1996) of the San Juan River

### **III. RESEARCH ACTIVITIES**

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email: range@cc.usu.edu

**Budget FY-2000:**

Payment for serving on the Peer Review Panel includes expenses for travel to and from meetings, and for non-federal personnel (Hubbs, Wohl, Ryel) an honorarium. The honorarium would be sized dependent on the activities of the Peer Reviewer. For example, in 1997 an honorarium of \$1,000 was provided for services related to a meeting with the Biology Committee and discussing the flow recommendation process, and reviewing the pre-draft Flow Recommendation Report. In, it is expected that the level of review, be it through meetings or review of documents, may be at least twice as extensive as the 1997 services. Hence, honoraria of \$2,000 per Peer Reviewer may be more appropriate. In anticipation of increased honoraria, and three meetings with the Program, the following budget is proposed.

Honoraria:	\$	6,000	
Travel:	\$	9,600	(\$800/meeting x 4 people x 3 meetings)
Total	\$	15,600	

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Funds remaining from 1999 are sufficient to cover the 2000 budget  
(Approximately \$16,000 is remaining)

**Goal:**

The goal of peer review is to provide additional scientific oversight over San Juan River Recovery Implementation Program technical studies and reporting. The Peer Review Panel will work with the Biology Committee to produce scientific credible documents and will assist the Biology Committee in maintaining a highly scientific direction to the Program.

**Methods:**

The Peer Review Panel will meet with the Biology Committee on an as needed basis, but likely no more than three times during 2000. They will also review Program reports when they are in draft and final form, including the final research reports; the draft and final Program Evaluation Report, and any other reports that are produced as end products of the Program. They will also be asked to assist the Biology Committee in developing a long term monitoring program, and will be asked to review 2000 Work Plans. Their reviews will be provided to the Biology Committee through Dr. Paul Holden in letter form, and through discussions at the Biology Committee at meetings. Biology Committee researchers may call Peer Review Panel members to ask for advice, and Peer Review Panel members may call Biology Committee researchers if they have questions concerning Program activities. All correspondence between the Biology Committee and the Peer Review Panel will be coordinated through Dr. Paul Holden, who will maintain a record of these coordination activities for the Program. Additional Peer Review Panel members may be added if a particular expertise is needed by the Biology Committee.

**Products:**

Peer review participation at 3 meeting and letter reports from each peer reviewer.

**Primary Contact:** Dr. Paul Holden  
BIO/WEST, Inc.  
1063 W. 1400 N.  
Logan, UT 84321  
Phone:435-752-4202  
FAX:435-752-0507  
e-mail: pholden@bio-west.com

**Personnel:**

Dr. Clark Hubbs  
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University of Texas at Austin  
Austin, TX 78712-1064  
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Dr. Ellen Wohl  
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Colorado State University  
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**Peer Review for 2000  
Fiscal Year 1999 Project Proposal**

Principal Investigator: Paul B. Holden  
BIO/WEST, Inc., Logan, Utah  
Jicarilla-Apache Tribe  
(435) 752-4202 pholden@bio-west.com

**Background:**

During 1997 a Peer Review Panel was established that included the following scientists:

Dr. Clark Hubbs - Fishery ecologist and professor emeritus from the University of Texas. Clark served on the Peer Review Panel for the Grand Canyon Environmental Studies.

Dr. Peggy Shute - Endangered Fish Biologist with TVA who is actively working on similar endangered species issues in the eastern U.S.

Dr. David Galat - Fishery Ecologist with the National Biological Survey and Missouri Cooperative Fishery Unit who is working on native fishes and instream flow issues on the Missouri River.

Dr. Ellen Wohl - Associate Professor in the Department of Earth Sciences at Colorado State University. Ellen has been involved with peer review of Upper Colorado River Basin projects and has expertise in geomorphology and sediment transport.

Dr. Ron Ryel - Biostatistician and ecologist with experience in population modeling. Ron has been involved with endangered fish issues in the Grand Canyon and the Upper Colorado River Basin.

Dr. Shute was unable to work on the panel in 1997 due to ill health and resigned from the panel in 1998 because of workload considerations. The other four members of the panel participated in meetings in 1997 where the flow recommendations were discussed, and continued involvement in the flow recommendation report process by commenting on the pre-draft report and attending a Biology Committee meeting to discuss the pre-draft report in 1998. They also met with the Biology Committee in 1999 to discuss the draft flow recommendation report that the Biology Committee sent to the Coordination Committee for review. In addition, in 1999 the Peer Review Panel reviewed the draft Monitoring Plan, and initial drafts of the final research reports.

In 2000, the Peer Review Panel is involved in evaluation of final research reports, and will be involved in review of the Program Evaluation Report that will summarize the results of the Program. The Peer Review Panel will be used to interact with the Biology Committee, meeting with them about three times during the calendar year, and reviewing documents as they are produced.

This proposal provides for funding to maintain the Peer Review Panel activities during 2000.

