FISCAL YEAR 2015 ANNUAL BUDGET AND WORK PLAN

Approved September 10, 2014

SJRRIP FY2015 AWP Budget Estimate (approved September 10, *2014*)

SOW	Title	Agency	2015 Hydropower Revenue	Capital Project Funding	Other Funding	2015 Grand Totals
	Element 1 - Management and Augmentation of Populations and Protection of Genetic Integrity					
5	CPM Genetics Study Plan	FWS, SNARRC	$58,033			$58,033
6	Horsethief Canyon Ponds O&M at Ouray NFH	FWS, GJ	$33,379			$33,379
7	Stocking & Acclimation of Age-0 CPM & Age-1+ RBS	FWS, ABQ	$34,141			$34,141
8	Colorado Pikeminnow Fingerling Production Dexter	FWS, SNARRC	$102,390			$102,390
9	Rearing Razorback Suckers Dexter	FWS, SNARRC	$81,216			$81,216
10	RBS Augmentation/NAPI Pond Management	NN, FWS	$152,106			$152,106
11	SJRIP PIT Tags (purchase)	BR	$60,000			$60,000
	Subtotal		**$521,265**	**$0**	**$0**	**$463,232**
	Element 2 - Protection, Management, and Augmentation of Habitat					
12	Maintenance and Operation of SJR Hydrology Model	BR, SLC	$78,550			$78,550
13	Stream Gaging and Flow Measurements	BR, USGS	$7,900			$7,900
14	Operation of PNM Fish Passage Structure	NN, FWS	$109,390			$109,390
15	SJR Channel and Floodplain Restoration, Phase II	TNC	$0		$171,019 [1]	$171,019
16	Habitat Imagery (videography)[5]	BR	$30,000			$30,000
	Capital Projects Management	BR	$0	$56,000		$56,000
	PNM Fish Passage O&M	PNM	$0	$100,000	$54,450 [2]	$154,450
	Subtotal		**$225,840**	**$156,000**	**$225,469**	**$607,309**
	Element 3 - Management of Non-Native Aquatic Species					
17	Upper/Middle River Nonnative Species Control & Rare Fish Monitoring	FWS, ABQ	$349,868			$349,868
18	Lower River Nonnative Species Control & Rare Fish Monitoring	UDWR	$181,374			$181,374
	Subtotal		**$531,242**	**$0**	**$0**	**$531,242**
	Element 4 - Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions					
19	Sub-Adult/Adult Lg-Bodied Fish Monitoring	FWS, GJ	$127,064			$127,064
20	YOY/Small-Bodied Fish Monitoring	NMDGF	$93,868		$40,000 [3]	$133,868
21	RBS/CPM Larval Surveys (Combined SOW)	ASIR	229,317			$229,317
22	Specimen Curation/Identification	UNM	$33,498			$33,498
23	Integration of Long-term Monitoring Data	UNM	$88,802			$88,802
28	Habitat/Temp Monitoring	ERI, MEC	$91,744			$91,744
29	SJR Population Model O&M and Model Runs	ERI, MEC	$14,960			$14,960
30	Analysis for Determining Natal Origin	ASIR	$59,687			$59,687
31	SJR Phase II Channel Restoration Site Monitoring	TNC	$87,687			$87,687
	Fish Entrainment - Site Re-Evaluations (RFP)[5]	BR	$50,000			$50,000
	2015 Flow Release Criteria Development Workshop[5]	BR, FWS	$50,000			$50,000
	Subtotal		**$926,627**	**$0**	**$40,000**	**$966,627**

	Element 5 - Program Coordination and Assessment of Progress Toward Recovery					
33	Program Management FWS	FWS, ABQ	$252,183		$201,851 [4]	$454,034
34	Base Funds and Contract Management BR	BR, SLC	$187,655			$187,655
35	Peer Review	BR, FWS	$65,000			$65,000
	Subtotal		**$504,838**	**$0**	**$201,851**	**$706,689**
	Element 6 - Information and Education					
	Education and Outreach (funds transfer to UCRRIP)	FWS, ABQ	$15,860			$15,860
	Subtotal		**$15,860**	**$0**	**$0**	**$15,860**
	SJRRIP Total		**$2,725,672**	**$156,000**	**$467,320**	**$3,290,959**
	2015 Estimated Base Funds (2014 Amt. x 2% CPI)		**$2,732,130**			
	Hydropower Revenue-Funded Projects		**$2,725,672**			
	Carry over from FY2014					
	Estimated available 2015 funds to expenditures		**$6,458**			
	Notes					
	2015 In-kind contributions: [1]TNC; [2] NN/BIA; [3] 2014 NMGFD; [4] 2014 USFWS					
	[5] Costs are estimates					

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Southwestern Native Aquatic Resources and Recovery Center

MAILING ADDRESS:
P.O. Box 219
Dexter, New Mexico 88230

STREET LOCATION:
7116 Hatchery Road
Dexter, New Mexico 88230

Title: Colorado Pikeminnow Broodstock Evaluation and Genetic Monitoring

Principal Investigator: Wade Wilson **Co-Invest./Cooperators**: Manuel Ulibarri

Background:

The Colorado pikeminnow, *Ptychocheilus lucius*, is an endangered endemic fish from the Colorado River system with wild populations only occurring in the Upper Basin. Wild populations in the Lower Basin were extirpated and although there were efforts to reestablish populations (Salt and Verde rivers of Gila River), these were considered nonessential experimental populations (USFWS, 2002).

To aid recovery efforts by augmenting declining populations, Southwestern Native Aquatic Resources and Recovery Center (SNARRC) maintains four different stocks of *P. lucius*: 1) a 1991 year-class (Colorado DX-F_0; 91YC) that consists of wild caught fish from the mainstem of the Colorado between 1987-1990; 2) a 2001 year-class (Colorado DX-F_1; 01YC); 3) a 2006 year-class (mix DX-F_2; 06YC); and 4) a 2007 year-class (Green DX-F_0; 07YC) which consists of 24 wild caught fish from the lower Green River midway between I-70 and the confluence of the Colorado River mainstem. SNARRC maintains the only *P. lucius* broodstocks available. Several other stocks have been at SNARRC; however, they no longer exist due to natural attrition.

To date, three studies have examined the genetic diversity of *P. lucius* in both wild and hatchery stocks. Ammerman and Morizot (1989) used protein electrophoresis (allozymes) to compare genetic diversity of wild Colorado and Green River individuals with two SNARRC stocks (81YC and 87YC). Their results indicated that the hatchery stocks were very similar to the wild populations. The second genetic study, Morizot et al. (2002), used allozymes to again compare genetic diversity between wild populations (Colorado, Green, Yampa, and San Juan) collected between 1990-1993 and two SNARRC stocks (74YC and 81YC). Again, the stocks evaluated were similar to the wild fish with the different wild populations being a single panmictic population. However, the presence of unique alleles (low frequency) in each basin, indicate that there may have been historical genetic divergence between the Colorado and Green rivers. The third study surveyed mitochondrial DNA diversity in both historical (1890-1976) and SNARRC broodstocks (74YC, 81YC and Colorado DX-F_0; 91YC). Their study found two haplotypes with the second being only found in two fish from the 81YC.

Justification:
According to the Policy Regarding Controlled Propagation of Species Listed under the Endangered Species Act (U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration 2000), propagation of threatened and endangered species will be "…based on sound scientific principles to conserve genetic variation…" and are "…implemented in a scientifically controlled and approved manner." The policy also states that controlled propagation has risks that must be evaluated. One of these is the increased risk of inbreeding due to enhancement of only a few genotypes. Understanding the genetic diversity of the captive stocks and how they compare to the wild populations can help avoid genetic risks associated with captive propagation and provide information that can be implemented appropriately.

As stated, three studies have examined *P. lucius* populations and captive stocks; however, due to natural attrition the stocks have lost individuals and thus the genetic diversity. Likewise, it has been years since the wild populations have been assessed for genetic changes. Thus, in order to provide the best scientific information available for recovery, the goal is to document the genetic diversity of SNARRC's established *P. lucius* broodstocks and compare it to current wild population estimates.

To accomplish this, SNARRC has developed a suite of polymorphic microsatellite markers that amplify in *P. lucius*, but funding is needed to screen the broodstocks and compare with wild individuals. The dataset created by using these markers will give researchers and managers the appropriate genetic information necessary to manage the current broodstocks.

Objectives: The following goals will start to build a dataset that will ensure that future management of *P. lucius* broodstocks and production fish will be a genetically appropriate product for augmentation and restoration activities.

1) Characterize a subset of each of the broodstocks held at SNARRC using microsatellites.
2) Compare the genetic diversity between broodstocks and wild individuals.

Schedule:

Completion of genetic analysis	July 1, 2015
Final Report	September 30, 2015

Intended Method of Information Dissemination:
Dissemination of the results will include a final report and presentation of project results at the Upper Basin/San Juan Researcher's meeting.

Literature Cited

Ammerman, L.K., and D.C. Morizot. 1989. Biochemical genetics of endangered Colorado squawfish populations. Transactions of the American Fisheries Society 118:435-440.

Borley, K., and M.M. White. 2006. Mitochondrial DNA variation in the endangered Colorado pikeminnow: A comparison among hatchery stocks and historic specimens. North American Journal of Fisheries Management 26:916-920.

Morizot, D.C., J.H. Williamson, and G.J. Carmichael. 2002. Biochemical genetics of Colorado pikeminnow. North American Journal of Fisheries Management 22:66-76.

U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration. 2000. Policy regarding controlled propagation of species listed under the Endangered Species Act. Federal Register 65:56916-56922.

U.S. Fish and Wildlife Service. 2002. Colorado pikeminnow (*Ptychocheilus lucius*) recovery goals: amendment and supplement to the Colorado Squawfish Recovery Plan. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, Colorado.

Cost Estimate for Colorado Pikeminnow Broodstock Evaluation and Genetic Monitoring

1. PERSONNEL		
A. Laboratory Work		
1 Biologist/Geneticist		$4,086
B. Report Writing		
1 Biologist/Geneticist		$7,587
	Subtotal Personnel	$11,673
2. TRAVEL		
A. Upper Basin/San Juan Researcher's Meeting (4 days total: 2 travel, 2 meeting)		$500
	Subtotal Travel	$500
3. MATERIALS/SUPPLIES		
A. Extractions		$1,801
B. PCR Reactions		$14,487
C. Genetic Analyzer Costs		$19,611
D. Other (tubes, tips, etc.)		$7,300
	Subtotal Supplies	$43,199
	Total	$55,372
SNARRC Utilities		$1,000
Administrative and Overhead Costs Regional Office @ 3%		$1,661
Project Total FY2015		**$58,033**

Rearing Endangered Fish at the Horsethief Canyon Native Fish Facility Ponds for Stocking into the San Juan River
Draft Fiscal Year FY-2015 Project Proposal
3 April 2014

Principal Investigators:
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Contract or Agreement number(s):
As of the end of FY-2013 = None assigned yet

Reporting Dates: 10/1/2014 through 9/30/2015

Operation & Maintenance of the
Horsethief Canyon Native Fish Facility Ponds
Fiscal Year 2015 Project Proposal
3 April 2014

Principal Investigator: Dale Ryden, Thad Bingham & Brian Scheer
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The Ouray National Fish Hatchery – Grand Valley Unit (NFH-GVU) consists of several distinct facilities located in and around Grand Junction, CO. One of these facilities is the Horsethief Canyon Native Fish Facility (HCNFF) pond complex (about 7½ miles west of the main hatchery building) near Fruita, CO.

The HCNFF consists of 22 ponds, ranging in size from 0.1 to 0.5 surface acres, with a total surface acreage for the entire facility of 6.2 acres. Each pond is 5-6 feet deep and is equipped with a fabric liner to prevent seepage. Each pond also has a concrete kettle and drain structure to facilitate draining and concentrating of fish for ease of harvest. This facility is anticipated to be a multi-species broodstock, production, and rearing facility dedicated to rearing the four endangered Colorado River fishes: Colorado pikeminnow, razorback sucker, humpback chub, and bonytail.

Until 2012, the operation and maintenance (O&M) of the entire Ouray NFH-GVU complex (Project 29a: Operation and Maintenance of Ouray National Fish Hatchery – Grand Valley Unit) was funded by Upper Colorado River Endangered Fish Recovery Program (UCREFRP). On 25 March 2010, the Coordination Committee of the San Juan River Basin Recovery Implementation Program (SJRBRIP) voted to cost-share 1/6 of the operation and maintenance costs for the HCNFF pond complex. This equates to a total of one surface acre of pond rearing and production space.

Initially, the one surface acre of grow-out ponds allotted to the SJRBRIP will be used to rear razorback sucker that are progeny of paired matings of appropriate genetic lineage, produced annually from razorback sucker broodstock being held at Ouray NFH-GVU. After spawning, fertilized eggs will be reared in flow-through egg jars at HCNFF. As these fish approach 200 mm TL, they will be stocked back out into grow-out ponds at HCNFF to be reared until they reach their target stocking size ($\geq$ 300 mm TL). It is anticipated that 2,000-4,000 razorback sucker ($\geq$ 300 mm TL) can be reared in the one surface acre of ponds. It is anticipated that fish of the appropriate target stocking size should be available to the SJRBRIP in fall (September or October) of each calendar year.

The SJRBRIP will have the option to change the management approach and species being reared in their ponds as they see fit, but will need to coordinate such changes with Ouray NFH-GVU hatchery staff and allow enough lead time to prepare for changes in importation/exportation permitting, purchasing of feed proper for the species being reared, etc. Changes in numbers of fish desired, species being reared, etc. may lead to adjustments in future years' budgets.

Cost Share with Upper Colorado River Endangered Fish Recovery Program

As stated earlier, the SJRBRIP's Coordination Committee voted to cost-share 1/6 of the O&M costs for the HCNFF pond complex. However, the completion and future operation of the HCNFF ponds represents a fundamental change

to the way the Ouray NFH-GVU has operated in past years. Because of this, ascertaining the actual cost and commitment (money, manpower, equipment) necessary to operate and maintain this newly-constructed facility at this early date is still a work in progress. The O&M of the HCNFF ponds is in reality part of a much larger picture of the overall O&M of the Ouray NFH-GVU itself. As a starting point, the following staffing estimates were made for the overall O&M of the entire Ouray NFH-GVU for FY-2014:

1) 24-Road Hatchery building will require 100% staffing for 6 months of the year
2) 24-Road Hatchery building will require 50% staffing for the other 6 months of the year
3) Peter's ponds complex, Horsethief SWA ponds & lease-free grow-out ponds will require 10 % staffing for 6 months of the year
4) The newly-constructed HCNFF ponds will require 40% staffing for 6 months of the year

a. One-sixth of the O&M of the HCNFF ponds will be paid for by the SJRBRIP

Possible Outyear Cost Adjustments

If the SJRBRIP decides to change stocking strategies (species, sizes, times of year fish are being stocked, etc.) outyear budgets may need to be adjusted to account for this. At present, the costs presented in this workplan represent the best estimates we can develop, based on the species, numbers, and timing of fish to be stocked from our facility to the San Juan River.

FY-2015 Budget:

(Based on projected FY-2015 costs)

Costs Shared by UCREFRP and SJRBRIP (i.e. O&M Costs)

Personnel/Labor Costs (Federal Salary + Benefits)

	UCREFRP Project 29a	SJRBRIP Cost
Principal Biologists (GS-11) – 1,960 hours @ $51.49/hr	201,841	6,741
X 2 people		
(130 total hours covered by SJRBRIP or 65 hr/person)		
Biological Technician (GS-7) – 1,960 hours @ $32.72/hr	64,131	2,142
(65 total hours covered by SJRBRIP)		
Biological Technicians (GS-5) – 600 hours @ $18.94/hr	22,728	759
X 2 people		
(40 total hours covered by SJRBRIP or 20 hr/person)		
Overtime:		
Biological Technician (GS-7) – 120 hours overtime	5,890	197
@ $49.08/hr		
(4 total hours of overtime hours covered by SJRBRIP)		
Biological Technician (GS-5) – 40 hours @ $28.41/hr	2,273	76
X 2 people		
(2.7 total hours covered by SJRBRIP or 1.35 hr/person)		
Sub Total	296,863	9,915

Permitting; Coordination; Data Input, Analysis, Management & Presentation; Report Writing; Office & Administrative Support (Federal Salary + Benefits)

Project Leader (GS-14) – 320 hours @ $80.99/hr	25,917	866
(10.7 total hours covered by SJRBRIP)		
Administrative Officer (GS-9) – 320 hours @ $43.41/hr	13,891	464
(10.7 total hours covered by SJRBRIP)		
Sub Total	39,808	1,330

In-Kind Services

Bozeman Fish Technology Center

Grind and sift fish food for larval razorback suckers

FY-2015 Budget Cost	<$2,575>	<86>
Subtotal with 3% added for inflation	<$2,652>	<89>

Operations (Fish Food, Chemicals and Fertilizer, Hatchery Supplies, Vehicles and Fuel, Electricity)

Fish Food (from Skretting USA)

Actual costs = 4 orders of fish food per year (1 order per fiscal quarter) at $17,800 each = $71,200. The line items below represent one of our four orders (placed 4/17/2013). This fish food order will last us 90 days. We have several different sizes of fish on station, thus the different sizes of food in each order.

Trout # 1 Crumble: 1,000 lbs @ $1.18 per lb = $1,180
Trout # 2 Crumble: 1,000 lbs @ $1.17 per lb = $1,170
1.0 mm RZ Grower 2,000 lbs @ $1.00 per lb = $2,000

2.0 mm RZ Grower 4,000 lbs @ $1.00 per lb = $4,000
3.0 mm RZ Grower 8,000 lbs @ $1.00 per lb = $8,000
4.0 mm RZ Grower 2,000 lbs @ $1.00 per lb = $2,000

Fish Food Sub Total	73,400	2,452

Chemicals and Fertilizer

Exact use of the money in this line item will vary from year to year depending on specific chemical/fertilizer/herbicide needs in a particular year. It will also depend on if there are outbreaks of pathiogens that need to be treated (e.g., "Ich") in a given year. Funds for a "typical" field season for one study would likely include the following:

Sodium Bicarbonate (pH increaser) = $5,600
Eighty 50-lb bags @ $70 per bag annually
Copper Sulfate = $4,825
Ten 50-lb bags (pellets) @ $95 each = $950
50 gallons 10% solution @ $77.50/gallon = $3,875
Spartan Sparquat 256 Germicidal Cleaner = $300
10 gallons @ $30 per gallon
Chloram-X (dechloniater) = $1,440
Sixteen 10 lb buckets (4/case, 4 cases/year) @ $90/bucket
Finquel brand MS-222 anesthetic = $900
Two 1 kg bottles @ $450/bottle
Chloramine-T = $880
Two 55-lb containers @ $440 per container
Formalin (10% fixative) = $2,100
Four 55-gallon drums @ $275 each
Specialized Haz-Mat shipping @ $1,000
Denatured ethyl alcohol = $760
Eight 5-gallon jugs @ $95 per jug
Distilled water = $300
Ten 2-gallon jugs @ $30 per jug
Stress Coat (slime coat replacement) = $290
Two 5-gallon containers @ $145 each
No-Foam De-Foamer = $210
6 gallons @ $35/gallon
Weed killer (2,4-D and Roundup) = $3,200
2,4-D 40 quarts of concentrate @ $35 each
Roundup 10 gallons concentrate @ $180 each
Aquashade (water colorant) = $3,000
50 gallons @ $60 per gallon
Dimilin 25W (for anchor worm control) = $5,000
Twenty 5 lb boxes @ $250 per 5 lb box

C**hemicals and Fertilizer Food Sub Total**	28,805	962

Hatchery Supplies and Equipment Repair and Replacement

Exact use of the money in this line item will vary from year to year depending on specific equipment repair, replacement, or upgrade needs needs in a particular year. Funds for a "typical" field season for one study would likely include the following:

Egg hatching jars – Model J30 = $455
5 @ $85/each
24-hr belt feeder = $2,700
Repair/replace 10 annually @ $270 each
Waders = $225
Replace 3 pair annually @ $75 each
Duraframe dip nets = $1,500
Replace 5 annually @ $300 each
Digital scale repair, replace battery, recalibration = $1,500
(3 scales per year @ $500 per service per scale)
YSI brand water chemistry meters = $2,000
(dissolved oxygen, pH, salinity) – repair, replace, recalibrate annually
HVAC service = $1,200
Done annually
Service fish food cooler refrigeration unit = $750
Done annually
Service the backup generator = $700
Done annually
Pump & motor maintenance/service = $5,700
Labor & parts to rebuild:
One portable water pump/year = $1,700
One hatchery motor/pump set/year = $4,000
Fluorescent hatchery lights = $2,200
Replace ½ of all hatchery lights annually
Tank Cleaning Supplies = $235
Scotch-Brite pads, scrubbing handles
Maintenance tool replacement = $400
Screwdrivers, crescent wrenches, monkey wrenches, vise grips, hammers, rubber mallets, ratchets & sockets, drills & drill bits, chop saw blades
Plumbing supplies = $2,000
PVC pipe, couplers, primer & glue
Refill compressed oxygen bottles = $2,500
50 per year @ $50 each
Air stones, tubing couplers, hose clamps = $1,500
0.4” air stones – 20 @ $50 each = $1,000
Tubing, couplers, hose clamps = $500
Screens and pond boards = $3,700
10 screens @ $300/screen
PVC lumber for making screen frames
Metal mesh for making screens
Redwood pond boards
100 boards (2” X 8” X 6’) @ $7 each = $700
Koch rings = $500
For aerating water in packed columns
Sand = $2,000
For sand filters - 1 pallet = twenty 80 lb bags

Hatchery Supplies Sub Total	31,765	1,061

Office Supplies Staples, copier paper, pencils/pens, paperclips, note pads, cleaning supplies, toilet paper, paper towels, etc. **Office Supplies Sub Total**	1,500	50
Vehicles (maintenance & repair) and fuel Vehicles: GSA-lease rate ($334/month = $11/day & 0.30.mile) Hatchery pickup truck = $8,495 24-Road Hatchery Building to Horsethief Canyon Native Fish Facility ponds (45 mile round trip X 1 vehicle X 365 days per year = 16,425 total miles per year) Fuel Diesel fuel = $350 For Kubota tractor – one 55-gallon drum of diesel @ $250 (includes fuel, barrel & delivery) For back-up generator at hatchery – 25 gallons @ $4.00/gallon Repair/replace shocks, struts, brakes = $800 **Vehicles and Fuel Sub Total**	9,645	322
Electricity = $6,800 For pump and spawning shed at the Horsethief State Wildlife Area brood ponds 8 months operation at $850/month **Electricity Sub Total**	6,800	227
Operations Sub Total	151,915	5,074
Sub Total for All Shared Costs	488,586	16,319

Costs Unique to SJRBRIP (Harvest, PIT-Tagging & Stocking Costs)

Personnel/Labor Costs (Federal Salary + Benefits)

	SJRBRIP Cost
Pond Harvest, PIT-Tagging, Stocking and Database Management	
Principal Biologist (GS-11) – 80 hours @ $51.49/hr (2 days X 2 people/day for fish harvest) (6 days X 1 person/day for PIT-tagging)	4,119
Biological Technician (GS-7) – 136 hours @ $32.72/hr (2 days for fish harvest) (6 days for PIT-tagging) (5 days for database and records management) (2 stocking trips X 2 days each X 1 person)	4,450
Biological Technician (GS-5) – 320 hours @ $18.94/hr (2 days X 3 people/day for fish harvest) (6 days X 5 people/day for PIT-tagging) (2 stocking trips X 2 days each X 1 person)	6,061
Sub Total	14,630

Lodging and Per Diem (Based on Published FY-2014 GSA Per Diem Rates)

Lodging	
2 nights lodging in Farmington, NM X 2 people at $83.00/night =	332
Per Diem	
4 days hotel rate (Farmington, NM) X 2 people at $46/day =	368
Sub Total	700

Fuel

Stocking truck (gets 8 miles per gallon) X 2 trips from Grand Junction, CO to Farmington, NM (660 miles round trip) X 2 trips (= 1,320 total miles) = 170 gallons of gas at $4.00/gallon	678
Water pump for tempering fish = 20 gallons gas at $4.00/gallon	80
Sub Total	758

Sub Total for Costs Unique to SJRBRIP	16,088

Total of All Costs Incurred by SJRBRIP:	
USFWS-CRFP (Grand Junction, CO) Total	32,407
USFWS Region 6 Administrative Overhead (3.00%)	972
USFWS Region 6 Total	$ **33,379**

Cost/Fish Comparison:

Workplan total cost in FY-2015 = $33,379

Estimated production in FY-2015 = 2,000-4,000 fish

For 2,000 razorback sucker produced, the cost/fish = $16.69

For 3,000 razorback sucker produced, the cost/fish = $11.13

For 4,000 razorback sucker produced, the cost/fish = $ 8.34

Augmentation of Age-0 Colorado pikeminnow and Age-1+ razorback sucker in the San Juan River Fiscal Year 2015 Project Proposal

Principal Investigators: D. Weston Furr, Ernest Teller, Sr. and Jason E. Davis
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Cooperative Agreement #'s:
USFWS – NMWFCO R11PG40011

Period of Performance: 2/27/2012 to 9/30/2016

Background

Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) are federally-listed endangered fish found in the San Juan River. The San Juan River Recovery Implementation Program (SJRIP) was initiated in 1992 to protect and recover populations of both Colorado pikeminnow and razorback sucker in the San Juan River Basin while water development proceeds in compliance with all applicable federal, state, and tribal laws (USFWS 2008). Recovery of Colorado pikeminnow, as listed in the recovery goals, is dependent on the maintenance of a wild population of at least 2,600 adults in the Green River sub-basin and at least 700 adults in the upper Colorado River sub-basin, as well as a target of 1,000 subadults in the San Juan River sub-basin (USFWS 2002). Delisting criteria include a self sustaining population that exceeds 800 adults maintained in the San Juan River sub-basin. Razorback sucker recovery criteria are dependent on the establishment of four self-sustaining populations of 5,800 adult fish each; two populations in the Upper Colorado River Basin (one population in the Green River subbasin, the other in either the Colorado River or San Juan River subbasins) and two populations in the Lower Colorado River Basin.