Phone: 435-752-4202  
FAX: 435-752-0507  
e-mail: pholden@bio-west.com

**Budget FY-2000:**

Personnel	\$ 85,000
Travel	\$ 2,000
Printing and Misc.	\$ 3,000
Total	<u>\$ 90,000</u>
<b>Amount Remaining in 99 Budget</b>	<b>\$ 35,000</b>
<b>Amount Requested in 00 Budget</b>	<b>\$ 55,000</b>

Dr. Holden will use the results of the final research reports to prepare the report, and may discuss pertinent issues directly with various researchers. Specific input that deals with their particular research may be required from some researchers if that information is not available in the final research reports. The intent is to assure that the Biology Committee members have input into the process and the draft report reflects the ideas of the entire committee rather than just Dr. Holden. Most of this coordination will be conducted via phone or email, but Dr. Holden may travel to researchers offices for more extensive discussions.

Once the pre-draft document is final, it will be printed and bound, and mailed to the Biology Committee and Peer Review Panel for review. Following their review, a draft report will be completed by May 15, 2000 incorporating pertinent comments. The draft report will be sent to the Coordination Committee and other Program participants. Upon approval by the Coordination Committee by June 30, 2000, comments will be incorporated and a final report will be completed by July 31, 2000. Printing of the final report for distribution will be the responsibility of the Program.

At the same time that the draft Program Evaluation Report is being prepared, the draft revised Long Range Plan will also be prepared by Paul Holden and Ron Bliesner, with input and comment by the Biology Committee and Peer Review Panel. BIO/WEST will have responsibility for producing the draft versions of the Plan. A draft revised Long Range Plan will be mailed to the Coordination Committee by May 31, 2000, with comments from the Coordination Committee due by July 15, 2000. A final Long Range Plan that incorporates Coordination Committee comments will be produced by August 15, 2000. Printing of the final Long Range Plan for distribution will be the responsibility of the Program.

**Products:**

Draft Program Evaluation Report and Long Range Plan with sufficient copies for the Coordination and Biology Committees. Camera ready copies of the final version of both reports.

**Personnel:**

Dr. Paul Holden will be responsible for the primary production of the reports and overall report coordination and project management. He will be assisted by Mr. Jack Ruppert, a BIO/WEST biologist familiar with the endangered fish and research on the San Juan River. Ms. Sandra Turner, BIO/WEST's Senior Editor, will provide the overall editorial review of the document. Ms. Turner will use her staff of editors, clerical specialists, and cartographers as needed to assist with document completion.

**Primary Contact:**

Dr. Paul Holden  
BIO/WEST, Inc.  
1063 W. 1400 N.  
Logan, UT 84321

revision by August 15, 2000. In addition, funding will also cover cost overruns for completion of the Flow Recommendation Report in 1999.

**Objective:**

The objective of this proposal is to provide the technical and editorial services necessary to produce a Program Evaluation Report that describes the progress and direction of the SJRIP, and a revised Long Range Plan that directs the Program in the future.

**Methods:**

The intent of the proposal is to complete the Program Evaluation Report in a reasonable period of time in 2000 with direct input from the Biology Committee and associated researchers but to free up time for Biology Committee members to complete other tasks. Dr. Paul Holden of BIO/WEST will assume the task of the primary author for the Report. Dr. Holden will prepare the various sections of the outline as shown below.

- 1.) Introduction - Background on how program was developed, funding sources, goals (Long Range Plan), etc.
- 2.) Studies that were performed
  - A. Biological Studies - Chronological review of the studies that were conducted including why they were conducted (Goals and Objectives), and what prompted changes.
  - B. Physical Studies - Chronological review of the studies that were conducted including why they were conducted, and what prompted changes.
- 3.) Results of the 7-Year Research Program as they relate to Program Milestones
  - A. Identify Factors Limiting Colorado Squawfish
  - B. Identify Factors Limiting Razorback Sucker
  - C. Identify Factors Limiting Other Native Fish Species
  - D. Limiting Habitats and Non-flow Habitat Modifications
  - E. Genetics Management Plan and need for refugia for Colorado Squawfish and Razorback Sucker
  - F. Augmentation
  - G. Non-native Fish Interactions
  - H. Contaminants
  - I. Other Results of the 7-year Research Effort
- 4.) Where do we go from here - Adaptive Management
- 5.) Summary and Suggestions for Changes to the Long Range Plan

**Technical and Editorial Services to Complete the  
Program Evaluation Report for the San Juan River and  
a Revision of the Long Rang Plan**

Principal Investigator: Paul B. Holden  
BIO/WEST, Inc., Logan, Utah  
Jicarilla-Apache Tribe  
(435) 752-4202 pholden@bio-west.com

**Background:**

Since 1991 the San Juan River Basin Recovery Implementation Program (Program) has been involved in a seven-year research effort. Much of the research has been directed by the Long Range Plan, a document prepared by the Program to show its goals and objectives, and the plan for meeting those goals and objectives. As the seven-year research program draws to a close, final reports on the various research projects are due. But a need exists to integrate the findings of those reports and put them in a format understandable to non-biologists, and in a format that shows the accomplishments of the Program in relation to its goals and objectives. In addition, the Long Range Plan also may need to be revised to respond to the knowledge that has been gained todate.