Fish community monitoring during the SJRIP seven year research period, 1991-1997, identified few wild Colorado pikeminnow inhabiting the San Juan River and prompted investigation into the feasibility and implementation of augmenting the population with hatchery reared fish. As a result of these findings, an experimental stocking of Colorado pikeminnow was conducted by Utah Department of Wildlife Resources in 1996 with the purposes of evaluating dispersal and retention of stocked Colorado pikeminnow and determining the availability, use, and selection of habitats by early life stages of Colorado pikeminnow (Ryden 2008). Stockings of larval, sub-adult and adult fish after this initial stocking resulted in the subsequent recapture of stocked fish suggesting that Colorado pikeminnow could survive in the San Juan River. In 2003, *An Augmentation Plan for Colorado Pikeminnow In The San Juan River* was finalized (Ryden 2003). This plan and later amendments called for the annual stocking of ≥ 300,000 age-0 and ≥3,000 age 1+ fish in the San Juan River until 2009. In early 2010 a revised plan, *Augmentation of Colorado Pikeminnow (Ptychocheilus lucius) in the San Juan River: Phase II, 2010-2020* (Furr 2010), was drafted that outlines the continuation of stockings through 2020. Phase II augmentation reflects changes requested by the SJRIP Biology Committee by discontinuing the stocking age-1+ Colorado pikeminnow in exchange for stocking increased numbers of age-0 fish (n≥ 400,000).

Similarly, after the failure to collect any wild razorback sucker in the San Juan River during three years of intensive studies (1991-1993) the SJRIP Biology Committee initiated an experimental stocking program for razorback sucker in the San Juan River (Ryden and Pfeifer 1994). Experimental stocking was implemented to provide needed insight about recovery potential and habitat suitability for the razorback sucker in the San Juan River between river mile (RM) 158.6 at the Hogback Diversion structure, NM and Lake Powell, UT RM 0 (Maddux et al. 1993). This is the area designated as Critical Habitat for razorback sucker (USFWS 1994). Between March 1994 and October 1996, 942 razorback sucker were stocked into the San Juan River at four stocking sites (RM 158.6, 136.6, 117.5, and 79.6). Data gathered on these fish identified habitat types being used year-round by razorback sucker in the San Juan River, and provided information on movements, survival, and growth rates. Based on the successes of the experimental stocking study, a full-scale augmentation effort for razorback sucker in the San Juan River was initiated with the *Five-Year augmentation plan for razorback sucker in the San Juan River* (Ryden 1997). In February 2003 the SJRIP-BC extended the augmentation effort for razorback sucker with *An augmentation plan for razorback sucker in the San Juan River: An addendum to the five-year augmentation plan for razorback sucker in the San Juan River* (Ryden 2003). However, due to changes in augmentation protocols and difficulties in producing requested numbers of fish the eight-year addendum to the original plan was delayed in initiation until 2009. The current augmentation plan calls for the annual stocking of ≥11,400 razorback sucker from a combination of fish reared in a hatchery and razorback sucker that are grown out in ponds on Navajo Agricultural Products Industry (NAPI) land.

The augmentation programs for the Colorado pikeminnow and razorback sucker populations in the San Juan River are related to the 2014 SJRIP Draft Long Range Plan (LRP). These activities are specifically addressed in the following Elements, Goals, Actions, and Tasks:

Element 1. Management and Augmentation of Populations of Colorado Pikeminnow and Razorback Sucker.

Goal 1.1— Establish a Genetically and Demographically Viable, Self-Sustaining CPM and RBS Populations.

Action 1.1.1 Develop plans for rearing and stocking for CPM and RBS.

Task 1.1.1.1 Review and update augmentation plan for CPM and adjust stocking goals as scheduled.

Task 1.1.1.2 Review and update augmentation plan for RBS and adjust stocking goals as needed.

Action 1.1.2 Produce, rear, and stock sufficient numbers of CPM to meet stocking goals of augmentation plan.

Task 1.1.2.2 Stock at least 400,000 age-0 (50–55 mm TL) CPM annually into the San Juan River.

Task 1.1.2.3 Opportunistically stock available CPM in excess of those described above.

Action 1.1.3 Produce, rear, and stock sufficient numbers of RBS to meet stocking goals of augmentation plan.

Task 1.1.3.4 Stock at least 91,200 RBS (> 300 mm TL) during eight year stocking period or 11,400 per year.

Task 1.1.3.5 Opportunistically stock available RBS in excess of the 11,400 per year described above.

Goal 1.2— Identify and Implement Strategies for Improving the RBS and CPM Augmentation Program and Genetic Integrity.

Action 1.2.1 Implement methods to evaluate status and success of stocked RBS and CPM.

Task 1.2.1.2 Identify, describe, and implement strategies for improving survival and retention of stocked razorback sucker and Colorado pikeminnow, including acclimation prior to stocking, size of fish stocked, time and location of stocking, physiological conditioning, and predator avoidance.

In addition to SJRIP Program priorities, the stocking of fish reared at U.S. Fish and Wildlife Service (Service) hatcheries in the Southwest Region (Region 2; New Mexico, Arizona, Texas and Oklahoma) are subject to Regional Policy No. 03-06, "Stocking of fish and other aquatic species". This policy applies to production, transport, and stocking for Service hatchery production and incorporates guidance and requirements from FWS Fish Health Policy (713 FWM 1-5), Policy for Controlled Propagation of Species Listed under the Endangered Species Act (Federal Register 65:183), and goals and objectives of the FWS Strategic Plan for the Fisheries Program. The Service's Fish and Wildlife Conservation Offices are the primary conduit for satisfaction of Policy requirements and ensures compliance with needs relative to fish health, stocking requests and priorities, deviation from approved stocking requests, pre-stocking treatments (e.g. nonnative fish removal from stocking sites), and applicable environmental compliance. The New Mexico Fish and Wildlife Conservation Office is the pertinent field office for the processing of SJRIP stocking requests under this policy directing the change in lead coordination and stocking responsibilities from FWS Region 6 to Region 2.

Objectives for Fiscal Year 2015

1. Coordinate with Southwest Native Aquatic Resources and Recovery Center (SNARRC), to procure and stock Colorado pikeminnow according to guidelines set forth in *Augmentation of Colorado Pikeminnow (Ptychocheilus lucius) in the San Juan River: Phase II, 2010-2020* (Furr 2010)
    a. Annually stock ≥400,000 age-0 Colorado pikeminnow.
2. Coordinate with SNARRC, Navajo Nation Department of Fish and Wildlife (NNDFW), and Ouray National Fish Hatchery-Grand Valley Unit (Ouray NFH-GVU) to procure and stock razorback sucker according to guidelines set forth in *An augmentation plan for razorback sucker in the San Juan River* (Ryden 2003)
    a. Annually stock ≥11,400 (≥300 mm total length) razorback sucker.
3. Identify and use multiple stocking locations to expand range and reduce potential for catastrophic loss of an entire year class at a single stocking location (Furr 2011). Stock Colorado pikeminnow according to guidelines defined in *Stocking plan and protocol for the augmentation of Colorado pikeminnow (Ptychocheilus lucius) in the San Juan River* (Furr and Davis 2009). Stock razorback sucker according to guidelines defined in *Stocking plan and protocol for the augmentation of razorback sucker (Xyrauchen texanus) in the San Juan River* (in preparation)
4. Provide summarization report on timing and location of individual stockings, numbers, and age classes while relating information to fulfillment of recommended stocking numbers as outlined in the augmentation plan.

Methods and Approach

Objective 1.a. Age-0 Colorado pikeminnow will be annually reared and harvested by SNARRC and delivered via standard distribution unit to the San Juan River. Fish will be stocked in the fall of each year, post irrigation season, to eliminate the risk of fish entrainment in irrigation canals. All age-0 Colorado pikeminnow will be acclimatized to a variety of conditions (i.e. flow, temperature, physical/environmental characteristic, etc.) for up to 72 hours prior to release into the San Juan River.

Objective 2.a. SNARRC will stock approximately 10,500 razorback sucker (≥200 mm total length) into three NAPI ponds (3,500 fish/pond). Grow-out, harvesting, and stocking via standard distribution unit into the San Juan River will be conducted by NNDFW annually with assistance from NMFWCO. When possible, fish will be stocked in the fall of each year, post irrigation season, to eliminate the risk of fish entrainment in irrigation canals. Ouray NFH-GVU will provide the SJRIP Augmentation Program with 2,000-4,000 razorback sucker (.300 mm TL) annually. All razorback sucker, or a subset, from Ouray NFH-GVU will be acclimatized to riverine conditions (i.e. flow, temperature, physical/environmental characteristic, etc.) for up to 72 hours prior to release into the San Juan River. A subset of fish that would serve as a control group may be hard released. Having this control group would aid the Program in comparing survival and retention of acclimatized fish by comparing differences in subsequent recapture rates.

Objective 3. New Mexico FWCO will identify various sites downstream of RM 196.1 (Verde del Rio Park, Bloomfield, NM) and determine their suitability for use as stocking locations (Furr 2011). Site selection criteria for razorback sucker will be defined in *Stocking plan and protocol for the augmentation of razorback sucker (Xyrauchen texanus) in the San Juan River* (in preparation) and reviewed for approval by the SJRIP Biology Committee. Site selection for Colorado pikeminnow will continue under in *Stocking plan and protocol for the augmentation of Colorado pikeminnow (Ptychocheilus lucius) in the San Juan River* (Furr and Davis 2009).

Objective 4. New Mexico FWCO will collate all pertinent stocking information including, but not limited to, timing, location, environmental conditions, size of fish, and numbers stocked. These data will be entered into a standardized database that will be provided to the Program Coordinators office for deposition. These data and subsequent recapture data will be used to evaluate stocking effectiveness.

Products/Schedule

An electronic data file will be provided for inclusion in the centralized database by 31 December 2015. A draft summary report detailing findings will be submitted to the San Juan River Implementation Program, Biology Committee, by 31 March 2016. Revisions will be completed and a final annual report will be submitted by 1 June 2016.

Literature Cited

Furr, D. W. and J. E. Davis. 2009. Stocking Plan and Protocol for the Augmentation of Colorado pikeminnow (*Ptychocheilus lucius*) in the San Juan River. U.S. Fish and Wildlife Service, San Juan River Recovery Implementation Program, Albuquerque, NM. 13 pp.

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Furr, D.W. 2011. Investigation of Stocking Sites in the San Juan and Animas Rivers Upstream of RM 166.6 (DRAFT). U.S. Fish and Wildlife Service, San Juan River Recovery Implementation Program, Albuquerque, NM. 19 pp + appendices.

Maddux, R. H., L. A. Fitzpatrick, and W. A. Noonan. 1993. Colorado River endangered fishes Critical Habitat: Draft Biological Support Document and appendices. U.S. Fish and Wildlife Service, Salt Lake City, UT. 222 pp.

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U.S. Fish and Wildlife Service. 1994. Determination of critical habitat for the Colorado River endangered fishes; razorback sucker, Colorado pikeminnow, humpback chub, and bonytail chub. Dept. of the Interior, U.S. Fish and Wildlife Service, Federal Register, 21 March 1994, 59:13374-13400.

U.S. Fish and Wildlife Service. 2002. Colorado pikeminnow (Ptychocheilus lucius) Recovery Goals: amendment and supplement to the Colorado Squawfish Recovery Plan. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, CO.

FY 2015 Proposed Budget:

Personnel/Labor Costs (Federal Salary + Benefits)	
Fish Biologist (GS-11-5) – 44 days @ $374/day	$ 16,456.00
Age-0 Colorado pikeminnow stockings (Objective 1.a): (1 person x 2 days/trip x 1 trip)	
Age-1+ razorback sucker stockings (Objective 2.a): (1 person x 2 days/trip x 6 trips)	
Reporting/Data Management (Objective 2) (1 person x 30 days)	
Bio. Science Technician (GS-8) – 14 days @ $348/day	$ 4,872.00
Age-0 stockings (Objective 1.a): (1 person x 2 days/trip x 1 trip)	
Age-1+ razorback sucker stockings (Objective 2.a): (1 person x 2 days/trip x 6 trips)	
Supervisory Fish Biologist (GS-13-5) – 5 days @ $533/day (Project oversight and review)	$ 2,665.00
Project Leader (GS-14-1)- 4 days @$556/day	$ 2,224.00
Sub-total	$ **26,217.00**
Travel and Per Diem (Based on Published FY-2014 Federal Per Diem Rates)	
Hotel Costs – 14 nights (14 nights @ $83/night – single occupancy = $1,162)	$ 1,162.00
Per Diem (Hotel Rate) – 28 days @ $46/day	$ 1,288.00
Sub-total	$ **2,450.00**
Equipment	
Vehicle Maintenance & Gasoline 8,000 miles @ $0.56/mile (includes costs associated with gasoline/diesel fuel vehicle maintenance)	$ 4,480.00
Sub-total	$ **4,480.00**
USFWS-NMFWCO Total	$ 33,147.00
USFWS Region 2 Regional Office Administrative Overhead (3%)	$ 994.00
USFWS Region 2 Total	**$ 34,141.00**

Out-year funding

FY 2016.....$34,679
FY 2017.....$36,219
FY 2018.....$37,311
FY 2019.....$38,410

COLORADO PIKEMINNOW FINGERLING PRODUCTION and RAZORBACK REARING of SUBADULTS at the SOUTHWESTERN NATIVE ARRC, Dexter, NM
San Juan River
FY-2015

IA# R13PG0035

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In October of 2012 Dexter National Fish Hatchery and Technology Center's name was officially changed to the Southwestern Native Aquatic Resources and Recovery Center (Southwestern Native ARRC). The facility is located in the Pecos River Valley of southeastern New Mexico, 200 miles southeast of Albuquerque, 20 miles south of Roswell, and one mile east of Dexter on State Road 190.

The following scope of work identifies the facilities and methodologies that will be used to continue producing 400,000 age-0 Colorado Pikeminnow (CPM) and 11,000, 200+ mm razorback sucker (RBS) for use by the San Juan River Recovery Implementation Program (SJRIP) to meet its augmentation objectives for the species in the San Juan River. The primary purpose being the distribution of CPM to the San Juan River and RBS to existing grow-out ponds located on the Navajo Indian Irrigation Project. Southwestern Native ARRC has developed production guides for both species based on historical growth rates and produces large numbers of each species for distribution throughout the upper and lower Colorado River Basin.

The U.S. Fish and Wildlife Service (USFWS) has developed extensive infrastructure and expertise at Southwestern Native ARRC to successfully contribute to recovery programs and the

facility has been totally devoted to the maintenance, propagation and culture of threatened and endangered fish species for forty years. During that period it has successfully cultured razorback sucker, bonytail, humpback chub and Colorado pikeminnow of the Colorado River system and currently maintains large genetically diverse broodstocks. Over the years staff have developed successful spawning, culture and distribution methodologies for the species that are still used today. The facility utilizes an abundant water supply to produce over 2.0 million fish annually.

Facilities

Situated on the northern fringes of the Chihuahua Desert, the elevation at Dexter is 3,500 feet, average rainfall is 12 inches, and the growing season of 180-200 days. Station facilities include: Administration/Laboratory Building; Fish Culture Building; Visitors Center; Maintenance/Shop Building; Vehicle Storage Building; Equipment Storage Building; Feed Building; General Storage Building.; three government houses; one mobile home, two RVs and one RV space.

Fish culture facilities in operation consist of 71 earthen/lined ponds ranging in size from 0.1-1.0 acres, four (6' X 40') fiberglass raceways, four (8' X 40') concrete raceways, Twenty (2' X 12') rectangular fiberglass tanks, forty (4') fiberglass circular tanks, fifty (3') fiberglass circular tanks and 80 ten-gallon and 20 forty-gallon aquariums. The facility utilizes three water reuse systems in the fish culture building. Phase III Facility Improvement Project was completed on June 5, 2003.

Water

An abundant supply of fish culture water is supplied by five shallow aquifer wells (150 feet in depth) capable of pumping a combined 2,000+ gallons per minute. The well water is a constant 64^0 F, pH of 7.5-8.5, total hardness of 2,100 ppm, and total dissolved solids of 3,500 ppm. Water rights, allocated through the New Mexico State Engineer's Office, total 2,185.5 acre-feet per annum or 10,927.5 acre-feet per five-year water period. Waste water from all fish culture operations collects in two sumps on the southeastern area of the facility and provides year round water to the wetlands.

I. Colorado Pikeminnow Fingerling Production

Background

Once very common throughout the Colorado River Basin, Colorado pikeminnow have declined from historic levels and are now found primarily in the Upper basin of the Colorado River. Various factors have contributed to the decline of the specie including alteration of natural stream flows and temperature regimes, loss of habitat and habitat fragmentation as a result of water development and the introduction of nonnative fish species.

Colorado Pikeminnow are native to the San Juan River. Its historic distribution included the entire mainstem San Juan River up to Rosa, New Mexico, located approximately 25 miles upstream from present day Navajo Dam. Currently the species is considered extremely rare and the small population is estimated at less then 20 adults. This small group of fish has persisted in

the San Juan River since the closure of Navajo Dam in 1962. Recent studies being conducted by the San Juan Recovery Implementation Program (SJRIP) indicate that the Colorado pikeminnow is reproducing and recruiting in the river to at least a limited degree, however the low numbers collected do not satisfy recovery goal requirements for the specie. The Recovery criteria calls for a target of 1,000 subadult's fish established by the end of a five year down listing period, and 800 adults maintained during the 7 year delisting period. The Upper Colorado River Endangered Fish Recovery Program has recommended that the wild population be increased by augmenting with hatchery produced fish. The **Augmentation Plan For Colorado Pikeminnow In The San Juan River (Phase I)**, (Ryden 2003) called for annual stocking of age-0 fish over an eight year augmentation program (2002-2009). As per the modified work plan, dated 6 April 2005, age-1 fish were produced at Dexter from 2006-2010 to augment the age-0 stockings in the San Juan River, (Ryden 2005, Addendum #1 to Augmentation Plan For Colorado Pikeminnow In The San Juan River). The augmentation plan (Phase I) for age-0 and age-1+ Colorado pikeminnow ended in 2010. Augmentation efforts identified in the Phase II (2010 – 2020) "*draft*" **Augmentation Of Colorado Pikeminnow (*Ptychocheilus lucius*) In The San Juan River Plan ,** (Furr 2009); focuses primarily on culturing and stocking increased numbers of age-0 fish. Current facility and broodstock capabilities at Southwestern Native ARRC allow for ≥400,000 age-0 Colorado pikeminnow to be produced and stocked annually. This has been identified as the stocking target for 2015 and subsequent years unless further production capacity is identified and/or stocking targets modified by the SJRIP.

Southwestern Native ARRC has been the leader in propagating and culturing Colorado pikeminnow (Ptychocheilus lucius) since 1981. The facility maintains several captive stocks as genetic reserves and has successfully produced fish for the Upper and Lower Colorado River Basin programs and the SJ RIP. The main emphasis has been on examining the reproductive biology of the species, broodstock development and culturing age-0, 1 and adults. This work plan proposes the production of 400,000 age-0 fingerlings (50 mm TL) annually for reintroduction in the San Juan River.

Funding requested also covers costs associated with proper care of broodstock necessary to successfully carry out this project for future years and aide in restoration of the species. Stocking will require coordination with New Mexico Fish & Wildlife Conservation Office, Navajo Nation Department of Fish and Wildlife, New Mexico Department of Game and Fish, Colorado Division of Wildlife and Utah Department of Wildlife Resources.

Objectives

(1) Produce 400,000 age-0 fingerlings (50 mm) for stocking in the San Juan River in 2015.

(1) Transport and distribute 400,000 age-0 Colorado pikeminnow from Dexter, to the San Juan River.

(2) Maintain 400 Colorado pikeminnow broodstock for recovery efforts.

Methods

Broodstock consists of 300 (F1) and 500 (F2) adults. These fish are 1999, 2004 and 2006 year-class (YC) progeny from wild adults collected from the Yampa, Green and Colorado Rivers, respectively. In 2006 staff began culturing a second broodstock of 500 (F2) individuals for future use. This stock is referred to as the 06CRDX lot derived from the 1991broodstock. In 2015 a maximum of 50 paired matings (1 female X 1 male) will be spawned from the 1999 YC broodstock. Given the past history of hormonal induced ovulation, 38 females (75%) should produce viable eggs during a given year. All members of the broodstock are PIT tagged and records of spawning pairs are maintained at Southwestern Native ARRC.

Spawning

Broodfish will be harvested from the culture pond in early May, males and females sorted and held indoor for spawning. Ovulation will be induced with intraperitoneal injections of common carp pituitary (CCP) at the rate of 4 mg/kg of body weight. When eggs can be expelled using slight pressure, a female will be stripped and milt added from one male. Each individual egg lot will be enumerated, incubated and kept separate in Heath Trays until hatching occurs, approximately 96 hours following fertilization at a constant water temperature of 72^{o}F.

Rearing Ponds

To meet the production goal of 400,000 age-0 (50mm) fish, rearing ponds will be stocked at the following densities:

Age-0 Growth: (June thru October - 150 day growing period)

- Pond 1B- .87 acre Earthen @ 100,000 fry
- Pond 2B- .73 acre Earthen @ 100,000 fry
- Pond 3A- .89 acre Lined @ 100,000 fry
- Pond 6D- .25 acre lined @ 100,000 fry
- Pond 7D- .25 acre lined @ 100,000 fry

Earthen and plastic lined ponds will be used for production. In earthen ponds, the bottoms will be packed and graded prior to receiving fish. Non-level pond bottoms can hinder fish harvest and aquatic vegetation can entrap fish at harvest time. Fertilization and slow filling of ponds will start 10 to 14 days prior to stocking. Staff will ensure that water quality is monitored. Temperature, dissolved oxygen and pH readings will be taken twice daily at 7:00am and 3:00 pm at the deepest part of the pond.

If the dissolved oxygen drops to < = 3 mg/I, supplemental aeration will be started. All feeding, fertilization and chemical applications will be stopped till adequate oxygen levels are restored. Aerators will be run all night for several days till the oxygen is back up to acceptable levels, (5-7 mg/1). Staff will avoid handling fish for 7 -10 days following a stress related circumstance.

Pond Vegetation Control and Fertilization

Diuron and Barrier will be used in earthen ponds to control rooted aquatic vegetation. Staff will use granular form when possible and broadcast the entire pond bottom at the recommended rates.

Diuron – 2.0 lbs per acre (dry broadcast)

Barrier- 100 lbs per acre (dry broadcast)

Copper sulfate (CUSo4) will be used to control floating filamentous algae blooms. Treatments will began approximately 45 days after fish are stocked into the ponds and repeated every 30 days. Application rates in DNFH&TC ponds are 5 to 8 lbs per acre. A secondary benefit derived from using CUSo4 is its effectiveness in controlling external parasites.

Zooplankton and invertebrate insect populations are cultured with the proper fertilization regime. Four types of fertilizer will be used:

1) Alfalfa meal
2) Alfalfa pellets
3) Cottonseed meal
4) Super phosphate

Initial fertilization rates for earthen ponds are 100 lbs of cottonseed meal, 100 lbs of alfalfa meal or pellets and 3 lbs of super phosphate. Follow up rates are administered on Monday and Thursday with 10 lbs cottonseed meal, and 10 lbs, alfalfa meal or pellets.

Water temperature, dissolved oxygen (DO) and pH readings will be taken in all rearing ponds daily. All readings will be recorded on record charts. If morning DO readings are below 3.0 or above 13.0 all fertilization will be stopped until DO's are brought back to accepted levels. If pH readings are greater than 9.5 fertilization will be terminated.

Feeding Schedule

Fish will be sampled at the end of every month. Size, weight and over all condition will be recorded. Feed amounts will be adjusted and projected for the upcoming month. Trout starter, #1 and #2 feed will be used and purchased from SKRETTING (formerly Nelson and Sons, Silver Cup), Murray, Utah. Age-0 fish will be fed three to four times daily at approximately 9:00am, 11:00am, 1:00pm and 3:00pm.

Feeding rates are based on water temperature and fish densities in the ponds and will be calculated as follows:

- water temp > = 80 ^{o}F feed 3 % BW per day, Mon, Wed and Fri.
- water temp 61-78 ^{o}F feed 2 % BW per day, Mon thru Fri.
- water temp < 60 ^{o}F feed 1.5 % BW per day, Mon and Thurs.

Staff will use the following guide to determine the proper particle size to offer the fish. Feed sizes will be mixed at ½ rations of each size when making the transition to the next larger size feed.

Fish Size	Particle Size
Fry	Starter
20mm	#1 crum
40mm	#2 crum
2-3"	1.0 mm

Schedule
Broodfish will be spawned in May 2015 and age-0 fish reared in earthen and plastic lined ponds from June - October 2015.

Projected Harvest Dates and Delivery Date
Age -0 fish will reach the target size of 50mm by the end of October of each year. The fish will be harvested from the ponds the final week of October and hauled and distributed into the San Juan River the first full week in November of each year.

Projected Duration Of Project:
Phase I of this project was initiated in 2002 in support of the SJRIP Colorado pikeminnow augmentation effort (2002-2009) identified in the **Augmentation Plan For Colorado Pikeminnow (CPM) In The San Juan River**, (Ryden 2003). As per the modified work plan, dated April 06, 2005 age-1 fish were produced at Dexter and delivered annually from 2006-2011 to the San Juan River (Ryden 2005, Addendum #1 to Augmentation Plan For Colorado Pikeminnow In The San Juan River). The augmentation plan (Phase I) for both age-0 and age-1+ Colorado pikeminnow ended in 2010. Under Phase II, augmentation efforts focus on culturing and stocking ≥400,000 age-0 Colorado pikeminnow annually from 2011-2020 or as directed by the San Juan Recovery Implementation Program.

II. Rearing Razorback Sucker SubAdults at the Southwestern Native ARRC

Background

Lake Mohave Razorback Sucker Broodfish

Razorback sucker (RASU) have been maintained and cultured at The Southwestern Native ARRC since 1981. The captive broodstock represent the Lake Mohave population. Three separate broodstocks are maintained; the 1981, Paired Mated(PM) and Wild Caught(WC) broodstocks. The PM stock is comprised of 90 unique family groups produced from paired matings of wild caught adults spawned at Willow Beach NFH from 1994 to 2004. The WC broodstock consists of six year classes of larvae and juvenile wild-caught fish from Lake Mohave from 2000 to 2005. These fish were captured as fry from eight locations throughout Lake Mohave and given the designation of (WC) future broodstock .

From 2001-2013 production of subadult razorbacks at Southwestern Native ARRC has yielded excellent survival and growth. The overall survival for razorback sucker grown to 450mm is 90.5%, while 85% of the fish achieved the target growout size in two years. Spawning and growing season consists of fish being spawned in the early spring and fry stocked in to earthen or lined ponds and grown out-door from April to October. Total dissolved oxygen and temperature are monitored daily and fish feed on phyto and zooplankton produced in fertilized ponds for approximately 45 days at which time they are offered a prepared razorback sucker diet. Fingerlings are routinely held and cultured in the Fish Culture building during the months of

January - March to prevent mortalities associated with outdoor over wintering. In the fall of the year when the fish reach target size they are harvested from the ponds and transferred to the Fish Culture building for sorting and tagging. Following a 7 to 10 day rest and recovery period they are loaded into distribution trucks and hauled to their stocking locations. Southwestern Native ARRC staff have successfully hauled 300+mm razorbacks to the San Juan river and razorbacks and Bonytail to Lake Mohave, Arizona, in the lower Colorado River. The distribution trips to the San Juan average 400 miles (8 hours) and the trips to Lake Mohave average 660 miles (12 hours) of hauling time in one direction.

Production Plan

Objectives:
The main objective of this proposed work is to spawn razorback sucker adults and rear 11,000, 200+mm fish annually and deliver them to existing grow-out ponds located on the Navajo Indian Irrigation Project.

Additional objectives of the work include:

(1) Improve, maintain and staff facilities at Southwestern Native ARRC to rear and distribute the target # of fish.

(2) Maintain razorback sucker captive broodstock for recovery efforts.

(3) Passive Integrated Transponder (PIT) tag all fish prior to stocking into the NAPI ponds. PIT tags will be provided by the SJRIP.

Methods
Captive propagation activities include spawning a minimum of 20 pairs of broodstock, incubating fertilized eggs, enumerating and stocking of swimup fry into rearing ponds, harvest of target sized fish from ponds, PIT tagging and distribution to the NAPI ponds near Farmington, NM on the Navajo Nation.

The project will utilize indoor and outdoor facilities. All spawning and incubation activities will be conducted indoor in the fish culture building. Razorback sucker will be initially reared in 2 earthen or lined ponds and in June of each year transferred to 3 ponds at surface acres of 0.79, 0.89 and 0.98.

Rearing Ponds
To meet the production goal of 11,000 (200mm) fish, rearing ponds will be stocked at the following densities:

Age 0 Growth: (April thru May - 60 day growing period)

Pond 1- .72 acre @ 12,000 fry
Pond 2- .79 acre @ 12,000 fry

Age I Growth: (June thru October - 150 day growing period)

Harvest Age I fish; enumerate and stock fingerlings into 3 ponds.

Pond 1- .79 acre @ 6,000 fingerlings
Pond 2- .89 acre @ 6,000 fingerlings
Pond 3- .98 acre @ 6,000 fingerlings

Earthen and lined ponds will be used for production. In earthen ponds the bottoms will be packed and graded prior to receiving fish. Non-level pond bottoms can hinder fish harvest and aquatic vegetation can entrap fish at harvest time. Fertilization and slow filling of ponds will start 10 to 14 days prior to stocking. Staff will ensure that water quality is monitored. Temperature, dissolved oxygen and pH readings will be taken twice daily at 7:00am and 3:00 pm at the deepest part of the pond.

If the dissolved oxygen drops to < = 3 mg/I, supplemental aeration will be started. All feeding, fertilization and chemical applications will be stopped till adequate oxygen levels are restored. Aerators will be run all night for several days till the oxygen is back up to acceptable levels, (5-7 mg/l). Staff will avoid handling fish for 7 -10 days following a stress related circumstance.

Pond Vegetation Control and Fertilization

Sonar, Diuron or Barrier will be used in earthen ponds to control rooted aquatic vegetation. Staff will use granular form when possible and broadcast the entire pond bottom at the recommended rates.

Diuron – 2.0 lbs. per acre (dry broadcast)
Barrier- 100 lbs. per acre (dry broadcast)

Copper sulfate (CUSo4) will be used to control floating filamentous algae blooms. Treatments will began approximately 45 days after fish are stocked into the ponds and repeated every 30 days. Application rates in ponds are 5 to 8 lbs per acre. A secondary benefit derived from using CUSo4 is its effectiveness in controlling external parasites.

Zooplankton and invertebrate insect populations are cultured with the proper fertilization regime. Four types of fertilizer will be used:

1) Alfalfa meal
2) Alfalfa pellets
3) Cottonseed meal
4) Super phosphate

Initial fertilization rates for earthen ponds are 100 lbs of cottonseed meal, 100 lbs of alfalfa meal or pellets and 3 lbs of super phosphate. Follow up rates are administered on Monday and Thursday with 10 lbs cottonseed meal, and 10 lbs, alfalfa meal or pellets.

Water temperature, dissolved oxygen (DO) and pH readings will be taken in all rearing ponds daily. All readings will be recorded on record charts. If morning DO readings are below 3.0 or above 13.0 all fertilization will be stopped until DO's are brought back to accepted levels. If pH readings are greater than 9.5 fertilization will be terminated.

Feeding Schedule

Fish will be sampled at the end of every month. Size, weight and over all condition will be recorded. Feed amounts will be adjusted and projected for the upcoming month. Razorback grower (0301) feed will be used and purchased from Skretting (formerly Nelson and Sons, Silver Cup), Murray, Utah. Fish will be fed twice daily, once at 9:00am and at 2:00pm.

Feeding rates are based on water temperature and fish densities in the ponds and will be calculated as follows:

- water temp > = 80 ^{o}F feed 3 % BW per day, Mon, Wed and Fri.
- water temp 61-78 ^{o}F feed 2 % BW per day, Mon thru Fri.
- water temp < 60 ^{o}F feed 1.5 % BW per day, Mon and Thur.

Staff will use the following guide to determine the proper particle size to offer the fish. Feed sizes will be mixed at ½ rations of each size when making the transition to the next larger size feed.

Fish Size	Particle Size
2-3"	1.0 mm
4-6"	2.0 mm
6-8"	3.0 mm

Schedule

Broodfish will be spawned in March and the fish reared in earthen ponds for their first growing season (April – October); held indoor during winter (November - March) and stocked into the NAPI ponds in April of 2015. Target sized fish are available for distribution in spring and fall of each year.

Projected Harvest Dates and Delivery Date

Year 2015 marks the tenth ninth year of razorback production at Dexter for distribution to the NAPI ponds. In 2007 a new single cohort fish rearing strategy was adopted by the SJRIP for the NAPI ponds. Since 2006, staff have stocked a total of 67,948 razorback's averaging 225mm in length into East and West Avocet and Hidden ponds and in 2012 stocked an additional 1,000 target sized RBS into the San Juan River. An additional 11,000 will be stocked into the NAPI ponds in April 2015. Based on historical growth rates for razorback at Dexter, the production target of 11,000, 200+mm fish is achieved in a fifteen month period Fish delivery will be in the spring of each year based on the new rotational production plan (single cohort). Approximately 11,000 fish will be stocked each trip and Dexter staff will coordinate the deliveries with the Navajo Nation Department of Fish and Wildlife, BIA and USFWS FWCO personnel. The estimated duration of the program is scheduled for a total of 15 years (2005- 2020).

PIT Tagging

Starting in 2012 all fish stocked into the NAPI ponds are PIT tagged prior to stocking. The fish will be graded and sorted approximately 6 to 8 weeks before the scheduled stocking date. Fish that average 200mm will be PIT tagged and allowed to recover for a minimum of 10 to 14 days after each handling. The PIT tagged fish will then be scanned for tag retention and any fish that dropped a tag will be retagged.

Projected Duration Of Project:

This project was initiated in January 2005 in support of the SJRIP razorback augmentation effort (2004-2011) identified in the **Five-Year Augmentation Plan For Razorback Sucker In The San Juan River** (Ryden 1997, 2003). The rearing of razorback sucker subadults at Southwestern Native ARRC could potentially continue till 2020 as per BOR RFP 04-SF-40-2250.

General Fish Husbandry Requirements and Conditions

Predator Control

Historically, Southwestern Native ARRC has not experienced excessive avian or mammal predation on fish stocks. Salamander, crayfish, frog and turtle infestation of ponds are nonexistent. On an annual basis specific ponds are covered with bird netting during the winter months to eliminate predation by migrating birds. An additional strategy employed by the staff is the harvest and hold stocks of fish indoor during the winter months of November to March. Razorback reared for this project will be maintained indoor in two 40,000 gallon systems during the winter months. These systems contain biofiltration, supplemental aeration, temperature control and alarm systems.

Handling and Transport Protocol

Transport of all fish will follow guidelines described in the USFWS Protocols for Biological Investigations developed by Dr. Gary Carmichael, retired U.S. Fish & Wildlife Service employee. The protocol is as follows:

1. When Colorado pikeminnow and razorback fingerlings, subadults and broodfish are handled they will be placed in a .5% salt bath to help in osmoregulation and reduce the effects of handling stress.

2. Temperature should be 5 degrees Fahrenheit lower in the hauling truck than in the river.

3. Drivers must be informed of and follow a specified route.

4. Transport water will contain 0.5 percent NaCl (18.9 grams per gallon).

5. Oxygen levels will be greater than 6.0 mg/L as determined with an oxygen meter.

6. Nets must be functional. Aeration equipment must be in place and must be used. A fish holding container will be a minimum of 5 gallons in size and fish densities will not exceed 1 lb of fish per gallon of water. Small delta mesh (1/8") will be present to transfer the fish from one container to another, although it is preferred to have water to water transfer. Oxygenation/aeration equipment will be in place and working.

7. Prior to transfer and after the fish are concentrated, they should be quickly placed in the transport tank. When using nets to place fish in transfer buckets or tanks, nets should not be overloaded. The fish on the bottom will be crushed. Using a wet transfer with buckets is preferable. When emptying the nets and buckets, care will be taken to avoid adding algae and mud to the transport tank. Before loading, dissolved oxygen levels should be at saturation.

8. Immediately after loading, all equipment on the transport vehicle should be re-checked and the vehicle should depart. Oxygen concentrations and temperatures should be monitored at a minimum of every hour.

9. During unloading tempering water should be present and functional, and thermometers should be used to match water temperatures. Hauling water temperatures should be equal to receiving water temperature.

***Acclimatizing the fish to the receiving water temperature will be conducted in increments of 2^{o} F or (1^{o}C) towards equalizing per 30 minutes time. Due to the high alkalinity and TDS of Southwestern Native ARRC water, staff will temper and acclimate the transported fish to the receiving water quality for a minimum of 1 hour prior to release. This process will allow sufficient time for the fish to osmoregulate to the receiving water quality. Tempering can be accomplished in the shipping tank by adding receiving water to the tank at given intervals.**

Fish Health Monitoring Protocols

All fish should be handled with the best animal husbandry practices available. A feeding schedule will be developed and followed daily. All tanks will be cleaned of uneaten food and feces daily. A daily log recording times of feeding, water temperature and comments on fish health will be maintained. If fish are maintained in a re-circulating system, all filters and pumps will be routinely cleaned and monitored. If fish are held in ponds O2 levels will be closely monitored. At least once a year, a fish health inspection will be conducted to examine fish for bacterial, viral and parasitic infections. Normally 60 fish per lot are sacrificed for an adequate sample. However, in the case of endangered or rare fish of genetic importance, numbers sampled may be less, depending upon availability. Non-lethal methods, if available, will be employed to obtain samples. Condition factors will be calculated on an annual basis and data added to a RBS database. Wet mounts will be examined for parasites and bacteria. Routine condition exams will be conducted and an examination will be conducted on all lots one month prior to delivery to the San Juan River and NAPI ponds on the Navajo Nation. Brood and refuge stock will have health checks annually and only when needed to minimize handling stress.

The U.S. Fish and Wildlife Service, Dexter Fish Health Program will provide bacterial and viral testing for razorback propagation and rearing activities. Treatment of disease will be the responsibility of the Southwestern Native ARRC fish culture staff. Fish health experts are available to advise on proper treatment, and to examine fish for infection.

Disposition of Fish

All fish propagated and cultured for this project are made available to the SJRIP for stocking and meeting augmentation requirements identified in Phase II (2010 – 2020) "*draft"* **Augmentation Of Colorado Pikeminnow (*Ptychocheilus lucius*) In The San Juan River Plan ,** (Furr 2009) and the **Five-Year Augmentation Plan For Razorback Sucker In The San Juan River** (Ryden 1997, 2003). In the case of catastrophic loss (>25% of the stock) at Southwestern Native ARRC, up to 1,000 individuals will be collected for testing and diagnosis to determine (if possible) reason for loss. A written statement describing the loss will be provided immediately to the US Fish and Wildlife Service (Service) Fisheries Division and the SJRIP Coordinator, Albuquerque, NM; followed by a detailed report of the diagnosis once results are available. Excluded from these reporting requirements are gametes and fish lost to natural attrition, including but not limited to non-viable eggs prior to hatch and incidental predation mortalities. As per the guidelines identified in the 2003 Memorandum of Understanding between the Service and University of New Mexico, Division of Fishes, Museum of Southwestern Biology (MSB), fish carcasses (specimens) will be provided to the MSB who serves as the repository for vouchered specimens of native fishes. Any additional mortalities above the 1,000 mark will be recorded in the annual Threatened and Endangered Species report and disposed of by burial onsite or at a local land fill.

If any concerns are identified leading to potential questions about stocking of fish, in the instance of fish having cleared the Service's fish health testing for reportable pathogens and other agents of concern using established Fish Health Center SOPs and those of the American Fisheries Society – Fish Health Section Blue Book, the SJRIP has 30 days to formally respond with recommendations on the disposition of the fish. After 30 days, if no response is provided, in writing, the disposition action for the fish will be at the discretion of the Service.

Reporting

A draft annual progress report detailing fish culture and distribution activities will be completed and provided to the SJRIP by January 31, 2016.

Budget

RE: Colorado Pikeminnow Fingerling Production and Razorback Rearing of Subadults at the Southwestern Native ARRC, Dexter, NM. The following costs are associated with producing and stocking 400,000 age-0 fingerlings in the San Juan River and 11,000 200 mm subadults into the NAPI ponds on the Navajo Nation in 2015. Identified costs also include maintaining Colorado pikeminnow and Razorback broodstock for recovery efforts.

Budget -Detailed Spending Plan 2015

I. Colorado Pikeminnow Fingerling Production

O&M Labor Costs

The labor costs identified for 2015 are broken down as follows, and include fringe benefits and payroll additives for each position identified:

Southwestern Native Aquatic Resources and Recovery Center

(1) Fish Biologist (1,280 hours -16pay periods) - GS 482-9 @$31.39/hr = $40,179

* Supervision, spawning, fish health and water quality monitoring, feeding, harvest and prep for distribution.

(1) Administrative Officer (240 hours- 3pay periods) - GS 341-9 @$30.71/hr =$ 7,370

* Budget tracking, purchasing, data base management & reporting.

Subtotal = $47,549

Equipment and Supplies:

Liquid oxygen and compressed oxygen 12 cylinders @ $79.05 Airgas	$ 948
Spawning Supplies Hormones (CCP 5 vials @ $190 per 10ml/vial)	$ 950
Fish health sampling prior to stocking Lab supplies for bacti, viral and parasite testing.	$ 2,050
Culture equipment (nets, seines, screens, etc.) Eager, Memphis Net & Twine	$2,090
Pond management supplies, Barrier $265.23/50# bag (20 bags) Van Diest	$5,304
Fish feed,1.60/lb, 6,000 lbs Nelson & Sons	$9,600
Cyclical Maintenance costs for: Tractors, mowers, gators, sweepers used in pond maintenance	$1,500
Subtotal	**$ 22,443**

Utilities:

Pumping costs Electrical 200,257 kwh @ .091	$18,223

Heating water for hatching eggs to swim-up	
Natural gas 1,525 ccf @ .96	$ 1,464
Subtotal	**$19,687**

Reintroduction Costs:

Salaries	
GS-9 Fish Biologist	
24 hrs @ $31.41	$753
GS-7 Fish Biologist	
24 hrs @ $23.34	$560
WG-7 Maintenance Worker	
24 hrs @ $21.22	$509
WG-5 Bio Science technician	
24 hrs @ $15.91	$381
Lodging &Per Diem $123/day (Dexter to Farmington, NM and return)	
$123.00/trip x 2 trips x 4 employees =	$ 984
Fuel costs and truck maintenance 1200 miles @ $5.45	$6,540
Subtotal	**$9,729**

Annual subtotal (CPM)	
(O & M Direct Costs)	**$ 99,408**

II. Rearing Razorback Sucker Subadults at the Southwestern Native ARRC

O&M Labor Costs

The labor costs identified in the 2015 Scope of Work are broken down as follows, and include fringe benefits and payroll additives for each position identified:

Southwestern Native Aquatic Resources and Recovery Center

(1) Fish Biologist (1,040 hours -13pay periods) - GS 482-9 @$31.41/hr = $ 32,666
* Supervision, spawning, fish health and water quality monitoring, feeding, harvest and distribution.

(1) Administrative Officer (160 hours- 2pay periods) - GS 341-9@$30.72/hr = $ 4,915
* Budget tracking, purchasing, data base management & reporting.

Subtotal = $37,581

Materials and Supplies

Cost based on SNARRC's historical purchases:

Fish Health

Fish health sampling prior to stocking	
Lab supplies for bacti, viral and parasite testing.	$ 1,183

Fish Culture Supplies

Nets, seines, tubs, screens.	$ 2,000
Wet lab supplies (pipets, petri dishes, slides, probes, markers)	$ 266
Theriputents- salt, Oxytetracycline, formalin, MS-222, stress coat	$ 637
Liquid and compressed oxygen for fish distribution	$ 212

Feed

Production diet RBS0301 (2.0 tons)4,000 lbs $ 1.506 per lb	$ 6,024

Spawning Supplies

Hormones (HCG 10 vials @ $ 53.05 per 10ml/vial)	$ 531

Fertilizer

Alfalfa pellets (1,000 lbs) .27/lb	$ 270
Inorganic - Super Phosphate (10 bags) 7.97/bag	$ 80

Chemicals- Aquatic Vegetation Control

Barrier- (6 bags) $265.23/bag	$ 1,591
Diuron -(2 bags) $ 79.57/bag	$ 159
Subtotal =	**$12,953**

Services

Utilities & Equipment Maintenance	
* Electrical, fuel and phone	$ 4,713
* Boiler system, heat exchanger maintenance	$ 1,061
*#1 well and water tower and pumping station maintenance	$ 13,079
Subtotal =	**$ 18,853**

Travel

- Fish stocking/distribution.

Dexter to Farmington (NAPI) & return- (1640 miles @ 5.47 per mile DX truck) =	$ 8,971

Fuel and routine vehicle maintenance.		
Perdiem- $123 per day X 2 trips X 2 individuals. =		$ 492
	Subtotal =	**$ 9,463**

Annual subtotal (RBS)	
O&M DIRECT COSTS	**$78,850**
I. Colorado Pikeminnow Fingerling Production	$99,408
II. Rearing Razorback Sucker Subadults at the Southwestern Native ARRC	$78,850
Annual total:	**$178, 258**
3 % Administrative Overhead	**$ 5,348**
TOTAL REQUESTED FOR 2015	**$ 183,606**

Projected out year funding request:

FY 2016 - $189,114
FY 2017 - $194,787
FY 2018 - $200,630
FY 2019 - $206,649
FY 2020 - $212,848

Literature Cited:

Furr, W. D. 2009. *Draft* Augmentation Plan, Augmentation of Colorado Pikeminnow (*Ptychocheilus lucius*) In the San Juan River, Phase II 2010-2020. U. S. Fish and Wildlife Service, Albuquerque, NM. 15 pages.

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Razorback Sucker Augmentation at NAPI Grow-Out Ponds
Fiscal Year 2015 Project Proposal

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Background

The Long Range Plan for recovery of endangered fishes in the San Juan River calls for propagation and augmentation of razorback sucker (RBS). Nine ponds have been built on Navajo Agricultural Products Industry (NAPI) lands to grow out RBS for stocking into the San Juan River. The Coordination Committee has decided to only utilize three of the nine existing ponds on NAPI during FY 2015.

Avocet Pond was originally a single pond built for watering cattle. On March 2, 1998 Avocet was divided into 2 ponds known as Avocet East and West. Avocet West is 3.4 acres and holds 18 acre-feet of water. Avocet West has a siphon for draining the pond. Avocet East is 3.52 acres and holds 19.6 acre-feet of water. Avocet East had no siphon when the ponds were divided, so draining was accomplished by renting a battery of water pumps. A siphon was installed in Avocet East during FY 2008 and the water can now be managed independent of Avocet West and without the need for pumping.

In October of 1999, Hidden Pond was built to rear razorback sucker. Hidden Pond is 2.83 acres. The dam was breached due to a storm event and the fish were lost. The dam was re-built in FY 2000 and a toe drain and spillway were built to protect the dam. Hidden Pond was lined with bentonite and contoured and a kettle was installed to facilitate fish harvest. A siphon was installed in July 2003. A salamander fence was installed around the Hidden Pond perimeter in August of 2003 to exclude predatory tiger salamanders.

Responsibility for Management of the NAPI ponds was originally shared between the U.S. Fish and Wildlife Service (Service), Bureau of Indian Affairs (BIA), Keller-Bliesner Construction and Ecosystems Research Institute. The Service was responsible for determining which ponds would receive RBS and when. In addition, the Service conducted sample counts and harvested the ponds with the assistance of the BIA. Keller-Bliesner was responsible for design and construction of the Six Pack ponds and re-construction of Hidden Pond. The BIA was responsible for monitoring water quality and Ecosystems Research was responsible for fertilization of the ponds and for developing a pond management plan.

Original pond management was for multiple cohorts to be raised in the ponds. Harvesting would be done passively with fyke nets so that the ponds would not be drained on an annual basis. In FY 2007, it was determined to change pond management direction. All of the ponds would be drained and harvested and single cohort management would replace the multiple cohort approach. During the first harvesting and draining of a Six-pack Pond, high mortality resulted when the number of fish remaining in the pond could not be removed before they succumbed to the rapidly warming water. Adjustments were made to reduce the mortality in future harvesting and draining events. The adjustments consisted of increasing the trapping effort prior to de-watering to reduce the number of fish remaining in the pond. In addition, the final fish removal would be accomplished with a higher pool of water to slow the warming of the water during the time of final harvest. This resulted in less mortality.

The Navajo Nation Department of Fish and Wildlife (NNDFW) was contracted to assume responsibility for daily management of the NAPI ponds in 2007. The Service assists the NNDFW with pond harvest as needed.

The ponds have been fenced and electric lines have been installed at each of the ponds. Aerators have been installed at each of the ponds to improve water quality. Water quality issues have caused fish mortalities in some of the ponds in the past. Water quality issues appear to have been resolved since installation of the aerators.