Funded in 1999, the Program Evaluation Report will be a brief synopsis of the results of the SJRIP during the 7-year research period as related to the goals and milestones of the Long Range Plan. This report will also provide a basis for changes in the Long Range Plan which directs Program activities. During 1999, funding for this project was provided for most members of the Biology Committee to prepare portions of the report and for BIO/WEST to complete editorial services. An outline for the report was prepared by the Biology Committee along with a determination of the committee members responsible for the various report sections. BIO/WEST's role for this report was primarily editorial with preparation of some technical portions. Most of the technical portions of the report were to be prepared by members of the Biology Committee. Additional effort beyond the outline has not progressed in 1999 because final research reports for the 7-year research period have not been completed. In addition to the final research reports that summarize research information from 1991 through 1997, researchers also have annual reports for 1998 and 1999 that are due in early 2000, and a monitoring report to complete. This raises the concern of whether members of the Biology Committee will have the time to complete the Program Evaluation Report, and the other outstanding reports, within a reasonable timeframe. This proposal provides for an alternative method for completing the Program Evaluation Report by having BIO/WEST complete the entire report and have Biology Committee members review and comment on it rather than having primary responsibility for writing the report. This proposal provides for the funding for the technical, editorial, and production efforts by BIO/WEST to complete the draft Program Evaluation Report by May 15, 2000 and a revised draft Long Range Plan by May 31, 2000 for review by the Coordination Committee. Coordination Committee comments will be due back to the Biology Committee by June 30, 2000 and July 15, respectively, for the two draft reports, and the final Program Evaluation Report will be produced by July 31, 2000, and the final Long Range Plan

**Budget FY-2000:**

Personnel

Research Assistant (4 months)	\$ 10,000
Data Entry Associate (2 months)	\$ 4,000

Subtotal	\$ 14,000
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Equipment and Supplies

Computer Equipment & Time	\$ 2,000
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Subtotal	\$ 2,000
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Total	\$ 16,000
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Overhead (15%)	\$ 2,400
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GRAND TOTAL	\$ 18,400
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- 4.) Generate final 1987-1989 San Juan River database and merge with current San Juan River database. Information will be disseminated via the next scheduled version of the San Juan River database (on compact disc).

**Methods:**

- 1.) Retrieve original files and field notes and enter collection data in appropriate format and fields.
- 2.) Review individual collection entries for accuracy of transcription.
- 3.) Check information against 1987-1989 report.
- 4.) Submit draft data set with accompanying annotations for review.
- 5.) Incorporate review comments, changes, corrections, and submit final electronic database to the San Juan River database manager.

**Products:**

An abbreviated draft descriptive narrative documenting the process, summary statistics, and results of this project will be provided (under a mutually agreed time-frame) to the San Juan River Biology Committee for review. The primary product that will result from this work will be the electronic copy of the field and collection data that is transferred to the San Juan River database manager following the successful protocol previously employed.

**Electronic Capture of the 1987-1989 San Juan River  
Research Program Database  
Fiscal Year 2000 Project Proposal**

Principal Investigators: Steven P. Platania and Robert K. Dudley  
Division of Fishes - Museum of Southwestern Biology  
University of New Mexico  
Albuquerque, NM 87131  
(505) 277-6667  
platania@unm.edu      rdudley@unm.edu

**Background:**

The 1987-1989 studies of the ichthyofaunal community of the San Juan River resulted in the capture of over 100,000 fish in New Mexico and Utah. Sampling techniques during the initial San Juan River surveys included raft-mounted electrofishing, seining (for larval and juvenile fishes), and trammel-netting. Over 25,000 fish were taken during raft-electrofishing. Fish sampling techniques employed during 1987-1989 are essentially the same as those that were established for the subsequent seven-year research program (1991-1998). While the information from the 1987-1989 research program has been analyzed and reported, these data have not been electronically captured and incorporated with the data from the seven-year research program. The absence of this data set has precluded the possibility of comparing results from most recent ichthyofaunal studies with that of the late 1980s. In addition, certain San Juan River hydrologic conditions experienced between 1987-1989 have not subsequently been duplicated. Temporal comparisons between discrete studies will not be possible until the former data set is available in electronic format.

**Study Area:**

The study area is the San Juan River between Navajo Dam and Lake Powell. This proposed project does not require any field collecting.

**Objectives:**

- 1.) Electronically capture San Juan River data generated from the 1987-1989 research program. Data will be entered using the format and fields currently employed by San Juan River researchers.
- 2.) Validation of data. Changes in river mile designations and any other fields that have been modified since 1989 will need to be made and checked.
- 3.) Generate draft and final 1987-1989 San Juan River database for review by appropriate personnel (including San Juan River biology committee).