Objectives

(NAPI Ponds Management)

Manage razorback sucker grow-out in East Avocet, West Avocet, and Hidden ponds to provide an additional source of RBS to supplement the augmentation program. Harvest, Passive Implant Transponder (PIT) tag, and stock razorback sucker from the three grow-out ponds into the San Juan River, in order to assist in fulfilling the tasks and objectives outlined in the current version of *An Augmentation Plan for Razorback Sucker in the San Juan River* (Ryden 2003).

1) Manage three grow-out ponds using a single cohort strategy; including passive and active harvest techniques.

2) Annually stock 3,500 (≥ 200mm) razorback sucker per pond.

3) Harvest all ponds on an annual basis.
    a. Implant all razorback sucker with a PIT tag prior to stocking.
    b. Stock all fish regardless of size at harvest.
    c. Stock ~ 4,200 to 6,300 fish based on 40-60% return.
    3c. Investigate and utilize multiple stocking localities.

4) Experimentally acclimatize, as guided by SRRIP – Biology Committee, razorback sucker from both NAPI ponds and Uvalde National Fish Hatchery.

Location

The RBS grow-out ponds are located in Block III of Region 2 on NAPI lands, south of Farmington, New Mexico. Avocet East and West are located NW of the intersection of N 4062 and N 4087, which is approximately 3 miles southwest of the Ojo Amarillo NHA Housing Subdivision. Hidden Pond is located SE of the intersection of N 4087 and N 4095 approximately 1 mile northwest of the NAPI Region II Complex.

Methods/Approach

The NNDFW will be responsible for overall management of the NAPI ponds regarding daily management duties, harvesting, and stocking. The Service, Region 2, will be responsible for coordinating the stocking of the ponds with Dexter NFH and NNDFW per US Fish and Wildlife Service Region 2 stocking policy. The NNDFW will be responsible for daily management of the three grow out ponds on NAPI with assistance by the Service, Region 2. Harvesting, tagging, and stocking will be conducted by NNDFW, with assistance from the Service if additional personnel are needed. Associated data management and reporting for the project will be handled by staff from the NNDFW.

Pond management requires that staff monitor and record water quality and quantity, and feed the fish on a daily basis. In addition, staff manages water quantity to ensure that water quality is optimal. Maintenance includes operating and repairing valves and aerators, evaluating the pond perimeters for erosion problems, operating the propane cannons to scare away predators, repairing fences, monitoring aquatic vegetation and maintaining a log book and database for management of the ponds.

During FY 2015, East Avocet, West Avocet, and Hidden ponds will be managed for a single cohort of RBS. NNDFW will implement passive harvest using fyke nets to trap, tag, and stock RBS into the SJR for several days or months prior to dewatering the ponds. As the ponds are dewatered, NNDFW and Service staff will work together to do the final RBS removal, tagging, and stocking into the SJR.

Maintenance

In recent years maintenance has been conducted by NNDFW personnel (when able to do so), Keller-Bliesner Construction and Ecosystems Research Institute, or NAPI maintenance personnel. Often repairs, installment of irrigation lines, valves repair/replacement, and other pond infrastructure require specialized tools and heavy equipment operation, which NNDFW does not have access to. NAPI has multiple equipment yards and an abundance of heavy equipment located near the ponds, which allow for frequent availability and can be onsite when called as problems and repair work is needed. Because of their extensive inventory of parts for irrigation on NAPI lands, they generally have valves, pipe, and miscellaneous parts on hand for repairs. Over the last two seasons (2010 and 2011) we have used NAPI exclusively for repairs and installations, then invoiced to either the NNDFW or Program office. It has been expressed that there is a need for a consistent process for repairs/maintenance to solve billing issues that have arisen in the past and which will indicate who will conduct the work.

When the ponds are drained, they will be evaluated for structural stability. Areas away from ponds that may be impacted by dewatering will also be evaluated. Staff will identify and document any structural damage to the ponds and dewatering areas if necessary. Feasibility will determine whether improvements are made or not. Repairs and general maintenance will be done as needed.

Under this Scope of Work, NAPI will be the obligated party under a sub-contract with NNDFW to conduct all maintenance, repair work, and future installations of which NNDFW is unable to do because of limited resources. NAPI will conduct this work as requested by NNDFW personnel and billed to NNDFW. Work will include [as needed] valve repairs/replacement, irrigation line repair/replacement, kettle dredging, graveling where needed, general dirt work (digging out irrigation lines, valves, etc.), and any other repairs/installations which are unforeseeable and can feasibly be done by NAPI personnel.

Products/Schedule

In the spring of 2015, Dexter National Fish Hatchery will deliver 10,500 ≥ 200 mm RBS to the three NAPI grow-out ponds. In the fall of 2015, the NAPI ponds will be de-watered and the RBS, which are targeted to be ≥ 300 mm will be harvested and transported to the San Juan River for stocking. A database summarizing numbers of fish, stocking locations and PIT tag numbers will be submitted to the SJRIP Program Coordinators Office by 31 March 2016. A draft report will be submitted by 31 March 2016 and finalized by 1 June 2016. Maintenance, repairs, installations, and billing records from NAPI will also be included in the annual report.

Budget Fiscal Year 2015

BUDGET WORKSHEET – Program Base Funding		
Razorback Sucker Augmentation at NAPI Grow-Out Ponds		
Personnel (salary/benefits)	**USFWS NMFWCO**	**NNDFW**
Daily Pond Management .30 FTE (GS-9-8) USFWS R2 and Active/passive Harvesting Assistance .5 FTE NNDFW X $42,554.72	$ 31,071	$ 22,572
Wildlife Technician .5 FTE NNDFW X $23,302.76		$ 12,361
Fringe Benefits $32,125 X 42.28%		$ 15,508
Personnel Subtotal	**$ 31,071**	**$ 50,441**
Travel		
Per Diem Lodging and Meals	$ 554	$ 1,060
Vehicle Mileage and Maintenance	$ 2,101	$ 19,096
Travel Subtotal	**$ 2,655**	**$ 20,157**
Office Supplies and Equipment		$ 530
General Operating Supplies (includes fish transport costs, i.e. oxygen, salt, stress coat, etc.)		$ 2,652
Electricity Costs (Aeration)		$ 1,061
Feed Cost ($1.55/lb – 5,000 lbs)		$ 8,222
Uniforms		$ 530
Printing/Binding/Photocopying		$ 106
Fuel – Propane/Cannon Guns		$ 212
Repairs and Maintenance – Paint, sealant, lubricants, plumbing supplies, water quality probes, etc.		$ 530
Support Subtotal	**$ -0-**	**$ 13,845**
NAPI maintenance (Large repairs/installations)		
Irrigation line and valve repair/installation		**$ 5,304**
Heavy equipment operation (graveling, dirt work, etc)		**$ 5,304**
Parts and labor		**$ 5,304**
NAPI maintenance Subtotal		**$ 15,913**
Total	**$ 33,726**	**$ 100,357**
NNDFW Admin charge (16.95%)	$ 1,011 (3% Admin.)	$ $17,011
USFWS/NNDFW Totals	**$ 34,738**	**$ $117,368**
Grand Total		**$152,106**

SJRIP PIT TAGS
2015 Project Proposal

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Background

PIT tags are used to individually mark fish for use in movement studies and for mark-recapture estimates in the San Juan River Basin. PIT tags are not specific to any particular project, but are used by several different projects. PIT tags and readers purchased for the SJRIP will be combined with the purchase made for the UCRIP to save money by purchasing larger quantities and save expenses associated with administering the contract. All PIT tags and readers will be shipped to USFWS in Grand Junction C/O Travis Francis at:

U.S. Fish and Wildlife Service
Colorado River Fishery Project
764 Horizon Drive, Building B
Grand Junction, Colorado 81506-3946
Phone: 970-245-9319 (19)

TASKS – 2015

1. Purchase PIT tags and readers and distribute to end-users

In FY2015, $60,000 is allocated in the workplan to purchase 25,000 PIT tags and associated equipment (readers, antennas, implanters, etc.). The purchase of PIT tags and readers is done under a fully competed contract that was awarded in June of 2011.

FY 2015 BUDGET

Funding source		**Projected expenditure in FY14**
FY2015 Annual funding		$60,000
Total		**$60,000**

Projected funding:
FY-2016 $60,000.00
FY-2017 $60,000.00

FY 2015 Project Proposal
San Juan River Basin Hydrology Model
Operation and Maintenance

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Relationship to SJRIP: Supports Program goals and management by developing, operating and maintaining a hydrology model of the San Juan Basin. The model is key to hydrological analysis of water development scenarios or other scenarios in relation to the flow recommendations.

Background:
The San Juan Basin Hydrology Model (SJBHM) is a hydrologic model of the San Juan River Basin. The SJBHM actually consists of a series of models including evapotranspiration models, a natural flow model in StateMod, and a simulation model in RiverWare. Revisions and modifications to the models and supporting data have occurred through a multi-year model development and validation phase. The FY2015 scope of work includes updating model documentation, annual operation and maintenance of the model and data management. FY2015 activities may also include initial steps in the collaborative testing and incorporation of revised flow recommendations as scenarios are developed by the Biology Committee. In addition, at the discretion of the Coordination Committee, scoping the development of a natural flow model may begin. The Bureau of Reclamation has the primary responsibility for model development and O&M.

Once approved, the model will be available to generate and analyze runs associated with Section 7 Consultations and/or special requests from the Biology or Coordination Committees related to the flow recommendations or other hydrological aspects of the Program.

Objective:
The objective for this work is to ensure that the San Juan Basin Hydrology Model is available for run requests. This will be accomplished by completion of model documentation as well as developing and incorporating a revised hydrologic baseline as well as potential flow recommendation scenarios. Adjusting model configurations or operating rules to incorporate new data and/or scenarios and evolving the data set forward through time is also necessary. The FY2015 request also includes funds to continue to provide technical transfer from the model developers to the model users and maintainers as well as coordination and interaction with the Hydrologic Baseline Workgroup and Program participants and their technical designees.

Deliverables:

An annual hydrology meeting detailing the accomplishments of the model development, data development and model runs will be held for program participants. A report of the meeting will be provided to the coordination committee. In addition, data, documentation and reports from model runs will be provided throughout the model run process. The modified model(s) and supporting data and scripts will also be delivered / made available.

Task Descriptions:

Task 1: Model Modifications In collaboration with the Biology Committee, begin work testing and implementing revised flow recommendation scenarios. Document all modifications to the model, communicate changes to Program and interested parties. Documentation started in FY14 will be finalized and delivered in early FY15.

Task 2: Model Maintenance Includes maintenance of the actual model as well as the supporting data and software. Maintain data to evolve the data set forward through time. This includes an annual update of USGS data, Reclamation data, New Mexico non-irrigation data, New Mexico irrigation data, Arizona and Utah depletions, Colorado depletions, climate data, and natural flow data. Data must be obtained from various sources and processed for compatibility with the multiple data loaders. Load updated data into the model, run and test the new data. Adjust model configuration, methodologies, or assumptions, as needed. Update and expand documentation to reflect current state of model. Update and maintain data management interfaces and other software associated with the data and models. Apply all RiverWare updates and patches as they become available. Provide technology transference to Reclamation's Western Colorado Area Office and Fish and Wildlife Service staff in the details of maintaining the data and models. Technology transfer will take place as model, data and software updates take place to ensure that several people are trained in the maintenance of the model.

Task 3: Model Runs and Analyses Generate and analyze model runs associated with the implementation of a revised hydrologic baseline, revised flow recommendation scenarios, Section 7 consultations or special requests from the Biology and/or Coordination Committees and/or special work groups. A consultation or scenario run usually requires model reconfiguration and the implementation of operating criteria. Provide technology transference to Reclamation's Western Colorado Area Office and Fish and Wildlife Service staff in the details of maintaining the data and models, and in operating the models. Technology transfer will occur as model runs and analyses are being executed to ensure that several people are trained in the operation of the model.

Task 4: Program Management and Coordination Attend or provide written reports for Coordination Committee meetings, as needed, to update the committee on the model status and model results. Attend and assist in conducting Hydrologic Baseline Workgroup meetings to provide model status updates, present results, and work on developing the revised hydrologic baseline. Conduct an annual hydrology meeting of Program participants to review and solicit input on accomplishments and activities relating to the model for the previous year, status of the model, and proposed activities for the coming year; and provide a report on the meeting to the Coordination Committee for their review and approval. Develop the FY2016 budget and track FY2015 expenditures.

Budget Summary FY 2015

Model Development	$22,150	
Model Maintenance	$10,500	
Model Runs	$22,400	
Program Management	$25,100	
Grand Total	**$78,550**	
FY-2016	**$73,400**	†
FY-2017	**$75,650**	†
FY-2018	**$77,970**	†

† Assumes ongoing model maintenance, model runs, tech transfer, documentation and program management and includes ~3% adjustment

Task 1 Model Development

A) Labor

Task	Position	Salary total/hr	Total Days	Total Cost
Model incorporation of new flow recommendations and scenarios	TSC[1] Eng	$80	15	$9,600
	WCAO[2] Eng	$80	10	$6,400
Documentation	TSC Eng	*Covered under FY14 SOW and budget.*		

B) Travel

Purpose	Destination	Trips	Days/ Trip	Airfare/ trip	MI&E, Car, Lodging/day	Total Cost
TSC meeting w/WCAO	DUR	1	3	$400	$250	$1,150

C) Other Costs

Task	Total Cost
RiverWare technical support	$5,000

Task 2 Model Maintenance

A) Labor

Task	Position	Salary total/hr	Total Days	Total Cost
Annual Data Update	TSC Eng	$80	5	$3,200
	WCAO Eng	$80	5	$3,200
Annual Software Update	TSC Eng	$80	5	$3,200

B) Travel

Purpose	Destination	Trips	Days/ Trip	Airfare/ trip	MI&E, Car, Lodging/day	Total Cost
WCAO meet for Coordination	DEN	1	2	$400	$250	$900

Task 3 Model Runs

A) Labor

Task	Position	Salary total/hr	Total Days	Total Cost
Model Runs and Analyses	TSC Engineer	$80	20	$12,800
	WCAO Engineer	$80	15	$9,600

Task 4 Program Management Coordination

A) Labor

Task	Position	Salary total/hr	Total Days	Total Cost
Meetings and Coordination	WCAO Engineer	$80	25	$16,000
Budget	WCAO Engineer	$80	5	$3,200

B) Travel

Purpose	Destination	Trips	Days/ Trip	Airfare/ trip	MI&E, Car, Lodging/day	Total Cost
TSC to Hydro Wk Grp Mtg	ALB	1	2	$500	$250	$750
WCAO to Hydro Wk Grp Mtg	ALB	1	2	$500	$250	$750
TSC to Annual Hydro Mtg	DUR	1	4	$400	$250	$1,400
WCAO to Annual Hydro Mtg	DUR	1	4	$400	$250	$1,400

[1] Technical Services Center (Denver)

[2] Western Colorado Area Office (Durango)

Improve Stream Gaging and Flow Measurements
San Juan River Basin Recovery Implementation Program
Fiscal Year 2015 Project Proposal

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Background

There are five United States Geological Survey (USGS) streamflow gaging stations on the main stem of the San Juan River that are very important to management of the river and the operation of Navajo dam to implement the San Juan Recovery Implementation Program (SJRIP) flow recommendations. Stream gaging data on the San Juan River are necessary to reliably implement and revise the SJRIP flow recommendations.

Study Area

San Juan River Basin in New Mexico

Objective

Provide funding to the USGS to take additional flow measurements as needed at the four San Juan River gages in New Mexico. The four gages are San Juan near Archuleta, San Juan at Farmington, San Juan at Shiprock, and San Juan at Four Corners. (Note: Base cost for operation of the stations is paid for by non-Program funds.)

Products:

1. Improved flow measurement and more accurate gage readings.

2. Technical presentation at the end of the year from USGS summarizing the activities completed and the value of obtaining additional readings.

Budget FY-2015:

Objective: Provide funding to USGS for 12 additional flow measurements at the four San Juan River Gages in NM.	Staff days	Labor	Travel	Equipment and supplies
Personnel	7.5	6,450		
Travel			1,450	
Equipment and supplies				0
Total				**$7,900**

Estimated Outyear Funding (Based on 4% adjustment for inflation)

Fiscal Year 2016	$8,220
Fiscal Year 2017	$8,550
Fiscal Year 2018	$8,890

Operation of Public Service Company of New Mexico Fish Passage Structure
Fiscal Year 2015 - 2018 Project Proposal

Principal Investigators: Jeffrey Cole, Chris Cheek, Ashley Curley
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Background

The Power Company of New Mexico (PNM) Diversion Dam was constructed in 1971. The 3.25-foot high diversion dam (weir) is located on the San Juan River about 12 miles downstream of Farmington, New Mexico near the town of Fruitland at River Mile 166.6. Facilities at the diversion include a concrete weir, a series of screened intake structures, an intake channel, a settling channel, and a pump house.

Water flows over the dam into a stilling basin created by a concrete apron. The stilling basin is the width of the river. The presence of the dam and the basin creates a barrier to fish moving upstream. As flows increase, the difference in the upstream and downstream water levels is reduced. Although water levels are reduced, water velocities increase and the weir provides an impediment to upstream fish movement. Recovery studies conducted as part of the SJRRIP have shown that some fish are able to move upstream past the weir but their specific method of movement is not known and the number of fish discouraged from upstream movement by the presence of the weir is also unknown. One possible method of upstream movement could occur during high river flows. When the flow in the San Juan River is above 7,000 cfs, some of the flow goes around the dam making it possible for fish to go around the dam at these higher flows.

A need has been identified by the San Juan River Basin Recovery Implementation Program (SJRRIP) to restore endangered fish passage upstream past the PNM Diversion Dam. The purpose of establishing fish passage was to protect and recover native Colorado pikeminnow (*Ptychocheilus lucius)* and razorback sucker (*Xyrauchen texanus*) populations in the San Juan Basin while water development proceeds in compliance with all applicable Federal and State laws, including fulfillment of Federal trust responsibilities to the Southern Ute Indian Tribe, Ute Mountain Ute Tribe, Jicarilla Apache Nation and the Navajo Nation. In addition, other native fish species would benefit from restored passage. The facility has been operated and maintained by the Navajo Nation Department of Fish and Wildlife (NNDFW) since it was built in 2003. The U.S. Fish and Wildlife Service (Service), Bureau of Reclamation (BOR), Bureau of Indian Affairs (BIA), Navajo Indian Irrigation Project (NIIP), Navajo Agricultural Products Industry (NAPI), and PNM have provided the NNDFW with technical assistance, planning assistance, environmental clearance, maintenance and improvements to the facility and its access points.

The fish passage has facilitated movement of pikeminnow and razorback suckers upstream into a 50 mile stretch of river, which is historical habitat of these species.

Study Area

Public Service Company of New Mexico Diversion Dam is located at RM 166.6.

Methods/Approach

The Fish Passage facility will be operated from March 1 to September 30, for each year of the five year proposed budget (2014 – 2018). The fish passage traps fish attempting to move upstream of the facility. All fish that are caught in the trap are transported to a sorting tray. All fish are identified and enumerated. Non-endangered native fish are released upstream of the facility. Rare native fishes are scanned for a pit tag, weighed and measured, marked with a pit tag if they do not have one and then released upstream of

the facility. All non-native fishes are removed from the river system permanently. When feasible, channel catfish are transported to area fishing lakes that already have channel catfish in their systems to support the sport-fishing program.

Daily operation and maintenance includes cleaning of surface and submerged trash, debris, silt, and river-born algae from the trash racks and bar screens in the fore-bay of the fish passageway, and aluminum conduit screens in the fish trap. The amount of algae, debris, trash, and sediment that accumulates daily at this site is seasonally variable, depending upon flow magnitude and water volume during the water year. Maintenance also includes painting as necessary to control corrosion, lubrication of moving equipment, and checking fluid levels in gearboxes and cooling radiators, as necessary. Representatives from the NNDFW, BOR, PNM and the Service will perform an inspection of the facility every 3 years. In the event of a significant flood event, representatives from the NNDFW will notify BOR, PNM and FWS and appropriate parties will inspect the facility for damage, as necessary.

The Fish Passage Program maintains a database of all fish processed through the facility. Staff that operate this facility also have initiated a public outreach and education program that will continue in FY' 2014. School groups visit the facility to learn about the purpose of the facility and the endangered fish program on the San Juan River.

Objectives of this project are as follows:

1. Determine the use of the fish passage by juvenile and adult native and nonnative fishes.
2. Identify any Colorado pikeminnow congregations that may be related to the spawning period in the San Juan River.
3. Maintain the facility in a manner that assures long-term benefit.

This proposal does not include any maintenance or repair work that is major and requires mobilization of heavy equipment and is outside of the constraints of this budget.

Products/Schedule

The Fish Passage facility will be operated from March 1 to September 30. Data will include definitive numbers of species, numbers per species, and seasonal use and distribution by species.

NNDFW staff will prepare and submit monthly reports and one draft and final annual report. Service staff will assist NNDFW with data analysis and draft and final report preparation, if needed.

NNDFW staff will attend SJRRIP Biology Committee meetings and provide reports as needed throughout the year.

Fiscal Year – 2015 Budget

BUDGET WORKSHEET Operation of San Juan/PNM Fish Passage		
Personnel (salary and benefits)	**USFWS Funding**	**NNDFW**
Fisheries Biologist 13 PPE		$22,562
Wildlife Technician 13 PPE		$11,708
Temporary Employment		$10,866
Fringe Benefits $34, 270 X 42.96% $10,866 X 9.26%		$14,723 $1,006
Personnel Subtotal		**$60,865**
Travel		
1 Tribal Vehicle		$18,540
Per Diem Lodging and Meals		$3,090
Travel Subtotal		**$21,630**
Office Supplies		$ 908
Office Equipment – LCD Projector and screen		$1,545
General Operating Supplies Plumbing supplies, Hardware Supplies, Neoprene Waders, rubber boots, wet suit, landscaping supplies		$3,632
Nenahnezad Phone		$ 824
Uniforms		$515
Printing/Binding/Photocopying		$103
Fuel – Gasoline for water pump		$731
Sewage Services – Fish Passage		$721
Repairs and Maintenance – Paint, sealant, lubricants, water pump repairs		$1,030
Support Subtotal		**$10,010**
Training and Conference Registration		$1,030
Consultant/ Professional Sub-Total		**$1,030**
	USFWS Funding	**Base Funding**
Budget Subtotal		**$93,536**
FY 2014 Carry over funds		**0**
Total		**$93,536**
Administrative charge (16.95%)		**$15,854**
Grand Total		**$109,390**

San Juan Recovery and Implementation Program
San Juan River Channel and Floodplain Restoration, Phase 2

Robert M Findling, Director of Conservation Projects
The Nature Conservancy
212 E. Marcy Street, Suite 200
Santa Fe, New Mexico 87501
(505) 946-2040 office
rfindling@tnc.org

Background

The goals of the San Juan Recovery River Implementation Program ("SJRIP") Long Range Plan include providing suitable habitat to support recovery of the Colorado pikeminnow and razorback sucker.

In 2010, The Nature Conservancy (TNC), acting in cooperation with the United States Fish and Wildlife Service, the Bureau of Reclamation, and the San Juan River Basin Recovery Implementation Program (SJRIP), contracted with the New Mexico Environment Department under their River Restoration Initiative (RERI) to assist in the restoration of secondary channels and backwaters in the San Juan River near Farmington and Shiprock, NM. Restoring these habitats will assist in the recovery of endangered species by increasing channel complexity and improving habitat conditions in the San Juan River.

In May 2011, a design report was presented to the SJRIP Biology Committee for completing habitat enhancement and restoration at six sites. Work began in October 2011 and was completed by the end of November. Planting vegetation at all sites was completed in Spring 2012.

One of the purposes of this project is to serve as a means of evaluating methods of habitat restoration. The general method used for this project was to clear and excavate the inlets of selected secondary channels in order to re-establish flows of 5-10 cfs at a San Juan River base flow of 500-700 cfs. Clearing the channel inlets will facilitate secondary channel flows during storm events and spring runoff in an effort to enable significant flushing of existing sediment. The expectation is that areas of low velocity habitat will be increased and continue to function as the main channel flow decreases. Continuous secondary channel flow was achieved for five of the six sites at base flow. All of the sites will flow during storm events and spring runoff which will allow for some in-channel movement of cobble and other materials. The SJRIP is monitoring each site to assess the effectiveness of the selected approach.

TNC is pursuing a second phase of channel and floodplain restoration at a complex of additional sites on the San Juan River between RM 134.5 and 136.5. Approximately, 4.7 miles of restored channel will be created by the second phase project. TNC expects to contribute non-federal funds to SJRIP supported activities over three federal fiscal years, FY 2012-2015, during the implementation of this project. A partial accounting of TNC's expenditures is included below. This budget includes the San Juan River fish habitat restoration project's second phase, which will be funded through a recent environmental damages mitigation settlement, but does not include other NFWF funds.