**Program Coordinator Objectives:**

- 1.) Assist with liaison and coordination of the Biological and Coordination Committees.
- 2.) Disseminate relevant information to the Coordination, Biology and Navajo Dam Operating Committee members and to other partners, especially State, Federal, and Tribal agencies.
- 3.) Work with the Biology Committee in drafting Annual Work Plan and Progress Reports and disseminate these to the Coordination Committee members.
- 4.) Finalize the Public Outreach Plan.
- 5.) Participation in meetings hosted by the Bureau of Reclamation regarding the reoperation of Navajo Dam.
- 6.) Enhancement of the public information web site and development of newsletters and/or brochures pertaining to the San Juan River Recovery Implementation Program.

**Products:**

- 1.) Final Public Outreach Plan
- 2.) Enhancement of SJRIP Web Site
- 3.) Brochure and/or newsletter on SJRIP

**Budget FY-2000:**

Personnel	\$ 44,315
Travel/Per Diem	\$ 4,500
Committee Meetings (supplies, meeting space, mailings)	\$ 5,500
Printing/publication/mailings/brochures	\$ 7,800
TOTAL	\$ 62,115

**Program Coordination  
Fiscal Year 2000 Project Proposal**

Principals: Ren Lohofener and Shirley Mondy  
U.S. Fish and Wildlife Service  
P.O. Box 1306  
Albuquerque, New Mexico 87103-1306  
(505) 248-6806  
Renne\_Lohofener@fws.gov Shirley\_Mondy@fws.gov

**Background:**

The San Juan River Recovery Implementation Program (SJRIP) is designed to simultaneously address endangered fish species recovery and development of water resources within the Basin. The SJRIP includes representatives from not only Federal agencies, but also the States of Colorado and New Mexico, the Jicarilla Apache Indian Tribe, the Southern Ute Indian Tribe, the Ute Mountain Ute Indian Tribe, the Navajo Nation, and private water development interests, which all have legal mandated responsibilities to the endangered fish and/or the water resources. The SJRIP includes three committees. The Coordination Committee, chaired by the Region 2 of the Fish and Wildlife Service, functions as the oversight committee, determining policy and reviewing proposals and reports from the Biology and Navajo Dam Operating committees. The Biology Committee is responsible for developing work plans to answer technical questions regarding recovery and development of San Juan River resources, conducting studies, reporting of study results, and developing a Long-Range Implementation Plan to guide research and management efforts. The Navajo Dam Operating Committee serves in an advisory role, primarily to the Biology Committee, to coordinate flow requests designed to address research needs.

Major focus during Fiscal Year 2000 Program Coordination activities will be the completion and dissemination of final reports from the original seven-year research program, including the Synthesis Report and the revision of the Long Range Plan. This will include assisting the Biology Committee in compiling the reports and disseminating them to all interested parties.

In addition, the role and responsibilities of the Program Coordinator have expanded to encompass significant public outreach efforts in addition to coordination duties and information dissemination among the committees. As a result, increased emphasis in Fiscal year 2000 is planned for public outreach and involvement, including finalizing a Public Outreach Plan which will include an increased distribution of Program information, enhancement of the current website, and development of a Program brochure and/or newsletter.

**Budget FY-2000:**

Personnel	\$ 25,000
Travel/Per Diem	\$ 5,000
TOTAL	<u>\$ 30,000</u>

**Program Management  
Fiscal Year 2000 Project Proposal**

Principal Investigator: Larry Crist  
U.S. Bureau of Reclamation  
125 South State Street, Mail Rm 6107  
Salt Lake City, UT 84138-1102  
(801) 524-3639 lcrist@uc.usbr.gov

**Background:**

Program Management funds are not used to support a specific study or project. Funds reserved for Program Management are used to provide staff time to attend Biology and Water Operations committee meetings of the Recovery Program, support individual studies as requested, administer funding agreements for planning, research and monitoring and participate in public meetings as required. The bulk of these funds are allocated to Reclamation's Grants and Cooperative Agreements staff, Upper Colorado Regional Office Environmental Resource Group and the Durango Area Office. During 1999 activities conducted by Reclamation included participation in the Recovery Program Committees, coordination of water operations and research activities, and administration of agreements with cooperating agencies. Management funds are important to insure that Reclamation's contributions to the program are properly administered and that funds are transferred in a timely and efficient manner.

**Objectives:**

- 1.) Administer and modify as needed existing Intra agency agreements with; U.S. Fish and Wildlife Service Region 6, U.S. Fish and Wildlife Service Region 2, and the USGS.
- 2.) Administer and modify as needed existing Cooperative Agreements with; the states of New Mexico, Utah, Colorado, and the University of New Mexico at Albuquerque.
- 3.) Administer and modify as needed Service Agreement with U.S. Bureau of Reclamation, Remote Sensing Branch for required services.
- 4.) Contract Bureau of Indian Affairs contributions to research program through existing agreements.
- 5.) Implement additional Cooperative Agreements or Interagency Acquisitions as needed.
- 6.) Provide staff support as needed to field studies.

## **II. PROGRAM MANAGEMENT/REPORTING**

**Non-Native Species Monitoring and Control  
Fiscal Year 2000 Project Proposal**

Principal Investigators: Jim Brooks and Jude Smith  
New Mexico Fishery Resources Office  
U.S.F.W.S.  
Albuquerque, NM  
(505) 346-2538    jim\_brooks@fws.gov

**Background:**

Introduced species have been implicated in the decline of several native fishes. In the Colorado River drainage, introductions occurred simultaneously with flow-related habitat alterations. These events coincided with a basin wide decline in distribution and abundance of many native species, in particular the Colorado squawfish and razorback sucker. Various laboratory and field studies have described the interactions among native and non-native species. Impacts on native fishes include resource overlap in both diet and habitat use (i.e., potential competition), predation, and hybridization.

During 1991-1997, this component of the San Juan River research has focused on the identification of the impacts of non-native species on the native fish community. Research has characterized the distribution and abundance of non-native species in main channel habitats, seasonal movements of channel catfish and common carp, the food habits of non-native predators, primarily channel catfish, the overlap of resource use between native and non-native fish species, and the relation of these findings to differing flow regimes. Channel catfish are the single most abundant large non-native predator in main channel collections. Data indicate that channel catfish occupy a variety of habitats within the main channel, generally exhibit localized movement, and at lengths > 450mm prey upon native species.

During 1999, control efforts were continued and formalized to reduce the abundance of channel catfish in the San Juan River downstream of Farmington. Channel catfish were removed by raft-mounted electrofishing and transplanted by Navajo Nation hatchery trucks to closed impoundments managed for recreational fisheries. This effort is strongly supported by the Navajo Nation and the State of New Mexico.

This workplan proposes to continue mechanical removal of channel catfish and other non-native species in conjunction with main channel adult monitoring and rare fish stocking efforts. Monitoring data on the distribution, abundance and food habits of non-native species will continue to be collected and analyzed. In addition, removal and transplantation of San Juan River channel catfish to isolated impoundments currently used for recreational fisheries will be continued and expanded to recreational fishing waters under the jurisdiction of the State of New Mexico. Support will also be provided for completion of study integration efforts.

## **Objectives:**

- 1.) Continue data collection and mechanical removal of non-native species during main channel adult rare fish monitoring efforts.
- 2.) Evaluate data for non-native species to determine effects of mechanical removal on abundance and distribution patterns.
- 3.) Continue, refine and expand program for mechanical removal and transplantation of channel catfish.
- 4.) Monitor the influx of lacustrine nonnative fish species into the San Juan River upstream of Lake Powell and determine predative impacts via stomach content analysis.
- 5.) Continue data integration efforts for input into the *Program Evaluation Report*, and revised *Long Range Plan*.

## **Methods:**

Mechanical removal will occur during the fall main channel monitoring efforts. Hoop netting efforts will be discontinued. During these sampling efforts, all nonnative species collected will be sacrificed and data recorded for species identification and enumeration, ontogenetic stage (young-of-year, sub-adult, adult) if collected from a non-Designated Mile, and standard and total lengths and weight for Designated Mile collections. Data will be summarized by geomorphic reach and sampling will occur two out of every three river miles. Tagging data for recaptured channel catfish and common carp tagged during 1993-1996 will be recorded in the field and integrated into existing databases for movement and abundance.

Lacustrine non-native species (primarily striped bass, walleye, largemouth bass) collected in the San Juan River will be sacrificed for stomach content analysis in the laboratory to identify predation on rare and other native fish species. Stomachs will be removed, preserved in 10% formalin and data will be recorded for predator species identification, standard and total lengths, weight and sex. Stomach content analysis will identify frequency of occurrence and weight by individual prey species, stomach fullness and relate standard length of identifiable prey species to predator standard length.

Separate efforts for mechanical removal and transplantation of channel catfish from the San Juan River to Navajo Nation and State of New Mexico waters will commence during March and April 2000. Electrofishing will be employed during March/April efforts when water temperatures are low and during fall main channel sampling efforts. Captured channel catfish will be measured, weighed, examined for external fish health condition and transported by hatchery truck to receiving waters on a daily basis during two five day efforts during spring sampling and during the first four days of the fall sampling (Hogback to Four Corners). A formal management plan will be completed to identify agency responsibilities, methods of capture and holding and transport for all receiving waters for

channel catfish mechanically removed from the San Juan River.

**Deliverables:**

Participation will continue in data integration efforts to incorporate 1997-1999 data, produce annual report, provide input to *Program Evaluation Report*, and complete revision of SJRIP planning documents . An electronic data file will be provided for inclusion in the centralized database by 31 March 2001. An annual report detailing findings will be completed in draft by 31 March 2001 for SJRIP Biology Committee review and finalized by 1 June 2001.