TNC Contribution to San Juan River Recovery Implementation Program: Non-Federal Funds

	Federal Fiscal Year				TOTAL
	2013	2014		2015	
	(10/2012 to 9/2013)	(1st & 2nd Quarter Actuals)	(10/2013 to 9/2014)	(10/2014 to 9/2015)	
Personnel	**10,195**	**27,370**	50,000	20,305	80,500
Contractual	**2,902**	**44,568**	120,000	117,098	240,000
Travel	**667**	**2,106**	4,000	2,833	7,500
Subtotal	***13,764***	***74,044***	*174,000*	*140,236*	*328,000*
*Indirect Costs (18% of $400K)**	***3,022***	***16,253***	*38,195*	*30,783*	*72,000*
Actual Expenses	**$16,786**	**$90,297**			
TOTAL	**$16,786**		**$212,195**	**$171,019**	**$400,000**

* Indirect costs are prorated by expenditure, but are based upon 18% of the total grant amount. Consequently, percentages are incrementally higher than 18% once allocated in a specific FY.

Total expenses in FY13 & the 1st two Quarters of FY14 are $107,083.

SJRIP Videography
2015 Project Proposal

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Denver, CO 80225
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bgoettlicher@usbr.gov

Background

High definition videography is used in the SJRIP to develop maps of the river and evaluate habitat relationships and provide a database that can be used to compare future conditions. Videography is also used for habitat mapping and developing fish-habitat relationships when requested. The videography is done in the late summer during base-flow conditions in an attempt to standardize the information with flows.

2015 Tasks

Fly San Juan River with vertically oriented camera and take HD video and high res. digital stills.

1. Periodically provide specific images that are rectified for detailed mapping.
2. Archive video/still frames and provide to researchers as requested.

Methods

Aerial imagery is collected along the river by using a helicopter which enables following the river corridor. The helicopter is equipped with a belly camera port which allows interior mounting of 2 cameras. In this case an HD video camera and a high resolution digital camera. The imagery is collected at an altitude that produces 5-6 frames per river mile.

Richard Davis (208-334-9315) at OAS will be contacted to get the flights scheduled. Both video (HD) and still photos (25mp) will be shot and all camera equipment, including the Tyler mount w/ base plate for mounting the photo equipment to the helicopter, will be provided by Reclamation (Bill Goettlicher and Andrew Pernick). Reclamation will also provide staff to operate the equipment and provide route guidance during flight. A Bell 206 L1 or L3 helicopter will be used to do the work. Reclamation (Mark McKinstry) will submit "Order Request Form for Government Flight Services" AQD91@ibc.doi.gov to OAS a minimum of 5 days before the planned start date (website for the form and instructions: http://oas.doi.gov/apmd). Specific requirements for the work are:

1. All filming done at approx.. 1,500 ft AGL (use of a laser altimeter is preferred but not required).
2. Filming speed at approx.. 40-60 kts.
3. River level for flight should be less than 1,000 cfs.
4. Day1 - approx. 10 am - start filming at the confluence of the San Juan River and the Animas River at Farmington, NM.
5. Film downstream (west) to approx. Four Corners or Bluff return to base of operations Farmington/Durango,CO.
6. Day 2 - approx. 12 noon - be on river filming from previous stopping point.
7. Continue filming downstream (including the Goose-necks) to Lake Powell (add 2 hours ferry time worst case to return once more to base of operations to disassemble equipment).
8. End of mission. Ferry times may vary depending on logistics of helicopter/personnel locations; but worst case is given here.
9. The total river mile distance to film is about 225 miles.

Estimated FY 2015 BUDGET

Funding source	**Expenditure in FY2014**
FY2015 estimated funding	$30,000
Total	**$30,000**

Projected funding:
FY-2016 $31,000.00
FY-2017 $32,000.00

Endangered Fish Monitoring and Nonnative species Monitoring and Control in the Upper/Middle San Juan River
Fiscal Year 2015 Project Proposal

Principal Investigators: Bobby R. Duran, Ernest Teller Sr. and Jason E. Davis
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Cooperative Agreement #'s:

USFWS – NMWFCO	R11PG40032
USFWS – CRFP	R10PG400024
UDWR – Moab	08FG402723
NMDGF – Santa Fe	07FG402632
NNDFW	R11AP40090

Period of Performance: 09/11/2011 to 9/30/2016

Background

The August 1, 2001 Colorado pikeminnow and razorback sucker Recovery Goals identified predation by and/or competition by nonnative fish species as a primary threat to the continued existence or the reestablishment of self-sustaining populations of these endangered fishes. In addition, reducing the impacts of nonnative fishes has been identified as a critical Program Element in the San Juan River Basin Recovery Implementation Program's Long Range Plan (2014). Goals, Actions, and Tasks associated with this Element encompassed within this scope of work include:

Goal 3.1—Control Problematic Nonnative Fishes

> Action 3.1.1 Develop, implement, and evaluate the most effective strategies for reducing problematic nonnative fish.
>
> > Task 3.1.1.1 Mechanically remove nonnative fish to achieve objectives.
> >
> > Task 3.1.1.3 Remove nonnative fish during Program research and monitoring activities.

Secondarily, nonnative fish removal crews collect both spatial and temporal data on rare fish encountered during sampling efforts. These data have been used in assessing progress towards recovery and to evaluate the augmentation programs for both Colorado pikeminnow and razorback sucker. Additional Long Range Plan Actions and Tasks associated with this task include but are not limited to the following:

Goal—4.1 Monitor Fish Populations of the San Juan River Basin

> Action 4.1.3 Collect data on the endangered fish and native and nonnative fish communities during other Program management activities, when possible.
>
> > Task 4.1.3.1 Collect data on the endangered fish and native fish community during nonnative fish control activities to aid in tracking the presence, status and trends of endangered fish populations.

Intensive removal of nonnative fishes, primarily channel catfish and common carp, has occurred in the upper reaches of the San Juan River since 2001. Between 2001 and 2003, removal trips focused on a 7.6 mile reach of river from PNM Weir (RM 166.6) to Hogback Diversion (RM 159.0). Declines in catch rates, seasonal movement by channel catfish, and high abundance of nonnative fishes downstream of Hogback Diversion prompted removal efforts to expand in 2003 to include the adjacent downstream reach, Hogback Diversion to Shiprock Bridge (RM 147.9). To address areas of higher channel catfish abundance, varying amounts of effort in these two sections have occurred over the duration of the project. To accommodate additional removal efforts downstream of Shiprock Bridge, three trips from Hogback Diversion to Shiprock Bridge and no trips from PNM Weir to Hogback Diversion were completed in 2014. Abundance trends reported from annual fall monitoring data collected in 2014 will help in determining the number of trips to be conducted in each of these two upper reaches in 2015. If nonnative fish abundances have significantly increased, intensive removal from PNM Weir to Hogback Diversion may be warranted. Although effort has shifted over time, these reaches remain important to long-term suppression and control of nonnatives riverwide. Some level of removal

in these reaches is still recommended since, historically, they have been dominated by large adult channel catfish and represent the uppermost range of channel catfish in the San Juan River.

Multi-pass removal efforts were successful, to a degree, in suppressing nonnative numbers within intensive removal reaches (Davis et al. 2009, Davis 2006). However, long term trend data collected during annual fall monitoring trips indicated an increase in channel catfish abundance riverwide beginning in 2004. Much of this was attributed to increased abundance in reaches that were between (RM 147.9 – 52.9) those where intensive removal efforts had occurred (Ryden 2006). Prior to 2006, nonnative fishes within this portion of the San Juan River were only opportunistically removed during spring razorback sucker and fall annual monitoring trips.

Beginning in 2006, U.S. Fish and Wildlife Service (FWS) – New Mexico Fish and Wildlife Conservation Office (NMFWCO) shifted removal efforts to include two trips from Shiprock, New Mexico to Montezuma Creek, Utah (RM 93.6). Removal efforts upstream of Shiprock Bridge were reduced to accommodate nonnative removal downstream to Montezuma Creek. In addition, at the direction of the San Juan River Recovery Implementation Program's (SJRIP) Biology Committee, trips specific to nonnative removal were initiated in 2006 to encompass the Montezuma Creek to Mexican Hat, Utah portion of the river (22 February 2006 Biology Committee Meeting). Two trips were conducted from Montezuma Creek to Mexican Hat, Utah in 2006 by NMFRO and Utah Division of Wildlife Resources – Moab (UDWR).

It was determined at the February 2007 Biology Committee Meeting to increase nonnative removal effort from Shiprock Bridge to Mexican Hat to reflect similar efforts to intensively sampled reaches upstream. Continued high channel catfish abundance makes this reach a high priority for removal in 2015. Therefore, we propose to continue removal in this reach to include four trips from Shiprock Bridge to Mexican Hat in FY 2015. The proposed schedule of trips will allow for focused removal in areas of highest priority while maintaining sufficient effort in upstream reaches to maintain current accomplishments.

Description of Study Area

Intensive nonnative fishes removal will occur in the San Juan River, New Mexico-Colorado-Utah, including three distinct reaches of the upper and middle portions of the San Juan River. These sections include PNM Weir (RM 166.6) to Hogback Diversion (RM 159.0); Hogback Diversion to Shiprock Bridge (RM 147.9); and Shiprock Bridge to Mexican Hat, Utah (RM 52.9).

Objectives

1. Continue to remove nonnative fishes, primarily channel catfish and common carp, from 113.7 river miles of the San Juan River.
2. Implement mark/recapture from Shiprock Bridge to Mexican Hat to calculate population estimates and determine exploitation rates for channel catfish.
3. Evaluate distribution and abundance patterns of nonnative species to determine effects of mechanical removal.
4. Characterize distribution and abundance of endangered fish in the upper and middle reaches of the San Juan River.

Methods/Data Analysis

Removal efforts from PNM Weir to Hogback and Hogback to Shiprock will be conducted by two electrofishing rafts and one support raft. Total length (TL; mm) will be recorded from all fish collected at one stop per day. Fish will be enumerated by size class (i.e. young-of-year, sub-juvenile, juvenile, adult) at all other stops. If unique or uncommon species are collected, TL and weight (g) will be collected and any other pertinent information will be recorded.

Removal efforts from Shiprock to Mexican Hat will be conducted four times a year. Three of these trips will be stand-alone efforts while the fourth removal trip will be in concert with the Sub-adult/Adult Fish Community Monitoring conducted by FWS-GJ. Sampling for nonnative fishes will be conducted by four raft mounted electrofishing units. Two rafts will begin sampling approximately one hour after the initial two rafts began, essentially accomplishing two sampling passes per trip. Total length will be recorded from all fish collected at one stop per day. Fish will be enumerated by size class (i.e. young-of-year, sub-juvenile, juvenile, adult) at all other stops. If unique or uncommon species are collected, TL and weight (g) will be collected and any other pertinent information will be recorded.

In addition to nonnative fishes, all rare fishes seen by downstream rafts will be netted. Upstream rafts will not collect rare fishes and will cease electrofishing when these species are observed. Rare fishes will be measured (nearest 1 mm) for TL, weight (nearest 5 g) and checked for the presence of a Passive Implant Transponder (PIT) tag. If no tag is present and fish are $\geq$ 150 mm TL a tag will be implanted. Other pertinent information (i.e. sex, reproductive stage, abnormalities) will be recorded.

Channel catfish ($\geq$ 200 mm TL) collected during a trip early in the calendar year (i.e. April) will receive a T-bar anchor tag and returned to the river. Fish <200mm TL will be removed from the river. Each tag will have a unique alphanumeric code for identification of individual fish. Total length from all channel catfish captured each day will be recorded. Channel catfish collected on subsequent trips will be removed from the river. Population estimates (Lincoln-Petersen with Chapman's Correction) will be generated for channel catfish captured during the first pass and recaptured in the second pass. Exploitation rates, *u*, will be estimated as the rate of recapture of marked fish (Deroba et al. 2005),

$$u = R/M$$

whereas *R* represents number of recaptured fish and *M* represents number of marked fish. Exploitation rates will be calculated for various size classes of fish throughout the sampling period (Elverud 2010).

All available capture data will be analyzed independently by section and project (i.e. PNM to Hogback; Hogback to Shiprock; fall monitoring). To determine trends in distribution and abundance, mean CPUE and standard error will be calculated. Species CPUE represents the total number of fish collected divided by the total effort of sampling (hours of electrofishing). Data will be summarized by type of trip, year, section and by individual trips. If CPUE data meet the assumptions of normality and variance, a One Way Analysis of Variance (ANOVA) will be conducted to determine if significant differences exist. Multiple pairwise comparisons using Bonferroni post hoc tests will be used to determine where specific differences exist. All CPUE data that does not meet the assumptions of an ANOVA and transformations are unsuccessful in normalizing the data will first be analyzed using a non-parametric Kruskal-Wallis rank test. If

significant differences are observed, among year comparisons of ranked data will be conducted using a Nemenyi post-hoc test (Sokal and Rohlf 1995). Statistical applications not mentioned here may be utilized if deemed appropriate.

Intensive removal trips by Section (FY 2015):

PNM to Hogback-	2 trips**
Hogback to Shiprock-	3 trips
Shiprock to Mexican Hat	4 trips
Shiprock to Mexican Hat	1 trip (tagging trip)
Total # of trips-	**10 trips in FY 2015**

**** subject to revision depending on identified priority reaches**

Products/Schedule

An electronic data file will be provided for inclusion in the centralized database by 31 March 2016. A draft summary report detailing findings will be submitted to the San Juan River Implementation Program, Biology Committee, by 31 March 2016. Revisions will be completed and a final annual report will be submitted by 1 June 2016.

Literature Cited

Davis, J.E, D.W. Furr and E. Teller. 2009. *Nonnative species monitoring and control in the upper San Juan River, New Mexico: 2008*. Final Report prepared for the San Juan River Recovery Implementation Program. U.S. Fish and Wildlife Service, Albuquerque New Mexico.

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Deroba, J.J., M.J. Hansen, N.A. Nate and J.M. Hennessy. 2005. *Evaluating assumptions of mark-recapture studies for estimating angling exploitation of walleyes in northern Wisconsin lakes*. North American Journal of Fisheries Management, (25): 890-896

Elverud, D.S. 2010. *Nonnative control in the lower San Juan River: 2009.* Draft Interim Progress Report for the San Juan River Recovery Implementation Program. U.S. Fish and Wildlife Service, Albuquerque, NM.

Ryden, D.W. 2006. *Long term monitoring of sub-adult and adult large-bodied fishes in The San Juan River: 2005*. Prepared for the San Juan River Recovery Implementation Program. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Sokal, R.R. and F.J. Rohlf. 1995. Biometry: the principles and practice of statistics in biological research. 3rd edition. W.H. Freeman and Company, New York.

Fiscal Year 2015 Budget
Labor Costs (Federal Salary and Benefits)

PNM Weir to Hogback Diversion: **

Fish Biologist (GS-9-5)-10 days @ $327/day
(1 person X 5 days/trip X 2 trips) ..... $ 3,270.00

Biological Science Technician (GS-8)-10 days @ $348/day
(1 person X 5 days/trip X 2 trips) ..... $ 3,480.00
$ 6,750.00

Hogback Diversion to Shiprock Bridge:

Supervisory Fish Biologist (GS-13-5)-10 days @ $533/day
(1 person X 5 days/trip X 2 trips) ..... $ 5,330.00

Fish Biologist (GS-9-5)-15 days @ $327/day
(1 person X 5 days/trip X 3 trips) ..... $ 4,905.00

Biological Science Technician (GS-8)-15 days @ $348/day
(1 person X 5 days/trip X 3 trips) ..... $ 5,220.00
$ 15,455.00

Shiprock to Mexican Hat:

Supervisory Fish Biologist (GS-13-5)-12 days @ $533/day
(1 person X 6 days/trip X 2 trips) ..... $ 6,396.00

Fish Biologist (GS-9-5)-48 days @ $327/day
(1 person X 12 days/trip X 2 trips) ..... $ 15,696.00

Biological Science Technician (GS-8)-48 days @ $348/day
(1 person X 12 days/trip X 4 trips) ..... $ 16,704.00

Fish Biologist (GS-5-5)-48 days @ $204/day
(1 person X 12 days/trip X 4 trips) ..... $ 9,792.00

Biological Science Technician (GS-5-1)-24 days @ $180/day
(2 people X 12 days/trip X 1 trip) ..... $ 4,320.00
$ 52,908.00

Shiprock to Sand Island (tagging trip):

Supervisory Fish Biologist (GS-13-5)-12 days @ $533/day
(1 person X 12 days/trip X 1 trip) ..... $ 6,396.00

Fish Biologist (GS-11-5)-12days @ $374/day
(1 person X 12 days/trip X 1 trip) ..... $ 4,488.00

Fish Biologist (GS-9-5)-12 days @ $327/day
(1 person X 12 days/trip X 1 trip) ..... $ 3,924.00

Biological Science Technician (GS-8)-12 days @ $348/day
(1 person X 12 days/trip X 1 trip) ..... $ 4,176.00

Fish Biologist (GS-5-5)-12 days @ $204/day
(1 person X 12 days/trip X 1 trips) ..... $ 2,448.00
$ 21,432.00

Administrative and Reporting Costs

Administrative Officer (GS-9-8)-10 days @ $336/day ..... $ 3,360.00

Project Leader (GS-14-1) – 12 days @ $556/day ..... $ 6,672.00

Supervisory Fish Biologist (GS-13-5)-50 days @ $533/day ..... $ 26,650.00

Fish Biologist (GS-9-5)-35 days @ $327/day ..... $ 11,445.00
$ 48,127.00

Sub-Total for Labor Costs ..... $ 144,672.00

Travel and Per Diem (Based on published FY 2014 Per Diem Rates)

Hotel Costs – 56 nights @ $83/night ..... $ 4,648.00

Per Diem (Hotel Rate) – 65 days @ $46/day ..... $ 2,990.00

Per Diem (Camp Rate) – 179 days @ $29/day ..... $ 5,191.00
Sub-Total for Travel and Per Diem ..... $ 12,829.00

Equipment

Removal Trips

PNM Weir to Hogback/Shiprock Diversion
3,000 miles @ $0.56/mile (400 miles/trip X 5 trips + 1,000 shuttling miles) ..... $ 1,680.00

Shiprock to Mexican Hat
8,400 miles @ $0.56/mile (700 miles/trip X 4 trips X 3 vehicles) ..... $ 4,704.00

Generator fuel – 320 gallons @ $4.00/gallon
20 gallons/trip X 5 trips; upper SJR trips
110 gallons/trip X 2 trips; camping trips ..... $ 1,280.00

Equipment Maintenance, Repair and Replacement
(i.e. life jackets, hip boots, generator repair, rubber gloves, dip nets
aluminum welding, raft repair, etc.) ..... $ 3,000.00

Tagging Trip

4,000 Floy T-Bar Anchor Tags
(FD-94 tags @ $610/1,000 tags) ..... $ 2,440.00

Six (6) Replacement Needles @ $10 ea. ..... $ 60.00

Generator Fuel – 55 gallons @ $4.00/gallon ..... $ 220.00

Vehicle Fuel
1,400 miles @ $0.56/gallon (700 miles roundtrip X 2 vehicles) ..... $ 784.00
Sub-Total for Equipment ..... $ 14,168.00

USFWS – New Mexico Fish and Wildlife Conservation Office ..... $ 171,669.00

USFWS– Administrative Overhead (3%) ..... $ 5,150.00

USFWS – Region 2 Total ..... $ 176,819.00

Funding for participating agencies

U.S. Fish and Wildlife Service – Colorado River Fishery Project $86,290.00
Utah Department of Wildlife Resources – Moab Field Station $23,634.00
New Mexico Department of Game and Fish- Conservation Services Division $12,550.00
American Southwest Ichthyological Researcher, LLC $46,558.00
Navajo Nation Department of Fish and Wildlife $4,016.98
Sub-Total for participating agencies ..... $ 173,048.98

Grand Total for FY 2015 ..... $ 349,867.98

**** if previous years data determine that removal from PNM Weir to Hogback Diversion is unnecessary, an extra trip in the middle San Juan River (RM 147.9-52.3) will be conducted with no added cost to the Program**

Under the heading "Funding for participation of other agencies." Cost for participation of U.S. Fish and Wildlife Service, Colorado River Project – Grand Junction, CO in FY-2015 nonnative removal activities.

Fiscal Year 2015 Estimated Budget:

Costs for participation of the U.S. Fish Wildlife Service, Colorado River Fishery Project (USFWS-CRFP) office, Grand Junction, CO.

(Based on projected FY-2015 costs)

Personnel/Labor Costs (Federal Salary + Benefits)	
Principal Biologist (GS-11) – 304 hours @ $47.93/hr	$ 14,571.00
(1 person X 5 days/trip X 1 hotel trip)	
(1 person X 11 days/trip X 3 camping trips)	
Bio. Tech. Crew Leader (GS-6) – 392 hours @ $31.81/hr	$ 17,242.00
(1 people X 5 days/trip X 1 hotel trip)	
(1 person X 11 days/trip X 4 camping trips)	
(+ 100 hours overtime at $47.72/hr = $4,772.00)	
Biological Technicians (GS-5) – 528 hours @ $18.94/hr	
(3 people x 11 days/trips x 2 trips)	
(+ 25 hours overtime each at $28.41/hr = $2,131.00)	$ 12,131.00
	$ 43,944.00
Administrative Support (Federal Salary + Benefits)	
Administrative Officer (GS-9) – 125 hours @ $43.41/hr	$ 5,426.00
Project Leader (GS-14) – 109 hours @ $80.99/hr	$ 8,828.00
	$ 14,254.00
Reporting/Data Management (Federal Salary + Benefits)	
Principal Biologist (GS-11) – 260 hours @ $47.93/hr	$ 12,462.00
	$ 12,462.00
Travel and Per Diem (Based on Published FY-2014 Federal Per Diem Rates)	
Hotel – 5 nights in Farmington, NM X 2 people/trip X 1 trip	$ 830.00
(10 nights @ $83/night – single occupancy = $830)	
Hotel – 1 night in Cortez, CO 2 people/trip X 2 trips	$ 436.00
(4 nights @ $109/night – single occupancy = $1,386)	
Hotel – 1 night in Cortez, CO 4 people/trip X 2 trips	$ 872.00
(8 nights @ $109/night – single occupancy = $1,386)	
Per Diem (Hotel Rate) – 6 days in Farmington, NM X 2 people per trip X 1 trip (12 days @ $46/day)	$ 552.00
Per Diem (Hotel Rate) – 1 day in Cortez, CO X 2 people per trip X 2 trips (4 days @ $51/day)	$ 204.00
Per Diem (Hotel Rate) – 1 day in Cortez, CO X 4 people per trip X 2 trips (8 days @ $51/day)	$ 408.00
Per Diem (Camp Rate) – 9 days X 2 people/trip X 2 trips (36 days @ $28/day)	$ 1,008.00
Per Diem (Camp Rate) – 9 days X 4 people/trip X 2 trips (72 days @ $28/day)	$ 2,016.00
	$ 6,326.00
Equipment	
Vehicle Maintenance & Gasoline (@ $354/month lease = $11.80 per day based on 30 days in an "average" month + $0.32/mile)	
1 trip from Grand Junction, CO to Farmington, NM X 1 truck X 6 days/trip	$ 350.00
(296 miles one-way = 592 miles round-trip) = $189	
(+ 56 miles shuttling/day X 5 days = 280 miles) = $90	
(1 truck X 6 days/trip X 1 trip X $11.80/day) = $71	

2 trips from Grand Junction, CO to Cortez, CO to Shiprock, NM to Mexican Hat, UT and back to Grand Junction, CO X 1 truck X 10 days per trip — $ 626.00
(610 miles/trip X 2 trips X 1 truck = 1,220 miles) = $390
(1 truck X 10 days/trip X 2 trips X $11.80/day) = $236

2 trips from Grand Junction, CO to Cortez, CO to Shiprock, NM to Mexican Hat, UT and back to Grand Junction, CO X 2 trucks per trip X 10 days per trip — $ 1,253.00
(610 miles/trip X 2 trips X 2 trucks = 2,440 miles) = $781
(2 truck X 10 days/trip X 2 trips X $11.80/day) = $472

Generator Gasoline

(25 gallons/trip X 1 trip @ $4.00/gallon) — $ 100.00
5 days @ 5 gallons/day X 1 raft X 1 trip

(45 gallons/trip X 2 trips @ $4.00/gallon) — $ 360.00
9 days @ 5 gallons/day X 1 raft X 2 trips

(120 gallons/trip X 2 trips @ $4.00/gallon) — $ 960.00
4 days @ 5 gallons/day X 1 raft X 2 trips
5 days @ 5 gallons/day X 4 rafts X 2 trips

Equipment Maintenance, Repair, & Replacement

Exact use of the money in this line item will vary from year to year depending on what equipment needs to be maintained, repaired, or replaced, but use of these funds for a "typical" field season for one study would include the following:

Annual trailer maintenance & safety inspection = $175

Replace/repair trailer suspension, trailer lights, winch handle/straps/gears, trailer jack stand wheel bearings

Replace trailer tires – 2 per year @ $100 each = $200

Synthetic oil for generators - 5 quarts at $7 each = $35

Generator repair/tune-up - 5 hrs @ $75/hr = $375

Hip boots – 2 pair at $50/pair = $100

Breathable chest waders - 2 pair @ $125/pair = $250

Stearns Type III life jackets – 3 @ $70 each = $210

Electrical Gloves - 3 pairs @ $65/pair = $195

Repair raft frame

Aluminum welding – 3 hours @ $150/hr = $450

Raft repair kits

Raft glue (urethane/hypalon) – Four 4-oz. cans @ $22.50/can = $90

NRS raft patch material – 5 feet @ $37/ft = $185

Acetone – 1 gallons @ $17.50/gallon = $17.50

Toluene – 1 gallon @ $17.50/gallon = $17.50

Replace any missing NRS HD-brand tie-down straps, each boat needs:

Ten 2-ft straps @ $4.20 each = $42

Five 3-ft straps @ $4.30 each = $21.50

Ten 4-ft straps @ $4.70 each = $47

Five 6-ft straps @ $5.05 each = $25.25

Five 9-ft straps @ $5.7 each = $28.50

Five 12-ft straps @ $6.15 each = $30.75

Replace any missing D-style carabiners, each boat needs:

10 @ $7.50 each = $75

Mesh rig bag – 1 @ $50 each = $50
Rafting oars, oar blades, and oar rowing sleeves
Carlisle 10-foot oar shafts – 2 @ $90 each = $180
Carlisle Oars blades – 4 @ $65 each = $260
Oar sleeves – 4 @ $12 each = $48
5-gallon plastic gasoline jerry cans – 5 @ $20 each = $100
River bags
NRS 3.8 heavy-duty Bill's Bag – 1 @ $100 each = $100
Clavey (green 7 X 17) dry bag – 3 @ $22 each = $66
Clavey (blue 10 X 24) dry bag) – 4 @ $26 each = $104
20 lb. propane tanks – 3 @ $20 each = $60
Pesola brand spring scales
20010 Micro-Line 10 gram – 1 @ $50 = $50
20060 Micro-Line 60 gram – 1 $46 = $46
20100 Micro-Line 100 gram – 1 @ $46 = $46
40300 Medio-Line 300 gram – 1 @ $54 = $54
40600 Medio-Line 600 gram – 1 @ $54 = $54
42500 Medio-Line 2,500 gram – 2 @ $56 = $112
41002 Medio-Line 1,000 gram – 3 @ $54 = $108
80005 Macro-Line 5 kg – 1 @ $107 = $107
80010 Macro-Line 10 kg – 1 @ $109 = $109

Other potential uses for these same funds could include replacing hand tools (ratchet and sockets, screw drivers, vise grips, pliers, Allen wrenches, crescent wrenches, hammer, etc.), WD-40, bailing wire, duct tape, electrical supplies (spark plugs, 12 and 14 gage wire for the boats, junction boxes, extra male & female plugs, wire nuts, fuses, Ohm meter, electrical tape), batteries (C, AA and AAA), camp stoves, lanterns, lantern mantles, small "pony" propane bottles for lanterns, Gott 5-gallon water jugs, shovels, 5-gallon buckets, cargo nets, fix chips or cracks in vehicle windshields, bulbs, lenses, and wiring to fix trailer lights and pigtails, new electrofishing spheres, wire rope for replacing electrofishing "witches brooms," Yeti 125-quart coolers, Dura-Frame electrofishing dip nets, 2-man dome tents, NRS Canyon Box for dry storage, Rite-In-The-Rain data sheets, data books, pencils, repair/replace river maps, etc.