**Budget FY-2000:**

Personnel:

Population monitoring	\$ 7,500,
Nonnative species removal/channel catfish translocation	\$ 100,00
Reporting/data management	\$ 5,500

Subtotal \$ 23,000

Travel/per diem:

Population monitoring	\$ 2,500
Removal/translocation	\$ 1,500
Reporting/data management	\$ 1,500

Subtotal \$ 5,000

Equipment and supplies

Population monitoring	\$ 2,000
Removal/translocation	\$ 3,500
Integration/final report	\$ 500

Subtotal \$ 6,000

**TOTAL \$ 34,000**

**Evaluation of Stocked Razorback Sucker  
Fiscal Year 2000 Project Proposal**

Principal Investigators: Dale Ryden and Frank Pfeifer  
U. S. Fish and Wildlife Service  
Colorado River Fishery Project  
764 Horizon Drive, South Annex A  
Grand Junction, Colorado 81506-3946  
(970) 245-9319  
dale\_ryden@fws.gov      frank\_pfeifer@fws.gov

**Background:**

Razorback sucker are native to the San Juan River. At present this species is extremely rare in the San Juan. In order to gain information on habitat use, possible spawning areas, and survival and growth rates of hatchery-reared razorback sucker in the wild, it was necessary to experimentally stock a small number of fish. The information obtained during the experimental stocking study was used to develop and implement a plan for full-scale augmentation of this species in the San Juan River. Integration of razorback sucker experimental stocking data with data from adult fish community monitoring studies, Colorado pikeminnow macrohabitat studies, contaminants studies, habitat mapping studies, and non-native species interaction studies, provided information essential to the development of flow recommendations for reoperation of Navajo Reservoir. Information obtained during the evaluation of stocked razorback sucker will help address objectives 5.1 through 5.5 in the San Juan River Long Range Plan.

Experimental stocking of razorback sucker into the San Juan River began in 1994, as was outlined in An Experimental Stocking Plan For Razorback Sucker In The San Juan River. Between 1994 and 1996, a total of 939 razorback sucker were stocked into the San Juan River. All fish were PIT-tagged before release into the wild. In March 1994, 15 radio-tagged razorback sucker were divided and stocked in equal numbers at RM 136.6, 117.5, and 79.6. These fish were progeny of paired matings between San Juan River arm of Lake Powell adults that had been reared at Wahweap (UDWR) hatchery near Page, Arizona. Between 27 October and 18 November 1994 and additional 193 of these Wahweap fish (16 of which were radio-tagged) and 478 fish from the same paired matings that had been reared at Ouray National Fish Hatchery (NFH) in Ouray, Utah were divided and stocked in roughly equal numbers at these same three stocking sites and at Hogback Diversion (RM 158.6). On 27 September 1995, 16 radio-tagged razorback sucker from Wahweap were stocked at Hogback Diversion. The last stocking associated with this study occurred on 3 October 1996, 237 razorback sucker from Wahweap (10 of which were radio-tagged) were stocked at Hogback Diversion. Based on the success of this experimental stocking study the decision was made to implement a full-scale augmentation program for razorback sucker in the San Juan River.

In August 1997, a Five-Year Augmentation Plan for Razorback Sucker in the San Juan River was finalized. Stocking of razorback sucker from various sources into the San Juan River began in early September 1997. Between 3 and 19 September 1997, a total of 2,885 razorback sucker were stocked

into the San Juan River at Hogback Diversion, New Mexico. The first group, stocked 3 September 1997, consisted of 1,027 fish that were collected from Lake Mohave as larval fish in 1996 and reared at Willow Beach NFH in Arizona. The second group, stocked 17 September 1997, consisted of 227 fish that were progeny of various crosses between Green River adults between 1989 and 1995 and were reared at Ouray NFH. The last group, stocked 19 September 1997, consisted of 1,631 fish, were 1996 progeny of paired matings between San Juan River of Lake Powell adults and Colorado River arm of Lake Powell adults or Upper Colorado River adults. This last group was raised at various facilities in Grand Junction, Colorado. All stocked fish were PIT-tagged before release into the wild.

In early spring of 1998, approximately 8,000 razorback sucker obtained from Lake Mohave were placed in a grow-out pond at Ojo Amarillo, just south of Farmington, New Mexico. On 22 April and 28 May 1998, 124 razorback sucker, progeny of paired matings between Green River adults, reared in golf course ponds in Page, AZ were harvested and stocked into the San Juan River at Hogback Diversion. On 14 and 15 October 1998, 1,155 of the fish from Ojo Amarillo pond were also harvested, PIT-tagged, and stocked at Hogback Diversion.