Equipment Maintenance, Repair, & Replacement Sub Total	$ 3,142.00
	$ 6,791.00
USFWS-CRFP (Grand Junction) Total	$ 83,777.00
USFWS Region 6 Regional Office Administrative Overhead (3.00%)	$ 2,513.00
USFWS Region 6 Total	$ 86,290.00

Under the heading "Funding for participation of other agencies." Cost for participation of Utah Division of Wildlife Resources – Moab Field Office in FY-2015 nonnative removal activities.

FY 2015 Costs for UDWR- Moab (includes 3% increase from FY14 on all line items)

Labor: salary + benefits + applicable overtime (personnel services)

	Rate	Hours	Cost
Project Leader	$30.60	70	$2,142
Biologist	$30.79	242	$7,452
Technician	$17.48	351	$6,134
		subtotal	**$15,728**

Food and Transport (current expense)

	Rate	Quantity	Cost
Fleet Costs (2 trucks for 3% of total fleet costs)	$42,024.00	0.03	$1,261
Food (2 people, 10 days, 3 passes)	$40.17	60	$2,410
		subtotal	**$3,671**

Equipment (current expense)

	Rate	Quantity	Cost
Camping gear repair/replacement:			$366
Sampling gear repair/replacement:			$361
Boating gear repair/replacement:			$464
Fuel for generators (30 gallons/pass)	$4.12	90	$371
		subtotal	**$1,560**

Total Expenses	**$20,960**
Administrative Overhead (17% on all personnel services)	**$2,674**
Grand Total FY 2015	**$23,634**

Under the heading "Funding for participation of other agencies." Cost for participation of New Mexico Department of Game and Fish in FY-2015 nonnative removal activities.

Personnel/Labor Costs (State Salary + Benefits)		
Biologists - 20 @ $426/day		
(1 person x 5 days/trips x 4 trips)		$ 8,520.00
		$ 8,520.00
Travel and Per Diem (State Per Diem Rates)		
Per Diem – 16 days @ $85/day		$ 1,360.00
		$ 1,360.00
Equipment		
Vehicle Maintenance & Gasoline (@ $0.55/mile)		
(2,780 miles for 4 trips from Albuquerque to Farmington		
and associated shuttling of vehicles)		$ 1,529.00
		$ 1,529.00
NMDGF – Santa Fe	**Total**	**$ 11,409.00**
Administrative Overhead (10%)		**$ 1,141.00**
NMDGF – Santa Fe – Total Budget		**$ 12,550.00**

Under the heading "Funding for participation of other agencies." Cost for participation of American Southwest Ichthyological Researchers, LLC – Albuquerque, NM in FY-2015 nonnative removal activities

2015 BUDGET: SAN JUAN RIVER NONNATIVE FISH REMOVAL
Based on four sampling trips per year: Shiprock to Mexican Hat
(rates adjusted by 3% to account for inflation)

Personnel

Field Data Collection
Shiprock to Mexican Hat - RM 148.0 - 53.3
Fisheries Biologist (2 staff x 4 trips x 11 days x 8 hrs/day at $ 45.73/hr): ..... $ 32,194
Personnel: ..... Total $ 32,194

Materials and Supplies

Rafts and associated sampling gear supplied by USFWS
Personal camping gear (we will use gear from SJR larval fish project)
Materials and Supplies: ..... Total $ 0

Travel and Per Diem

Travel
Travel - (1 vehicle x 4 trips x 450 miles x $ 0.62/mile): ..... $ 1,116
(roundtrip Albuquerque to Farmington and return) [1]
Travel - (1 vehicle x 4 trips x 600 miles x $ 0.62/mile): ..... $ 1,488
(roundtrip Albuquerque to Montezuma Creek and return) [1]
[1] (Two "new" staff drive to Montezuma Creek on day six and replace the two staff that started the trip)

Per Diem
Per Diem - 1 hotel day per trip x 4 trips x 2 staff ($ 95/day): ..... $ 760
Per Diem - 9 field days per trip x 4 trips x 2 staff ($ 45/day): ..... $ 3,240
Travel and Per Diem: ..... Total $ 6,604

2015 Project Totals
Personnel: ..... Total $ 32,194
Materials and Supplies: ..... Total $ 0
Travel and Per Diem: ..... Total $ 6,604
Project Subtotal: ..... Total $ 38,798
IDC (20%): ..... Total $ 7,760

2015 Scope of Work: ..... GRAND TOTAL $ 46,558

Under the heading "Funding for participation of other agencies." Cost for participation of the Navajo Nation Department of Fish and Wildlife in FY-2015 nonnative removal activities.

Personnel/Labor Costs (Salary + Benefits)

Fish Biologist – 6 days @ $163.54/day (1 person x 3 days x 2 trips)	$ 981.24
Biological Technician – 6 days @ $89.54/day (1 person x 3 days x 2 trips)	$ 537.24

Sub-Total	$1,518.48
Fringe Benefits X 42.48%	$ 645.05
Total Personnel/Labor	**$ 2,163.53**

Travel (Vehicle shuttling)

Vehicle Lease/Maintenance & Gasoline $15.13/day X 12 days = $181.56 + 2 X 36miles X .30/mile=$21.60 (36 miles round trip from Fruitland, NM to Shiprock x 6 trips)	$ 203.16
Total Travel/Per Diem	**$ 203.16**
Sub-total with 3% added for inflation	$ 209.25

Equipment

Equipment Maintenance, Repair, & Replacement (e.g., life jackets, hip boots, generator repair, rubber gloves, dip nets, aluminum welding, raft repair, etc.)	$ 1,000
Total Equipment	**$ 1,000**
Sub-total with 3% added for inflation	$ 1,030

Navajo Nation Fish and Wildlife Total	**$3,402.78**
Navajo Fish and Wildlife Administrative Overhead (18.05%)	**$ 614.20**
Navajo Nation Total	**$4,016.98**

FY 2015 Scope of Work to Bureau of Reclamation:

Nonnative Species Control and Rare Fish Monitoring in the Lower San Juan River
Fiscal Year 2015 Project Proposal and Estimated Budget for 2015-2019

Principal Investigator: Brian Hines
Prepared by: Katie Creighton and Brian Hines
Utah Division of Wildlife Resources, Moab Field Station
1165 S. Hwy 191- Suite 4, Moab, Utah 84532
(435) 259-3782, (435) 259-3780
bhines@utah.gov, katherinecreighton@utah.gov

BOR Cooperative Agreement #

UDWR Moab Field Station: R13AC40007

Navajo Nation: R11AP40089

New Mexico Department of Game and Fish: 07FG402630

USFWS Grand Junction: R10PG40123

Reporting Dates: 10/1/2014 through 9/30/2015

Nonnative Species Control and Rare Fish Monitoring in the Lower San Juan River
Fiscal Year 2015 Project Proposal and Estimated Budget for 2015-2019

Principal Investigator: Brian Hines
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Background:

The lower San Juan River is particularly important in the recovery of the Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) since it contains typical nursery habitat similar to what is present on the Green and Colorado rivers. Within the past eight years, collections of endangered fish have been increasing in this section of river. The largest collection of razorback sucker larvae in 2002 was from Reach 2 (RM 21.2; Brandenburg et al. 2003) and the largest single collection of razorback sucker larvae in 2003 came from a backwater in Reach 1 at RM 8.1 (Brandenburg et al. 2004). Additionally, adult razorback sucker were found congregating around Slickhorn Rapid (RM 17.7) in the spring of 2002, apparently using this area for spawning (Jackson 2003). In spring of 2006, another congregation of adult razorback suckers and possible spawning area was located at river mile 23.4. Collections of adult Colorado pikeminnow in the San Juan River have been extremely rare. No wild adults have been collected since 2000 (Ryden 2003). From 2002 to 2004, Colorado pikeminnow adults and subadults, presumably from the 1996-1997 stocking efforts, have been found using the lower canyon (Reaches 1 and 2) of the San Juan River in the spring and summer (Jackson 2005). From 2003 to 2010, young-of-year Colorado pikeminnow stocked in the fall of the previous year near Farmington, NM, were also found using the lower portions of the San Juan River (Golden et al. 2005, Elverud 2009). Some of the most encouraging findings are the collections of two wild spawned Colorado pikeminnow larvae at RM 46.3 and 18.1 in 2004 (Brandenburg et al. 2005) and two wild spawn age 0 razorback sucker at RM 26.5 (Hines 2014).

Nonnative fish species remain prevalent in the lower San Juan River. Channel catfish (*Ictalurus punctatus*) and common carp (*Cyprinus carpio*) are typically the most abundant fish species collected during fall monitoring in Reaches 1 and 2 (Ryden 2003). Native and endangered fish are threatened by predation from adult channel catfish (Marsh and Brooks 1989, Brooks et al. 2000), and may compete for food and space with juvenile channel catfish. Additionally, Colorado pikeminnow have been found with channel catfish lodged in their throats in the San Juan (Ryden and Smith 2002, Elverud 2009, personal observation) and Green (McAda 1983, personal observation) rivers. Common carp tend to feed on larval fish and eggs (Cooper 1987). In the spring and summer of 2004, recently stocked razorback sucker and Colorado pikeminnow were found in the stomachs of two different channel catfish (Jackson, 2005).

Since 1995, many nonnative species including striped bass (*Morone saxatilis*) and walleye (*Stizostedion vitreum*) have been able to move into the San Juan River from Lake Powell. From 1988 to 1995, a waterfall at approximately RM 0 acted as a barrier between the San Juan River and Lake Powell, preventing species from moving upstream. During 1995, rising lake levels inundated the waterfall. When lake levels receded in the winter of 1996, the waterfall did not reappear. Striped bass, walleye and threadfin shad (*Dorosoma petenense*), not previously documented in the San Juan River before waterfall inundation, were collected during large bodied fish sampling (Ryden 2001). Since then, striped bass and walleye have been collected periodically until 2000 when large numbers were collected near Farmington, NM (approximately 166 river miles upstream of Lake Powell). Many native suckers were found inside the stomachs of these striped bass (unpublished data from San Juan River database). The San Juan River Recovery Implementation Program (SJRIP) determined in 2001 that control of striped bass and other nonnative species in the lower river was warranted. Utah Division of Wildlife Resources began nonnative fish control with the goal of removing striped bass and other nonnative species in the lower San Juan River, while documenting river and lake conditions that may correlate to striped bass movement out of Lake Powell. It was anticipated that these correlations would provide information for determining the most effective time to remove

striped bass. During 2002, Lake Powell water temperature was positively correlated with the highest catch of striped bass in June, in the lower San Juan River (Jackson, 2003). A new waterfall at RM –0.5 has prevented striped bass and other fish from moving from Lake Powell since 2003. No striped bass or walleye were observed in the lower San Juan River from 2003 to 2009. In 2006, two adult gizzard shad were captured below the waterfall indicating another possible nonnative fish of concern. In 2007, seine sampling below the waterfall collected hundreds of young-of-the-year gizzard shad below the waterfall. Additionally in 2007, 2008 and 2009, adult gizzard shad, striped bass and adult walleye were collected below the waterfall. Colorado pikeminnow and razorback suckers have also been collected during sampling efforts below the waterfall indicating loss of stocked endangered fish over the waterfall and the waterfall acting as a barrier to all fish attempting to move upstream.

Over 114,000 channel catfish and approximately 3,500 common carp were mechanically removed from the lower San Juan River from 2002 to 2013. A decrease in mean total length (TL) of channel catfish was observed between 2002 and 2013, indicating that removal efforts are causing a shift in the population size structure to smaller individuals. Additionally, shifts in sized structure of channel catfish have been reported further upstream (Davis 2005) and on a river-wide scale (Ryden 2005). Catch rate of adult channel catfish also decreased from 4.9 adult catfish per electrofishing hour in 2002 to 2.0 adult catfish per electrofishing hour in 2006 in the lower San Juan. Furthermore, similar shifts in yield and population structure have been observed in sport and commercial fisheries as the rate of exploitation increased (Bennet 1971; McHugh 1984, Pitlo 1997). Continued removal of all size classes of channel catfish in the San Juan River may eventually lead to decreased fecundity and a reduction of the overall population, therefore lessening the impact that these fish have on the native and endangered fish community.

A significant decline in catch rates of common carp was observed from 2002 to 2013. Between 2002 and 2013, catch rate of common carp decreased from over 5 fish per electrofishing hour to < 0.2 fish per electrofishing hour. However, it is unclear if this decline was directly related to removal efforts, the presence of the waterfall, or the low water conditions that have been present over the period of this project. It is probable that a combination of these factors is causative to some extent. The continuation of removal efforts for channel catfish and common carp will aid in the illumination of contributory factors and the evaluation of the success of this project and similar nonnative control efforts.

Over the course of this project, important monitoring information has been obtained on the progress of the endangered fish community as well. We have observed the apparent spawning aggregation of razorback sucker in spring 2002 at Slickhorn Rapid and collected some of the first wild spawned juvenile razorback sucker in 2003, 2004, and 2013. Since 2002, we have documented the distribution and abundance of Colorado pikeminnow and razorback sucker in the lower San Juan River stocked from 2002 to 2013. Preliminary population estimates for juvenile Colorado pikeminnow residing in the lower San Juan River were generated from 2004 to 2013 from recapture data. In 2004, we documented the first cases of channel catfish predation on stocked juvenile razorback sucker and Colorado pikeminnow in the San Juan River.

This work plan proposes the continuation of nonnative control and monitoring of endangered fishes in the San Juan River in accordance with the Long Range Plan (Element 3, Task 3.1.1.1; Element 4, Task 4.1.3.1). Some effort was shifted in 2014 from the lower canyon to the section between Montezuma Creek and Sand Island. This study will serve to determine the most effective time for removal actions. The presence of the waterfall at Piute Farms may provide a rare opportunity to concentrate on removal of other nonnative fish while influx from the lake is eliminated. Continuing monitoring and removal in the lower river above the waterfall will aid in removal efforts being conducted further upstream, and suppress predation and competition impacts on the endangered and native fish community by nonnative fish in the lower San Juan River. In addition, we propose to continue to monitor and document the progress of Colorado pikeminnow and razorback sucker in the lower San Juan River as well as the . Recapture data for juvenile Colorado pikeminnow collected during nonnative monitoring will serve in determining population size, growth and movement of these fish in the lower San Juan River.

Description of Study Area:

The study area for this project includes the San Juan River from Montezuma Creek (RM 93) to Mexican Hat (RM 53) and Mexican Hat (RM 53) to Clay Hills (RM 2.9), Utah. The river from Montezuma Creek to RM 67 is part of

Geomorphic Reach 3. Geomorphic Reach 2 goes from RM 68 to RM 16 and is primarily bedrock confined and dominated by riffle-type habitat. River mile 16 down to Clay Hills contains Geomorphic Reach 1 where the river is canyon bound with an active alluvial bed. Habitats within this section are heavily influenced by the shifting thalweg, changing river flow, and reservoir elevations. This section of river has been identified as important nursery habitat for native and endangered fish species.

Objectives

1.) Continue mechanical removal and monitoring of large-bodied nonnative species in the lower portion of the San Juan River from Mexican Hat to Clay Hills (six passes).

2.) Mechanically remove and monitor large-bodied nonnative species in the middle San Juan River from Montezuma Creek to Mexican Hat (three passes) (NEW TASK)

3.) Generate a population estimate of channel catfish by mark-recapture data from Mexican Hat to Clay Hills.

4.) Monitor distribution and abundance of endangered fish in the lower San Juan River.

5.) Generate a population estimate of juvenile Colorado pikeminnow (>150 mm) by mark-recapture data from Mexican Hat to Clay Hills.

Methods/Approach:

Mechanical removal of nonnative species will be conducted from Montezuma Creek to Clay Hills, Utah. Sampling effort will be conducted via two raft mounted electrofishing boats. The study area will be electrofished in a downstream fashion with one boat on each shoreline. Each boat will have one netter and one rower. Nine five-day passes with 6 people are anticipated. Timing and location of sampling will be dependent on catch rate from past data. Six passes will be conducted in the lower reach (Mexican Hat to Clay Hills) and three passes will be conducted in the upstream reach (Montezuma Creek to Mexican Hat). Spring effort (March-April) will focus on the lower reach while summer effort (July-August) will focus on the upstream reach. Data from the adult fall monitoring conducted by U.S. Fish and Wildlife Service- Grand Junction in September will be incorporated into data analysis. In an average water year, this schedule would allow for sampling a variety of habitat conditions, including variable flows, temperatures, and turbidity. In drought years, when downstream movement is hindered by low flows, electrofishing effort may be concentrated on areas with higher catch rates or trips will be increased to six days while reducing the number of trips to eight.

All nonnative fish collected will be identified, enumerated, measured to the nearest mm for total and standard length, weighed to the nearest gram, and removed from the river. Gender and reproductive status of lacustrine species will be determined and approximate location of capture by river mile recorded. Stomach contents of lacustrine species will be examined. Contents needing microscopic identification will be preserved. Any threatened and/or endangered fish encountered will be collected, identified, enumerated, measured to the nearest mm for total and standard length, weighed to the nearest gram, and scanned for a PIT tag. If a PIT tag is not present, one will be inserted. General condition of the fish will be recorded in addition to any parasites or abnormalities. All threatened and endangered fish collected will be returned to the river at the location in which they were caught. River mile and GPS coordinates will be recorded at the location in which threatened and endangered fish are collected. Catch rates for all fish will be calculated as number of fish caught per hour. Other native fish will not be netted.

Channel catfish collected during the first trip of the year will receive a floy tag and be returned to the river. Channel catfish collected on subsequent trips will be removed from the river. A Lincoln-Peterson population estimate will be generated for channel catfish captured during the first pass and recaptured in the second pass. Captures of channel catfish during subsequent trips will allow us to monitor ratios of marked to unmarked fish and use these ratios to calculate a rough population estimate thereafter. Ratios of marked fish to unmarked fish will help determine if assumptions of a closed population are being met.

Population estimates will be generated for juvenile Colorado pikeminnow (>150 mm) in the lower San Juan River using closed population models within program CAPTURE. Program CAPTURE will be used to determine confidence intervals around the estimate, the coefficient of variation, and the probability of capture. Population estimates between two passes will be calculated using the Lincoln-Peterson model. Conducting several trips in the lower San Juan River will allow for choosing the "mark" pass and the number of "recapture" passes. Use of different mark and recapture passes will allow for testing of the reality of the results generated. Furthermore, using several combinations of trips will allow for lessening the likelihood of violating assumptions of the models used.

General water quality parameters will be recorded including temperature, conductivity, salinity, and dissolved oxygen. Daily river discharge, temperature and turbidity will be compared to catch rates for striped bass to determine the relationship between river conditions and movement of these fish upstream.

Costs for other cooperating agencies that may provide personnel and equipment as needed are included in this budget.

Products/Schedule:

A draft report for the Nonnative Species Monitoring and Control in the Lower San Juan River activities will be prepared and distributed to the San Juan River Biology Committee for review by 31 March 2016 for 2015 field work completed. Historical information on nonnative fish species use of the lower San Juan River will be included; to the extent it is available. Upon receipt of written comments, that report will be finalized and forwarded to members of the San Juan River Biology Committee 1 June 2016. Electronic copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed.

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Nonnative Species Control and Rare Fish Monitoring in the Lower San Juan River Fiscal Year 2015 Project Budget. BOR Cooperative Agreement with UDWR: R13AC40007

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FY 2015 Costs for UDWR- Moab (includes 3% increase from FY14 on all line items)

Task 1. Six Passes- Mexican Hat to Clay Hills

Labor: salary + benefits + applicable overtime (personnel services)

	Rate	Hours	Cost
Project Leader	$30.60	120	$3,672
Biologist	$30.79	900	$27,714
Technician	$17.48	1800	$31,459
		subtotal	**$62,844**

Food and Transport (current expense)

	Rate	Quantity	Cost
Fleet Costs[a] (3 trucks for 18% of total fleet costs)	$42,024.00	0.18	$7,564
Food (6 people, 5 days, 6 passes)	$30.90	180	$5,562
Shuttle (3 trucks, 6 passes)	$185.40	18	$3,337
Out-of-state per diem (Biologist and Project Leader)	$48.41	9	$436
Hotel- Durango (Biologist and Project Leader)	$97.85	6	$587
		subtotal	**$16,464**

Equipment (current expense)

	Rate	Quantity	Cost
Camping gear repair/replacement[b]:			$2,326
Sampling gear repair/replacement[c]:			$2,245
Boating gear repair/replacement[d]:			$2,163
Fuel for generators (20 gallons/pass)	$4.12	120	$494
		subtotal	**$7,229**

Other

	Rate	Quantity	Cost
Swiftwater Rescue Training	$360.50	2	$721
		subtotal	**$721**

Task 1 subtotal	**$87,258**

Task 2. Three Passes- Montezuma Creek to Mexican Hat

Labor: salary + benefits + applicable overtime (personnel services)

	Rate	Hours	Cost
Project Leader	$30.60	89	$2,723
Biologist	$30.79	447	$13,764
Technician	$17.48	1035	$18,089
		subtotal	**$34,577**

Food and Transport (current expense)

	Rate	Quantity	Cost

Fleet Costs[a] (3 trucks for 7% of total fleet costs)	$42,024.00	0.07	$2,942
Food (6 people, 5 days, 3 passes)	$30.90	90	$2,781
Shuttle (3 trucks, 3 passes)	$82.40	9	$742
		subtotal	**$6,464**
Equipment (current expense)			
	Rate	**Quantity**	**Cost**
Camping gear repair/replacement[b]:			$1,171
Sampling gear repair/replacement[c]:			$1,004
Boating gear repair/replacement[d]:			$979
Fuel for generators (20 gallons/pass)	$4.12	60	$247
		subtotal	**$3,401**
Task 2 subtotal			**$44,442**
Total Expenses			**$131,700**
Administrative Overhead (17% on all personnel services)			**$16,562**
UDWR-Moab Total			**$148,261**
USFWS GJ Total			**$17,824**
NMFG Total			**$5,892**
Navajo Nation Total			**$9,397**
Grand Total FY 2015			**$181,374**

[a] The State of Utah motorpool vehicles cost approximately $6,800/year/vehicle (includes fleet rental, mileage, and gas), which is based on the average annual cost for all trucks used in our program.

[b] Includes, but is not limited to, tents, sleeping pads, toilet system, cookware, stoves, propane, charcoal, satellite phone and service, drybags, coolers, first aid supplies.

[c] Includes, but is not limited to dip nets, tags, tagging equipment, electrofishing units, electrofishing wiring, anodes, cathodes, generators, data loggers, etc…

[d] Includes, but is not limited to, raft repair/replacement, oars, oar hardware, raft frame repair, dry boxes, straps, etc…

[b,c,d] Estimated costs are based on actual costs from previous years plus an estimated 3% cost of living increase each year following.

Under the heading "Funding for Participating Agencies." Estimated costs for participation of the Navajo Nation Department of Fish and Wildlife, in FY-2015. BOR Cooperative Agreement Number with Navajo Nation: R11AP40089

Fiscal Year 2015 Estimated Budget: Navajo Nation (includes 3% increase)

FY 2015 Costs for Navajo Nation			
Personnel/Labor Costs (Salary+Benefits)	Rate	Quantity	
Fish Biologist	$158.78	14	$2,223
Bio Tech	$86.93	14	$1,217
Fringe Benfits (Labor Costs* 42.48%)	$43.75		$1,461
Subtotal			$4,901
Travel and Per Diem			
Hotel- (4 nights)	$72.10	4	$288
Camping Rate-(20 nights)	$29.87	20	$597
Vehicle Lease/Maintenance	$467.62	1	$468
Gasoline-(260 miles)	$0.62	260	$161
Subtotal			$1,514
Equipment			
Maintenance, Repair, Replacement	$1,545.00	1	$1,545
Subtotal			$1,545
Total Expenses			$7,960
Navajo Nation Administration Fees (18.05%)			$1,437
Navajo Nation FY15 Total			**$9,397**

Under the heading "Funding for Participating Agencies." Costs for participation of the New Mexico Game and Fish in FY 2015 BOR Cooperative Agreement Number with New Mexico Department of Fish and Game: 07FG402630

Fiscal Year 2015 Estimated Budget: New Mexico Game and Fish

FY 2015 Costs for New Mexico Game and Fish			
Personnel/Labor Costs (Salary+Benefits)	Rate	Quantity	
Fish Biologist	$360.50	12	$4,326
Subtotal			$4,326
Travel and Per Diem			
Per Diem	$87.55	12	$1,051
Gasoline-(260 miles)	$0.36	1400	$505
Subtotal			$1,555
New Mexico Game and Fish FY15 Total			**$5,881**

Participation in Non-native Species Control in the *Lower& Middle* San Juan River Fiscal Year 2015 Project Proposal 31 March 2014

Budget for Participation by U.S. Fish Wildlife Service, Colorado River Fishery Project (USFWS-CRFP)

Developed by:
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Contract or Agreement number(s): R10 PG 400023 (08-AA-40-2720)

Reporting Dates: 10/1/2014 through 9/30/2015

U.S. Fish Wildlife Service, Colorado River Fishery Project (USFWS-CRFP)
Budget for Participation in
Non-native Species Control in the *Lower* San Juan River
Fiscal Year 2015 Project Proposal
Updated: 28 March 2014 (by Ben Schleicher and Dale Ryden)

Principal Investigator:
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Fiscal Year 2015 Budget:

Costs for participation of the U.S. Fish Wildlife Service, Colorado River Fishery Project (USFWS-CRFP) office, Grand Junction, CO.
(Based on projected FY-2015 costs)

Personnel/Labor Costs (Federal Salary + Benefits)		
Principal Biologist (GS-11) – 80 hours @ $47.93/hr		$ 3,834.00
(1 person X 5 days/trip X 2 trips)		
Principal Biologist (GS-7) - 80 hours @ $32.72/hr		$ 4,090.00
(1 people X 5 days/trip X 2 trips)		
(+ 30 hours overtime at $49.08/hr = $1,472)		
Biological Technician (GS-5) – 80 hours @ $18.94/hr		$ 2,366.00
(1 people X 5 days/trip X 2 trips)		
(+ 30 hours overtime each at $28.41/hr = $852)		
	Sub Total	$ 10,290.00
Administrative Support (Federal Salary + Benefits)		
Administrative Officer (GS-9) – 23 hours @ $43.41/hr		$ 998.00
Project Leader (GS-14) -- 15 hours @ $80.99/hr		$ 1,215.00
	Sub Total	$ 2,213.00
Travel and Per Diem (Based on Published FY-2014 Federal Per Diem Rates)		
Hotel Costs		
2 nights X 3 people X $83/night (standard hotel rate)		$ 498.00
Per Diem (Hotel Rate)		
2 days X 3 people X $46/day (standard hotel rate)		$ 276.00
Per Diem (Camping Rate)		
10 days X 3 people X $28/day		$ 840.00
	Sub Total	$ 1,614.00
Equipment		
Vehicle Maintenance & Gasoline (GSA lease @ $345 = $11.50 per day based on 30 days in an "average" month + $0.31/mile)		
2 trips from Grand Junction, CO to Clay Hills boat take-out in Utah X 1 truck X 5 days per trip (camping)		550.00
(350 miles 1-way = 700 miles round trip X 2 trips) = $435		
(1 truck X 5 days/trip X 2 trips X		

$11.50/day) = $115	
Generator Gasoline for Electrofishing	
(20 gallons/trip X 2 trips @ $4.00/gallon)	$ 160.00
Equipment Maintenance, Repair, & Replacement	$ 2,475.00

Exact use of the money in this line item will vary from year to year depending on what equipment needs to be maintained, repaired, or replaced, but probable uses for this incurred cost include the following:

- Annual trailer maintenance & safety inspection = $175
  - Replace/repair trailer suspension, trailer lights, winch handle/straps/gears, trailer jack stand wheel bearings
- Replace trailer tires – 2 per year @ $100 each = $200
- Spark plugs for generators - 5 @ $7.50 each = $37.50
- Synthetic oil for generators - 5 quarts at $7.50 each = $37.50
- Generator repair/tune-up - 3 hrs @ $75/hr = $225
- Hip boots – 3 pair at $50/pair = $150
- Breathable chest waders - 4 pair @ $125/pair = $500
- Dura-Frame electrofishing dip nets – 3 @ $300 each = $900
- Stearns Type II life jackets – 3 @ $70 each = $210
- Electrical Gloves - 3 pairs @ $65/pair = $195
- Repair raft frame
  - Aluminum welding – 3 hours @ $150/hr = $450
- Restock raft repair kits
  - Raft glue (urethane/hypoalon) – Two 4-oz. cans @ $22.50/can = $55
- NRS raft patch material – 5 feet @ $37/ft = $185
- Acetone – 1 gallon @ $17/gallon = $17
- Replace any missing NRS HD-brand tie-down straps, each boat needs:
  - Ten 2-ft straps @ $4.20 each = $42
  - Five 3-ft straps @ $4.30 each = $21.50
  - Ten 4-ft straps @ $4.70 each = $47
  - Five 6-ft straps @ $5.05 each = $25.25
  - Five 9-ft straps @ $5.7 each = $28.50
  - Five 12-ft straps @ $6.15 each = $30.75
- Replace any missing D-style carabiners, each boat needs:
  - 10 @ $7.50 each = $75

Sub Total	$ 3,185.00
USFWS-CRFP (Grand Junction, CO) Total	$ 17,302.00
USFWS Region 6 Administrative Overhead (3.00%)	$ 519.00
USFWS Region 6 Total	$ 17,821.00

Sub-Adult and Adult Large-Bodied Fish Community Monitoring
Fiscal Year 2015 Project Proposal
3 April 2014

Principal Investigator:
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Contract or Agreement number(s):
Old =
R10 PG 40 021 (08-AA-40-2715) for USFWS – Grand Junction, CO
R10 PG 40 020 for USFWS – Albuquerque, NM
08 FG 40 2716 for UDWR – Moab, UT
Don't know if these are still the valid agreement numbers or not

Reporting Dates: 10/1/2014 through 9/30/2015

Sub-Adult & Adult Large-Bodied Fish Community Monitoring
(a.k.a. Adult Monitoring)
Fiscal Year 2015 Project Proposal
3 April 2014

Principal Investigator:
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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. These studies indicated that at least one of the two endangered fish species (i.e., Colorado pikeminnow) was still a viable member of the San Juan River fish community.

Between 1991 and 1998, the Main Channel Fish Community Monitoring study (called "Adult Monitoring" for short), greatly refined our understanding of the San Juan River fish community. The main sampling technique employed during the 1991-1998 Adult Monitoring study was raft-borne electrofishing, although radio telemetry was also heavily employed. Data collected during the 1991-1998 Adult Monitoring study provided information on specific habitat usage by rare fish species. In addition, data gathered during the 1991-1998 Adult Monitoring study aided in the selection of specific sites for detailed hydrologic measurements and larval drift sampling. Integration of 1991-1998 Adult Monitoring data along 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 a logical framework upon which to make flow recommendations for the reoperation of Navajo Reservoir that would benefit the San Juan River's endangered fishes (as well as other members of the native fish community).

The Sub-Adult & Adult Large-Bodied Fish Community Monitoring study (also referred to as Adult Monitoring), which began in 1999, is a direct offshoot of the 1991-1998 Adult Monitoring study. This study is one of a suite of long-term monitoring efforts detailed in the San Juan River Recovery Implementation Program's (SJRIP) Monitoring Plan and Protocols (SJRIP 2012) that are designed to help evaluate progress of the two endangered fish species towards recovery under the SJRIP's Long Range Plan (SJRIP 2013). The current Adult Monitoring study incorporates essentially the same monitoring protocols as did its 1991-1998 precursor study (e.g., sampling via raft-borne electrofishing). This allows for data collected during the current Adult Monitoring study to be validly combined with and compared to the older 1991-1998 Adult Monitoring data. The combination of these two data sets provides statistically-powerful, long-term trend data through which the SJRIP's Biology Committee can view changes in the San Juan River's large-bodied fish community over time. This long-term trend data allows the SJRIP Biology Committee to evaluate whether various management actions being implemented are having the desired effects on the San Juan River fish community. In addition, Adult Monitoring has proven to be an effective tool for monitoring populations of both stocked razorback sucker and Colorado pikeminnow.

Relationship to the Recovery Program

Adult Monitoring provides data for or makes possible (at least in part) the following Tasks under element numbers 1-5 of the Long Range Plan (SJRIP 2009): 1.1.1.1, 1.1.1.2, 1.2.1.1, 1.2.1.2, 1.2.2.1, 3.1.1.1, 3.1.1.3, 3.1.1.4, 3.1.1.7, 4.1.1.1, 4.1.1.2, 4.1.1.3, 4.1.2.3, 4.1.2.4, 4.1.2.5, 4.1.3.1, 4.1.5.1, 4.1.5.2, 4.1.5.3, 4.1.6.1, 4.3.1.1, 4.3.2.2, 4.3.3.1, 4.3.4.1, 4.3.4.2, and 4.3.4.3. The monitoring protocols discussed in the Methods section of this report reflect those that are currently included in the latest version of the revised SJRIP Monitoring Plan and Protocols (SJRIP 2012).

Description of Study Area

As per the latest version of the SJRIP Monitoring Plan and Protocols (SJRIP 2012) the study area for Adult Monitoring extends from river mile (RM) 180.0 (just downstream of the Animas River confluence in Farmington, NM), downstream to RM 77.0 (just upstream of the Sand Island boat launch near Bluff, UT). The river section from RM 77.0 downstream to RM 2.9 (Clay Hills boat launch, just upstream of Lake Powell in UT) is scheduled to be sampled every fifth year. So, that section of river should be sampled again in 2015.

In addition to sampling the lower San Juan River in 2015, three additional river sections in NM will be sampled. These three river sections would include: 1) the lower Animas River from the Penny Lane Landing downstream to the San Juan River; 2) the San Juan River from the Bloomfield Riverside Landing (RM 196.0) downstream to the McGee Park Landing (RM 188.7); and, 3) the McGee Park Landing downstream to the Animas River confluence.

Objectives

1) Annually, during autumn, document fish community structure, species abundance (presented as catch/time, CPUE) and distribution, and size structure among populations of both native and nonnative large-bodied fishes in San Juan River. Specific emphasis shall be placed upon monitoring the population parameters among the rare San Juan River fish species -- Colorado pikeminnow, razorback sucker, and roundtail chub (both wild and stocked fish).

2) Obtain data that will aid in the evaluation of the responses (e.g., year-to-year survival, reproduction, recruitment, growth, and condition factor) of both native and nonnative large-bodied fishes to management actions.

3) Continue to perform activities that support other studies and recovery actions being implemented by the SJRIP. These may include the following:
    a. Remove nonnative fish species which prey upon and may compete with native fish species in the San Juan River.
    b. Collect GPS waypoints in habitats where endangered Colorado pikeminnow and razorback sucker are collected.
    c. Collect tissue samples from various fish species for stable isotope, genetics, and contaminants studies.

Through the handling of large numbers of fish for other study objectives and because of its long-term dataset, Adult Monitoring provides chances to opportunistically observe and monitor other information on the San Juan River's large-bodied fish community. This includes, but is not limited to: 1) the incidence of disease and abnormalities among fish populations; 2) the distribution and abundance of nonnative white sucker and the rate of hybridization between this species and native sucker species; 3) hybridization rates among native sucker species, specifically the endangered razorback sucker and flannelmouth sucker; 4) negative interactions between channel catfish and native fish species, specifically endangered Colorado pikeminnow and razorback sucker; and, 5) documenting episodic events, such as the invasion of the San Juan River by fish species from Lake Powell or collecting rare, but potentially important fish species, such as grass carp.

Methods

Objectives 1-3: One Adult Monitoring trip will take place in the fall of 2015. This trip will sample from RM 196.0 (Bloomfield Riverside Landing) downstream to RM 2.9 (Clay Hills boat landing). Raft-borne electrofishing will be the primary sampling technique. Sampling will begin in the second to third week of September and will be concluded by the second to third week of October.

Electrofishing will follow the methods set forth above and in the SJRIP Monitoring Plan and Protocols (SJRIP 2012). Two oar-powered rafts, with one netter each, will electrofish in a continuous downstream fashion, with one raft on each shoreline. Netters will net all stunned fish that can possibly be collected, regardless of species or body size. Trailing or "chase" rafts will not be used to collect fish. No outboard motors will be used. Sampling crews will consist of approximately 8-10 people (4 for electrofishing, 2-3 for baggage rafts, and 2-3 for other research elements that are being done simultaneously with our sampling). Electrofishing will sample two out of every three miles (approximately 130 total sampled miles). All fish collected will be enumerated by species and life stage at the end of every sampled mile. Every fourth sampled mile (known as a "designated mile" or DM), all fish collected will be weighed and measured. All native fish collected will be returned alive to the river. All nonnative fish collected will be removed from the river. All nonnative predatory fishes (e.g. - walleye, striped bass, largemouth bass, smallmouth bass) collected will be weighed and measured, and may have stomach samples 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, razorback sucker, and roundtail chub greater than 200 mm TL will be implanted with 134 kHz PIT (Passive Integrated Transponder) tags. Notes will be kept on any parasites and/or abnormalities observed on collected fishes.

The U.S. Fish and Wildlife Service (USFWS) will assume the lead responsibility for Adult Monitoring trips and other cooperating agencies will provide personnel and equipment as needed. Costs for cooperating agencies are included in this budget.

Products

An interim progress report for Adult Monitoring data collected during 2015 is scheduled to be available by 31 March 2016. The final version of this interim progress report which incorporates comments received, is scheduled to be completed by 1 June 2016. Data files containing PIT tag information on the federally-listed endangered fish species (Colorado pikeminnow and razorback sucker) collected during this Adult Monitoring trip will be submitted for inclusion in the SJRIP's integrated database by 31 December 2015. Data files containing the remainder of the information (e.g., data on common fish species) collected during this Adult Monitoring trip will be submitted for inclusion in the SJRIP's integrated database by 31 March 2016.

Qualifications of Personnel Included in the Budget

Principal Biologist (GS-11) – Benjamin Schleicher, USFWS-CRFP

Ben has five years with the USFWS-CRFP performing fisheries research and management in the Colorado and San Juan River basins, leading crews on daily and multi-day trips dealing with endangered species population estimates, nonnative fish removal, and riverwide fish community monitoring. He also spent two years with the UDWR-Moab performing the same tasks in the Colorado, Green, and San Juan River basins. In summer 2012, Ben took over as principal fish biologist for Region 6 of the USFWS in charge of performing fisheries research and management associated with the San Juan River Recovery Implementation Program (SJRIP). Specific to the San Juan River Basin recovery Implementation Program, Ben has been involved in a number of areas including: 1) long-term augmentation and monitoring of the San Juan River's two endangered fish populations; 2) performing and analyzing the effects of nonnative fish removal operations; and, 3) performing razorback sucker surveys in Lake Powell. Ben co-authored the 2012 Sub-Adult and Adult Large-Bodied Fish Community Monitoring Adult Monitoring report and was sole author of this report in 2013. Ben also was a co-author of the 2011 and 2012 San Juan River arm of Lake Powel Razorback Sucker Survey reports. Ben took over as the USFWS's Region 6 representative on the SJRIP Biology Committee in May 2013.

Principal Biologist (GS-14) -- Dale Ryden, USFWS-CRFP
Dale has 24 years of experience performing fisheries research and management in the Colorado, Gunnison and San Juan rivers. For over 21 years, Dale was the principal fish biologist for Region 6 of the USFWS in charge of performing fisheries research and management associated with the San Juan River Recovery Implementation Program (SJRIP). During his involvement with the SJRIP, Dale's responsibilities have ranged across a number of areas including: 1) initial reintroduction efforts for razorback sucker in the mainstem San Juan River; 2) long-term augmentation and monitoring of the San Juan River's two endangered fish populations; 3) annually monitoring the riverwide distribution and abundance of the entire large-bodied fish community in the San Juan River; 4) determining habitat use and preference and locating spawning areas of stocked razorback sucker and both stocked and wild Colorado pikeminnow via radio-telemetry; and, 5) performing and analyzing the effects of nonnative fish removal operations. Dale has authored two peer-reviewed journal articles on his work in the San Juan River basin, as well as over 35 agency reports, and numerous augmentation plans and addendums. He co-authored a genetics management plan for the endangered Colorado pikeminnow and razorback sucker in the San Juan River and has been a contributing author to both the flow recommendations report for the reoperation of Navajo Reservoir and the long-term monitoring protocols document currently being used by the SJRIP. During the development of the flow recommendations document, Dale acted as the chairman for the Native Fishes Workgroup. He is the Project Leader for the Colorado River Fishery Project off ice in Grand Junction, CO. From 2011-2013, Dale was the USFWS's Region 6 representative on the SJRIP Biology Committee. In May 2013, Dale became the USFWS's Region 6 representative on the SJRIP Coordination Committee.

Biological Technician Crew Leader (GS-6) – Brendan Crowley, USFWS-CRFP
Brendan has six years with the USFWS-CRFP preforming fisheries research and management in the Colorado and San Juan River Basins. He has led single and multi-day trips conducting sampling for endangered and other native fishes, as well as conducting non-native fish removal efforts. In addition to leading crews, Brendan leads annual efforts to salvage endangered and other native fishes from irrigation canals in the area of Grand Junction, CO after the canals as they are dewatered each fall. He also assists biologists at the Ouray National Fish Hatchery – Grand Valley Unit with day to day operations and fish culture.

Biological Technicians (GS-5) – USFWS-CRFP
All have at least a BS degree in biology. Depending upon the individual, they have up to 3 years of experience performing fisheries research and management in the Colorado River Basin, including the San Juan River.

Projected Duration Of Project
The Adult Monitoring study began in 1991 (see Introduction for details). It has continued, annually, with a consistent sampling regime every year since that time. This has allowed for the compilation of one of the longest-running and most statistically powerful fisheries databases available to the SJRIP. The Adult Monitoring study was modified with just very slight changes (e.g., a reduction in sampling frequency from every RM to two out of every three RM's) when it was incorporated as an integral part of the long-
term San Juan River Monitoring Plan and Protocols (Propst et al. 2000) and a second time (to sample only RM 180.0-77.0) with the development of the SJRIP's Monitoring Plan and Protocols (SJRIP 2012). The suite of long-term monitoring studies are scheduled to run through the termination of the San Juan River Recovery Implementation Program.

Literature Cited
San Juan River Basin Recovery Implementation Program. 2012. San Juan River Basin Recovery Implementation Program Monitoring Plan and Protocols. San Juan River Basin Recovery Implementation Program, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

San Juan River Basin Recovery Implementation Program. 2012. Long-Range Plan. San Juan River Basin Recovery Implementation Program, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Fiscal Year 2015 Budget

Costs for participation of the U.S. Fish Wildlife Service, Colorado River Fishery Project (USFWS-CRFP) office, Grand Junction, CO.

(Based on projected FY-2015 costs)

Note: When the FY-2014 workplan for Adult Monitoring was developed (in March 2013), the extra 5 days required to sample the lower San Juan River was not included in the FY-2015 budget. The FY-2015 budgets seen below include that extra 5 days of work for both USFWS-CRFP and cooperating agencies. We haven't changed the USFWS-CRFP FY-2016 to FY-2018 outyear budgets from what was originally submitted in the FY-2014 workplan (developed in March 2013), since they are based on the same number of days sampling and sampling of the same river sections as was the FY-2014 workplan.