On 3 March 1999, approximately 35,000 larval razorback sucker from Lake Mohave were divided and stocked in roughly equal numbers in Ojo Pond and the east cell of the newly-constructed Avocet Ponds. On 26 May 1999, approximately 30,000 larval razorback sucker from Horsethief State Wildlife Area (near Grand Junction, CO) were stocked into the west cell of the Avocet Ponds. Razorback sucker intended to be stocked in 1999 were mainly the larger individuals left over from 1998 stockings in Ojo Pond. However, on 3 August 1999, heavy rains caused the dam at the Ojo Pond to wash out, draining the entire pond. Subsequent recovery efforts by the Bureau of Indian Affairs recovered approximately 180 razorback sucker in Ojo Wash. These fish were placed in the east cell of Avocet Pond. However, the majority of fish that were to be stocked in the San Juan River in 1999 were not recovered.

Thus, since 1994, a total of 5,103 razorback sucker have been stocked into the San Juan River (4,164 since the five-year augmentation effort for this species was begun in 1997). Follow-up monitoring will continue on razorback sucker monitoring and main channel fish community monitoring ("adult monitoring") trips.

### **Description of Study Area:**

The study area for razorback sucker monitoring extends from river mile (RM) 158.6 (Hogback Diversion) downstream of Farmington, New Mexico, to RM 76.4 (Sand Island boat landing) downstream of Bluff, Utah.

### **Objectives:**

- 1.) Determine habitat use and needs, site preference, and movement patterns of hatchery-reared razorback sucker in the wild.

- 2.) Determine survival rates and growth rates of hatchery-reared, known-age razorback sucker in the wild.
- 3.) Determine whether hatchery-reared razorback sucker will recruit into the adult population and successfully spawn in the wild.
- 4.) Finalize report for results and findings from 1994-1997 razorback sucker monitoring studies. Produce an "annual" report for results and findings of 1998 and 1999 razorback sucker monitoring field work.

**Methods:**

Objectives 1-5: Two electrofishing/netting trips will occur in 2000 to monitor stocked razorback sucker. Both trips will sample from Hogback Diversion to Bluff, Utah. The spring sampling trip will occur before runoff begins, in late March or early April. The summer trip will occur after the hydrograph has returned to summer baseflow. Electrofishing, seining, and trammel netting will be used to determine dispersal, and survival of stocked fish. Electrofishing and handling of rare fish species will follow the protocol found in the main channel fish community monitoring workplan, except that electrofishing will be done every mile, instead of 2 out of every 3 miles and only data on rare fish species collected (i.e., razorback sucker, Colorado pikeminnow, and roundtail chub) will be recorded. When rare fish species are collected, PIT tag number, length, weight, reproductive status, and general health information will be recorded.

In support of Objectives 1 and 3, four razorback sucker were implanted with radio transmitters (one-year lifespan) on the fall 1999 main channel fish community monitoring trip. These fish will be tracked throughout the suspected spawning season for razorback sucker in the San Juan River (i.e., late February through early June). The objectives of this radio telemetry effort will be: 1) to determine whether or not spawning aggregations of razorback sucker can be identified; 2) to document, in more detail, seasonal movement patterns and habitat selection by razorback sucker during spawning seasons. Tracking trips will be conducted on a monthly basis (minimum of four trips) from the last week of February to the first week of June. If spawning aggregations of razorback sucker are identified, trips will be done on a weekly basis, concentrating on the spawning fish. Fish contacted during radio tracking trips will be tracked for a minimum of one hour each. At the end of the contact, all riverine habitats for 100 meters both up- and downstream of the most up- and downstream fish locations during the contact period will be mapped on hardcopies of aerial videography. All habitats utilized by the fish will be recorded as well as the amount of time spent in each particular habitat type. Once back from the field, relative percentages of habitats available and habitats used will be determined, so that habitat selection can be determined as in previous razorback sucker telemetry studies on the San Juan River. During radiotelemetry contacts, detailed habitat information on substrate, depth, cover, and velocity at the fish's most frequented location will also be recorded. Water quality parameters including dissolved oxygen, water temperature, conductivity, and pH will be measured at each contact location. At the end of a radio telemetry contact, attempts will be made to recapture radiotelemetered fish via trammel netting and/or seining. Recapture efforts will be aimed at gaining data on age, growth and sexual status as well as trying to recapture any other razorback sucker that might be aggregating with radiotelemetered fish. If spawning aggregations of razorback sucker are identified, crews from other research elements

monitoring razorback sucker larval drift (i.e., Platania) and habitat quality and quantity (i.e., Bliesner and Lamarra).

Mechanical removal of nonnative fish species will continue to take place on all razorback sucker monitoring trips.

The Service will have the lead for the razorback sucker monitoring and other cooperating agencies will provide personnel and equipment as needed.

**Products:**

A first draft of the final report for the 1994-1997 razorback sucker monitoring study has already been circulated. A re-draft of this report was completed in mid-October 1999, with a final of this report expected by January 2000. A draft "annual" report for razorback sucker monitoring trips conducted in 1998 and 1999 is scheduled to be available by 31 March 2000. Finalization of the 1998-1999 "annual" report is scheduled to be completed by 1 June 2000. Costs for the finalization of the 1994-1997 razorback sucker monitoring report and producing a draft of and finalizing the 1998-1999 razorback sucker monitoring report are included in the budget for this workplan. At present, all DBASE IV files containing information on total catch and length/weight data gathered for rare fish species through April 1999 have been submitted to Keller-Bliesner Engineering for inclusion on the San Juan River Recovery Implementation Program integrated database CD-ROM. Data for rare fishes collected after April 1999 will be submitted for inclusion on the CD-ROM by 31 March 2000.

**Budget FY-2000:**

Personnel costs	
1 GM-13 Supervisor	\$ 5,000
1 GS-11 Fishery Biologist	\$ 13,000
1 GS- 7 Administrative Support	\$ 2,000
Data analysis and final report costs	\$ 5,000
Travel-Per Diem	\$ 3,000
Equipment and Supplies	\$ 4,000
Subtotal	\$ 32,000
Service Administrative Overhead (22.00%)	\$ 7,040
TOTAL	\$ 39,040

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**Collection of Larval Razorback Sucker from Lake Mohave  
for Use in Augmentation Efforts in the San Juan River  
Fiscal Year 2000 Project Proposal**

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**Background:**

In August 1997, a Five-Year Augmentation Plan for Razorback Sucker in the San Juan River was finalized. Stocking of razorback sucker from various sources into the San Juan River began in early September 1997. The five-year plan called for 31,800 razorback sucker to be stocked into the San Juan River in Year 1. Between 3 September 1997 and 15 October 1998, a total of 4,164 razorback sucker were stocked into the San Juan River at Hogback Diversion, New Mexico.

Numbers of razorback sucker available to the San Juan River Recovery Implementation Program (SJR-RIP) for 2000 and out years of the five-year augmentation effort are limited and will not be able to fulfill numbers specified in the plan. The only source presently available for making up the shortfall in desired numbers of stocked fish is Lake Mohave. During spawning season in Lake Mohave, large numbers of larval razorback sucker can be collected in a very short time by dipping the larvae as they are attracted to lights suspended from boats. Collection of larval razorback sucker and transport to and rearing in Ojo Amarillo pond south of Farmington will allow the SJR-RIP to obtain a large number of razorback sucker for use in the five-year augmentation effort for this species.

**Description of Study Area:**

Larval razorback sucker will be obtained from Lake Mohave in the Lower Colorado River Basin. Fish will then be transported to and reared in either Ojo Amarillo pond or the Avocet ponds, on the N.A.P.I. farm just south of Farmington, New Mexico. Fish will be held in Ojo or Avocet ponds until the time of harvest and stocking. Fish harvested from these ponds will be transported to Hogback Diversion (RM 158.6) and stocked into the main channel of the river below the diversion structure at a later date.

**Objectives:**

- 1.) To obtain larval razorback sucker to be raised in Ojo Amarillo or Avocet ponds, for later use in the five-year augmentation effort for razorback sucker in the San Juan River.

- 2.) To plant and rear Lake Mohave razorback sucker in Ojo Amarillo or Avocet ponds in spring 2000. These same fish will be harvested from Ojo pond in fall 2001 and PIT-tagged.
- 3.) To stock harvested, PIT-tagged razorback sucker into the San Juan River at Hogback Diversion in support of the Five Year Augmentation Plan for Razorback Sucker in the San Juan River.

**Methods:**

Members of the U.S. Fish and Wildlife Service's Colorado River Fishery Project Office in Grand Junction, Colorado will assist in the annual collection of larval razorback sucker in Lake Mohave. Collected larval fish will be transported via stocking truck and planted in Ojo Amarillo or Avocet ponds for rearing to a stockable size. Trap netting will be used to subsample razorback sucker and analyze growth. Razorback sucker will be harvested in the fall of 2001, PIT-tagged, and stocked (via stocking truck) at Hogback Diversion, in support of the Five Year Augmentation Plan for Razorback Sucker in the San Juan River.

Handling and transport of larval razorback sucker will follow existing U. S. Fish and Wildlife Service protocols.

The Service will have the lead for the collection of larval razorback sucker. Other cooperating agencies may provide personnel and equipment if needed. This workplan includes labor costs for the collection of larvae, transport of razorback sucker to Ojo Amarillo and Avocet ponds, harvest, PIT-tagging, and stocking.

**Budget FY-2000:**

Labor	\$ 6,000
Travel-Per Diem	\$ 1,000
Equipment and Supplies	\$ 3,000
Subtotal	\$ 10,000
Service Administrative Overhead (22.00%)	\$ 2,200
TOTAL	\$ 12,200
Additional Costs: PIT tags (10,000 at \$4.00 each)	\$ 40,000

NOTE: If the money for the purchase of PIT tags stays with the Bureau of Reclamation, the San Juan River Recovery Implementation Program will not have to pay the U.S. Fish and Wildlife Service's 22.00% administrative overhead charge on this item.