Personnel/Labor Costs (Federal Salary + Benefits)

Objectives 1-3: Logistics, Electrofishing, Removal of Nonnative Fish

Principal Biologist (GS-11) – 256 hours @ $47.93/hr	$ 12,270.00
(1 person X 10 days planning & organization)	
(1 person X 4 days/trip X 1 trip – work from hotel)	
(1 person X 15 days/trip X 1 trip – camping)	
(1 person X 3 days/trip X 1 trip – work from hotel)	
Bio. Tech. Crew Leader (GS-6) - 152 hours @ $31.81/hr	$ 7,936.00
(1 person X 4 days/trip X 1 trip – work from hotel)	
(1 person X 15 days/trip X 1 trip – camping)	
(+ 65 hours overtime at $47.72/hr = $3,101.00)	
Biological Technicians (GS-5) – 528 hours @ $18.94/hr	$ 14,573.00
(3 person X 4 days/trip X 1 trip – work from hotel)	
(3 person X 15 days/trip X 1 trip – camping)	
(+ 67 hours overtime each at $28.41/hr = $3,806.00)	
(3 person X 3 days/trip X 1 trip – work from hotel)	
(+ 9 hours overtime each at $28.41/hr = $767.00)	
Sub Total	$ 34,779.00

Permitting; Coordination; Data Input, Analysis, Management & Presentation; Report Writing; Office & Administrative Support (Federal Salary + Benefits)

Administrative Officer (GS-9) – 200 hours @ $43.41/hr	$ 8,682.00
Principal Biologist (GS-11) – 400 hours @ $47.93/hr	$ 19,172.00
Project Leader (GS-14) – 320 hours @ $80.99/hr	$ 25,917.00
Sub Total	$ 53,771.00

Travel and Per Diem (Based on Published FY-2013 Federal Per Diem Rates)

Hotel Costs	
15 nights @ $83/night (in Farmington, NM)	$ 1,245.00
5 nights @ $109/night (in Cortez, CO)	$ 545.00
12 nights @ $83/night (in Farmington, NM)	$ 996.00
Per Diem (Hotel Rate)	
3 days X 5 people X $46/day (in Farmington, NM)	$ 690.00
1 days X 5 people X $51/day (in Cortez, CO)	$ 255.00
3 days X 4 people X $46/day (in Farmington, NM)	$ 552.00
Per Diem (Camping Rate)	
15 days X 5 people X $28/day	$ 2,100.00
Sub Total	$ 6,383.00

Equipment and Supplies

Vehicle Maintenance & Gasoline (@ $354/month lease = $11.80 per day based on 30 days in an "average" month + $0.32/mile)

1 trip from Grand Junction, CO to Farmington, NM X 1 truck X 6 days/trip – work from hotel — $ 443.00
- (296 miles one-way = 592 miles round-trip) = $189
- (+ 70 miles shuttling/day X 5 days = 350 miles) = $112
- (2 truck X 6 days/trip X 1 trip X $11.80/day) = $142

3 additional days sampling on lower Animas River and San Juan River upstream of Animas confluence – work from hotel — $ 129.00
- (30 miles/day X 3 days X 2 trucks = 180 miles) = $58
- (2 trucks X 3 days X 11.80/day) = $71

1 trip from Grand Junction, CO to Cortez, CO to Shiprock, NM to Mexican Hat, UT and back to Grand Junction, CO X 2 trucks X 10 days per trip – camping portion — $ 627.00
- (610 miles/trip X 1 trip X 2 trucks = 1,220 miles) = $391
- (2 trucks X 10 days/trip X 1 trip X $11.80/day) = $236

Generator Gasoline

(50 gallons/trip X 1 trip @ $4.00/gallon) – work from hotel — $ 200.00
- 5 days @ 5 gallons/day X 2 raft X 1 trip

(30 gallons/trip X 1 trip @ $4.00/gallon) – work from hotel: 3 additional days sampling on lower Animas River and San Juan River upstream of Animas confluence — $ 120.00
- 3 days @ 5 gallons/day X 2 raft X 1 trip

(120 gallons/trip X 1 trips @ $4.00/gallon) – camping portion — $ 480.00
- 4 days @ 5 gallons/day X 1 raft X 1 trip
- 5 days @ 5 gallons/day X 4 rafts X 1 trip

Equipment Maintenance, Repair, & Replacement — $ 5,044.00

Exact use of the money in this line item will vary from year to year depending on what equipment needs to be maintained, repaired, or replaced, but use of these funds for a "typical" field season for one study would include the following:

- Annual trailer maintenance & safety inspection = $175
- Replace/repair trailer suspension, trailer lights, winch handle/straps/gears, trailer jack stand wheel bearings
- Replace trailer tires – 2 per year @ $100 each = $200
- Spark plugs for generators – 5 at $7 each = $35
- Synthetic oil for generators - 5 quarts at $7 each = $35
- Generator repair/tune-up - 5 hrs @ $75/hr = $375
- Hip boots – 2 pair at $50/pair = $100
- Breathable chest waders - 2 pair @ $125/pair = $250
- Stearns Type III life jackets – 3 @ $70 each = $210
- Electrical Gloves - 3 pairs @ $65/pair = $195
- Dura-Frame electrofishing dip nets – 2 @ $300 each = $600
- Raft trailer maintenance
  - Signal light pigtail adapters – 2 @ $30 each = $60
- Repair raft frame
  - Aluminum welding – 3 hours @ $150/hr = $450
- Raft repair kits
  - Raft glue (urethane/hypalon) – Four 4-oz. cans @ $22.50/can = $90
  - NRS raft patch material – 5 feet @ $37/ft = $185

Acetone – 1 gallons @ $17.50/gallon = $17.50
Toluene – 1 gallon @ $17.50/gallon = $17.50

Replace any missing NRS HD-brand tie-down straps, each boat needs:
Ten 2-ft straps @ $4.20 each = $42
Five 3-ft straps @ $4.30 each = $21.50
Ten 4-ft straps @ $4.70 each = $47
Five 6-ft straps @ $5.05 each = $25.25
Five 9-ft straps @ $5.7 each = $28.50
Five 12-ft straps @ $6.15 each = $30.75

Replace any missing D-style carabiners, each boat needs:
10 @ $7.50 each = $75

Mesh rig bag – 1 @ $50 each = $50

Yeti 125-quart coolers – 1 @ $500 each = $500

Rafting oars, oar blades, and oar rowing sleeves
Carlisle 10-foot oar shafts – 2 @ $90 each = $180
Carlisle Oars blades – 4 @ $65 each = $260
Oar sleeves – 4 @ $12 each = $48

5-gallon plastic gasoline jerry cans – 5 @ $20 each = $100

River bags
NRS 3.8 heavy-duty Bill's Bag – 1 @ $100 each = $100
Clavey (green 7 X 17) dry bag – 3 @ $22 each = $66
Clavey (blue 10 X 24) dry bag) – 4 @ $26 each = $104

20 lb. propane tanks – 3 @ $20 each = $60

Pesola brand spring scales
20010 Micro-Line 10 gram – 1 @ $50 = $50
20060 Micro-Line 60 gram – 1 $46 = $46
20100 Micro-Line 100 gram – 1 @ $46 = $46
40300 Medio-Line 300 gram – 1 @ $54 = $54
40600 Medio-Line 600 gram – 1 @ $54 = $54
42500 Medio-Line 2,500 gram – 2 @ $56 = $112
41002 Medio-Line 1,000 gram – 3 @ $54 = $108
80005 Macro-Line 5 kg – 1 @ $107 = $107
80010 Macro-Line 10 kg – 1 @ $109 = $109

Other potential uses for these same funds could include replacing hand tools (ratchet and sockets, screw drivers, vise grips, pliers, Allen wrenches, crescent wrenches, hammer, etc.), WD-40, bailing wire, duct tape, electrical supplies (12 and 14 gage wire for the boats, junction boxes, extra male & female plugs, wire nuts, fuses, Ohm meter, electrical tape), batteries (C, AA and AAA), camp stoves, lanterns, lantern mantles, small "pony" propane bottles for lanterns, Gott 5-gallon water jugs, shovels, 5-gallon buckets, cargo nets, fix chips or cracks in vehicle windshields, bulbs, lenses, and wiring to fix trailer lights and pigtails, new electrofishing spheres, wire rope for replacing electrofishing "witches brooms," 2-man dome tents, NRS Canyon Box for dry storage, camping kitchen gear (roll-up camp tables, anodized dutch ovens, plates, bowls, cups, silverware), data books, Rite-In-The-Rain data sheets, pencils, repair/replace river maps, etc.

Sub Total	$ 7,043.00
USFWS-CRFP (Grand Junction, CO) Total	$101,976.00
USFWS Region 6 Administrative Overhead (3.00%)	$ 3,059.00
USFWS Region 6 Total	$105,035.00

Funding for Participation by Other Agencies: (These figures are submitted to USFWS-CRFP by the listed cooperating agencies)

USFWS-NMFWCO - Albuquerque, NM (Region 2)	
See Attached Budget for Line Item Breakdowns	$ 15,406.00
Utah Division of Wildlife Resources - Moab, UT	
See Attached Budget for Line Item Breakdowns	$ 6.623.00
	$ 22,029.00

FY-2015 WORKPLAN TOTAL	**$127,064.00**

Under the heading "Funding for participation of other agencies." Cost for participation of the U.S. Fish and Wildlife Service, New Mexico Fish and Wildlife Conservation Office, NM in FY-2015.

Personnel/Labor Costs (Federal Salary + Benefits)

Fish Biologist (GS-9)– 16 days @ $306/day	$ 4,896
(1 person x 16 days x 1 trip; Shiprock to Clay Hills)	
Biological Science Tech (GS-8) – 19 days @ $348/day	$ 6,612
(1 person x 16 days x 1 trip; Shiprock to Clay Hills)	
(1 person x 3 days x 1 trip; Animas to Shiprock)	
Supervisory Fish Biologist (GS-13) – 2 days @ $544/day	
(Project participation oversight and contract management)	$ 1,088
Administrative Officer (GS-9) – 1 day @ $314/day	$ 314
Sub Total	**$ 12,910**

Travel and Per Diem (Based on Published FY-2014 Federal Per Diem Rates)

Hotel Costs – 2 nights	$ 218
(1 night x 2 rooms @ $109/night; Cortez, CO)	
Per Diem	
Camping Rate - 28 days @ $29/day	$ 812
(2 people x 14 days x 1 trip)	
Hotel Rate – 2 days @ $46.00/day	$ 92
Sub Total	**$ 1,122**

Equipment

Vehicle Maintenance & Gasoline (@ $0.56/mile)	
(660 miles round trip from Albuquerque, NM to Blanding, UT + 100 miles shuttling)	$ 425
Equipment Maintenance, Repair, & Replacement	
(e.g., life jackets, hip boots, generator repair, rubber gloves, dip nets, aluminum welding, raft repair, etc.)	$ 500
Sub Total	**$ 925**

USFWS-NMFWCO (Albuquerque) Total	**$ 14,957**
USFWS Region 2 Regional Office Administrative Overhead (3%)	**$ 449**
USFWS Region 2 Total	**$ 15,406**

Under the heading "Funding for participation of other agencies." Cost for participation of the Utah Division of Wildlife Resources, Moab, UT in FY-2015.

UDWR Budget FY-2015

Labor: salary + benefits + applicable overtime (personnel services)

	Rate	Hours	Cost
Project Leader	$30.60	0	$0
Biologist	$30.79	60	$1,848
Technician	$17.48	120	$2,097
		subtotal	**$3,945**

Food and Transport (current expense)

	Rate	Quantity	Cost
Fleet Costs (2 trucks for 1.5% of total fleet costs)	$42,024.00	0.015	$630
Food (1 person, 15 days, 1 pass)	$40.17	15	$603
Out-of-state Per Diem (travel day)	$46.35	1	$46
Hotel (Cortez, CO- GSA Rate)	$79.31	1	$79
		subtotal	**$1,359**

Equipment (current expense)

	Rate	Quantity	Cost
Camping gear repair/replacement:			$155
Sampling gear repair/replacement:			$155
Boating gear repair/replacement:			$155
Fuel for generators	$4.12	45	$185
		subtotal	**$649**

Total Expenses	**$5,952**
Administrative Overhead (17% on all personnel services)	**$671**
Grand Total FY 2015	**$6,623**

Small-Bodied Fishes Monitoring
Fiscal Year 2015 Statement of Work and Project Budget
Agreement Number: SJ2631

Principal Investigators: Eliza Gilbert and Michael Ruhl
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Background

In 1991, the San Juan River Seven-Year Research Program was initiated. Subsequently, in 1992, the Research Program was placed under the auspices of the San Juan River Basin Recovery Implementation Program (SJRIP). The Research Program involved a variety of activities designed to characterize the status of the resident fish community (particularly the federally-protected Colorado pikeminnow *Ptychocheilus lucius* and razorback sucker *Xyrauchen texanus)*; to identify and quantify those factors (biotic and abiotic) that may be limiting protected fish species, as well as other native fish species; and to identify management and conservation activities that may contribute to recovery of protected species. Much of the research begun under the Seven-Year Research Program has been completed and a variety of management and conservation activities initiated.

The SJRIP drafted the Long Range Implementation Plan to guide and provide a means of evaluating progress towards achieving species recovery. It was designed to provide for "adaptive management" wherein research and particularly management or conservation activities were modified to reflect new information. To aid in the practice of adaptive management, the Long Range Plan identified monitoring of the San Juan River native and nonnative fish populations as a necessary components to "evaluate management actions and to document the [SJRIP's] progress toward achieving species recovery" (Element 4).

The SJRIP Monitoring Plan and Protocols was initially implemented in 1999 based on protocols developed for specific life stages and abiotic factors (Propst et al. 2000). The monitoring protocols contained herein are the third revision to the Monitoring Plan and Protocols (2009 Monitoring Plan and Protocols Workshop). To aid in the evaluation of achievement of these SJRIP goals, the following Monitoring Plan and Protocols' goals were developed:

1. Track the status and trends of San Juan River's fish community.
2. Track changes in abiotic parameters, including water quality, channel morphology, and habitat, important to the fish community.
3. Evaluate endangered fish species progress towards recovery.
4. Evaluate the effect of management actions, especially endangered fish stocking, non-native fish removal, and mimicry of the natural flow regime on the populations of native and non-native fishes in the San Juan River.

Meeting these goals will be accomplished by achieving the following objectives. Objectives are listed as they relate to each of the following SJRIP Monitoring Plan and Protocol goals.

1. Annually, during autumn, document occurrence and density of native and nonnative small-bodied fishes in San Juan River.

2. Document primary channel shoreline and near-shoreline, secondary channel, and backwater mesohabitat use by age-0 Colorado pikeminnow, razorback sucker, and roundtail chub, as well as other native and nonnative fishes.
3. Obtain data that will aid in the evaluation of the responses (e.g., reproduction, recruitment, and growth) of native and nonnative fishes to different flow regimes and other management actions (e.g., impediment modification).
4. Track trends in species populations (e.g., abundance, relative condition, and size structure).

The monitoring protocols detailed herein were developed from methodologies used during the Seven-Year Research effort and subsequent modifications as developed and accepted by the SJRIP. These methods were based upon published literature, the professional experience of each researcher, peer discussions and review, and project evaluations.

Study Area

The study area for annual small-bodied fishes monitoring, covering this statement of work, extends from River Mile 180.6 (Animas and San Juan rivers confluence, near Farmington, New Mexico) downstream to River Mile 2.8 (Mexican Hat, Utah).

Methods

Small-bodied fishes monitoring is designed to sample efficiently and effectively those habitats having the greatest likelihood of supporting age-0 individuals of large-bodied species and all age classes of small-bodied species. During autumn, primary shoreline and near-shoreline, secondary channel, and backwater habitats of the San Juan River will be sampled at 3-mile intervals from the Animas-San Juan rivers confluence (RM 180.6) to San Island (RM 76.4). At each sample location (except backwaters), all mesohabitats present (8 to 10) will be sampled with 3.0 x 1.2 m (3 mm mesh) seine. For backwaters, a minimum of two samples will be obtained; one seine haul will be made across backwater mouth and a second will be made parallel to its long axis. Additional seine hauls may be made if deemed appropriate by sampling crew. All specimens obtained from a mesohabitat will be identified to species; specimens of uncertain identity will be retained for later identification. After measurement (mm total length), all identified native fishes will be released. If a rare fish is collected, and it is of sufficient length (>150 mm TL), it will receive a uniquely numbered PIT tag. Total (mm TL) and standard (mm SL) lengths and mass (g) will be obtained from each rare fish captured. All nonnative specimens collected from a mesohabitat will be retained or destroyed. Fish data will be recorded by mesohabitat from each sampled area. Sampling effort will be reported as number of individuals captured per unit area. After fish collection, area, depth, and cover of sampled mesohabitats will be determined. With 8 to 10 samples per site, a total of 280 to 350 primary channel, 160 to 200 secondary channel (assuming 20 side channels are present), and 20 backwater (assuming 10 backwaters are present) samples will be obtained each year.

Geographic coordinates (UTM Zone 12, NAD 83) for each site will be recorded. Basic water quality parameters (water temperature, dissolved oxygen, conductivity, specific conductance, and salinity) will be measured at each site.

The San Juan River between San Island (RM 76.4) and Clay Hills Crossing (RM 2.9) is sampled every fifth year. Sampling procedures in these lower reaches are the same as those between Animas-San Juan rivers confluence and Sand Island. This lower reach was sampled in 2010 and will be sampled again in 2015.

Annual reports will be primarily a summation of data obtained each year, a synthesis of data across years to document and assess species population responses to environmental variables (mainly discharge), a summary of mesohabitat associations of fishes, and basic characterizations of species demographics (population size and age structure, recruitment, and survival). In addition to annual narrative reports, all data collected will be recorded on electronic spreadsheets and provided to USFWS Program Office in a format determined by the database manager and principal investigator, by June 30 of the year following data collection.

Additional Sampling for Sites Modified to Increase Habitat Complexity (The Nature Conservancy sites)

Incorporated into this year's annual monitoring of small-bodied fish will be the second year sampling newly modified habitat. Six secondary channels were modified during the fall of 2012 through excavation of sediment and removal of non-native plants. The location and length of channels re-opened are:

1. River Mile 132.2 - 6,600 feet in length
2. River Mile 132.0 – 2,000 feet in length
3. River Mile 130.7A – 1,500 feet in length
4. River Mile 130.7B – 700 feet in length
5. River Mile 128.6 - 3,700 feet in length
6. River Mile 127.2 – 3,700 feet in length
7. Additional sites - River Mile(s) to be determined as site selection still underway. Modification of channels to be conducted by The Nature Conservancy and Keller-Bliesner Engineering in the fall of 2014.

Methods used to sample secondary channels (as described in the Methods section above) will be used to sample these sites. The SJRIP Habitat Monitoring Program will be determining reference sites. These sites will also be sampled by for small-bodied fishes. Data analysis will include comparisons between the fish community present in these newly re-opened side channels and reference sites.

Additional Sampling on the Animas River and/or on the San Juan River above its confluence with the Animas River (Upstream sites).

The SJRIP recently began augmenting populations of razorback sucker and Colorado pikeminnow in the Animas River and San Juan River upstream of its confluence with the Animas River. Prior to 2012, no monitoring of these sections of river was underway. In 2012 and 2013, the upper portion of the San Juan River was sampled from the Bloomfield Riverside Landing (RM 196.0) downstream to the McGee Park Landing (RM 188.7) and from the McGee Park Landing downstream to the Animas River confluence. Small-bodied monitoring did not occur on the Animas River upstream from the Penny Lane Landing downstream to the San Juan River due to low water (2012) and inaccessibility (2013). Both of these sites will be monitored in 2015 given water conditions and adequate launching sites allow sampling to occur.

References

Golden, M.E. and P.B. Holden. 2005. Retention, growth and habitat use of stocked Colorado pikeminnow in the San Juan River 2003-2004: Annual report. Prepared by BIO-WEST, Inc. for the San Juan River Basin Recovery Implementation Program, U.S. Fish and Wildlife Service, Albuquerque, New Mexico. PR 874-2: 87 p.

Propst, D.L., S.P. Platania, D.W. Ryden, and R.L. Bliesner. 2000. San Juan River Monitoring plan and protocols. San Juan Recovery Implementation Program, U.S. Fish and Wildlife Service, Albuquerque, NM.

Funding History:

Fiscal Year 2000	$57,200	Fiscal Year 2010	$89,479
Fiscal Year 2001	51,700	Fiscal Year 2011	82,929
Fiscal Year 2002	51,700	Fiscal Year 2012	83,417
Fiscal Year 2003	49,775	Fiscal Year 2013	92,353
Fiscal Year 2004	63,545	Fiscal Year 2014	84,307
Fiscal Year 2005	72,645		
Fiscal Year 2006	72,885		
Fiscal Year 2007	81,246		
Fiscal Year 2008	91,882		
Fiscal Year 2009	89,479		

FY 2015 Budget

Field

Personnel

Tasks - Annual monitoring primary channel, secondary channel, and backwater habitats, San Juan River, Farmington, NM to Mexican Hat, UT; The Nature Conservancy and upstream sites; 19 field days projected at 12 hours of work per day = 228 hours

Project Leader (1)

124 hrs regular	124 hrs
$33.58/hr (base salary) + $10.76 (benefits)	$44.33/hr
104 hrs overtime	104 hrs
$44.33/hr * 1.5 (time-and-a-half)	$66.50/hr
	$12,412.92

Project Biologists (3)

124 hrs regular	124 hrs
$26.90/hr (base salary) + $8.61(benefits)	$35.51/hr
88 hrs overtime	104 hrs
$35.51/hr * 1.5 (time-and-a-half)	$53.26/hr
	$9,942.28

TOTAL PERSONNEL **$22,355.20**

Per Diem

12 days/project biologist (in-state rate) for 4 biologists - $85.00/day (standard NM in-state rate)	$4,080.00
7 days/project biologist (out-of-state rate) for 4 biologists -$115.00/day (standard NM in-state rate)	$3,220.00
TOTAL PER DIEM	**$7,300.00**

Vehicles (2)

Round-trip Farmington/Shiprock, NM	
2000 miles @ $0.55/mile	$1,110.00
Round-trip to Mexican, Utah ($0.55/mile)	
1280 miles @ $0.55/mile	$ 704.00
TOTAL VEHICLE	**$1,804.00**

Field Equipment & Supplies

Water quality instrument maintenance 2@$400	$ 800.00
Life Jackets 5@$40	$ 200.00
Raft maintenance	$ 500.00
Whirlpacks (500) @ $50.00/500	$ 50.00
Formalin (30 gal) @ $25/5gal	$ 150.00
TOTAL EQUIPMENT & SUPPLIES	**$1,700.00**

TOTAL FIELD $33,159.20

Specimen Management

Personnel

Project Biologists (2)

Tasks—processing (sorting, identification, and data-entry). Since 2000, annual monitoring collections averaged of 31,000 specimens (retained and/or released) although the last two years of collection have resulted in lower numbers of fish captured. Approximately 18 hours per day of sampling may be required to process data and specimens retained in the laboratory.

15 days of sampling at 18 hrs each	540 hrs[1]
$26.90/hr (base salary) + $8.61(benefits)	$35.51/hr

TOTAL SPECIMEN MANAGEMENT $19,175.40

Data Synthesis and Report Preparation

Personnel

Project Leader (1)

Tasks—data analysis, data synthesis, report drafting, report review, and report revision.

120 hrs	120 hrs
$33.58/hr (base salary) + $10.76 (benefits)	$44.33/hr
TOTAL PROJECT LEADER SALARY	**$5,319.60**

Project Biologists (2)

Tasks—data management, data QA/QC, data analysis, data synthesis, table and graph preparation, report drafting, and report revision.

200 hrs ea.	400 hrs
$26.90/hr (base salary) + $8.61(benefits)	$35.51/hr

TOTAL PROJECT BIOLOGISTS SALARY
$14,204.00

TOTAL DATA SYNTHESIS & REPORT PREPARATION $19,523.60

[1] Additional 5 days of sampling not added to lab work as traditionally this section of river has fewer fish.

Reviews and Meetings

Personnel

Project Leader (1)

Tasks—2 Biology Committee meetings @28 hrs. ea; report review (40)	86 hrs
$33.58/hr (base salary) + $10.76 (benefits)	$44.33/hr
TOTAL PROJECT LEADER SALARY	**$3,812.38**
Project Biologists (1)	
Tasks—5 Biology Committee @28 hrs. ea(140 hrs); report review (60 hrs)	200 hrs
$26.90/hr (base salary) + $8.61(benefits)	$35.51/hr
TOTAL PROJECT BIOLOGISTS SALARY	**$7,102.00**
TOTAL SALARY	**$10,914.38**

Per Diem - meetings requiring travel

Project Biologists (1) (includes 3 Biology & 1 Coordination Committee meetings)	
3days @ $85.00/day (standard NM in-state rate)	$255.00
9 days @ $115.00/day (standard NM out-of-state rate)	$1035.00
Project Leader (1) (includes 1 Biology & 1 Coordination Committee meetings)	
6 days @ $115.00/day (standard NM out-of-state rate)	$690.00
TOTAL PER DIEM	**$1980.00**

Travel

Vehicle	
1 Biology & Coordination Committee meetings (Farmington)	
400 miles@ $0.55/mile (standard NM rate)	$220.00
3 Biology & Coordination Committee meetings (Durango)	
500 miles ea. = 1500 miles @ $0.55/mile (standard NM rate)	$825.00
TOTAL VEHICLE	**$1,045.00**
TOTAL REVIEWS & MEETINGS	**$13,849.38**

Administrative

Personnel

Secretary/Clerk Duties

Tasks—purchasing, travel arrangements.

Project Biologist (1)	80 hrs
$26.90/hr (base salary) + $8.61(benefits)	$35.51/hr

SECRETARY/CLERK SALARY
$2,840.80

Grant and Budgeting

Tasks - administration of agreements, tracking budget expenditures

Project Leader (1)	120 hrs
$33.58/hr (base salary) + $10.76 (benefits)	$44.33/hr

GRANT AND BUDGETING	**$5,319.60**
TOTAL ADMINISTRATIVE	**$8,160.40**

FY 2015 TOTAL	**$93,867.98**[2]
Field Work	**$33,159.20**
Specimen Management	**$19,175.40**
Data Synthesis and Report Preparation	**$19,523.60**
Reviews and Meetings	**$13,849.38**
Administrative	**$ 8,160.40**

[2]Budget reflects a 3% increase in salaries from fiscal year 2014.

SAN JUAN RIVER LARVAL RAZORBACK SUCKER AND COLORADO PIKEMINNOW MONITORING FISCAL YEAR 2015 SCOPE OF WORK

SUBMITTED TO THE U.S. BUREAU OF RECLAMATION

FROM

AMERICAN SOUTHWEST ICHTHYOLOGICAL RESEARCHERS, L.L.C. (*ASIR*)
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1 OCTOBER 2015- 30 SEPTEMBER 2016

SAN JUAN RIVER LARVAL RAZORBACK SUCKER AND COLORADO PIKEMINNOW MONITORING FISCAL YEAR 2015 PROJECT PROPOSAL

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Razorback Sucker project history:

The apparent absence of Razorback Sucker in the San Juan River drainage necessitated experimental stocking of adults (n=672) of this species in 1994 between Hogback, New Mexico, and Bluff, Utah. In their 1995 report of activities, Ryden and Pfeifer (1996) suggested that the majority of the 1994 experimentally stocked Razorback Sucker would achieve sexual maturity in 1996 and spawning by those individuals might begin a few years afterwards.

At the November 1996 San Juan River Basin Biology Committee integration meeting, it was suggested that the Colorado Pikeminnow, *Ptychocheilus lucius*, larval fish drift study (= Passive Drift Netting Study; RM 127.5 and RM 53.3; July-August) be expanded in an attempt to document spawning of the stocked Razorback Sucker (presumed to be during April-May). In addition to temporal differences in spawning between Colorado Pikeminnow and catostomids (Suckers), researchers were attempting to document reproduction by hatchery reared Razorback Sucker whose spawning potential was unknown. Sampling for larval Razorback Sucker was to be conducted to determine if the stocked population of adult Razorback Sucker would spawn in this system. Conversely, data from the passive drift-netting study continued to document Colorado Pikeminnow reproduction in the San Juan River and, because of this certainty, larval fish sampling efforts for this fish would (initially) be different than those for Razorback Sucker.

Numerous Upper Colorado River Basin researchers reported light-traps as one of the best means of collecting larval Razorback Sucker. Most of their light trapping efforts was concentrated in floodplain habitats during high spring flows. Light-trap sampling was employed during the first year (calendar year 1997) of the San Juan River larval Razorback Sucker survey. The lack of inundated floodplain habitats in the San Juan River, in comparison to the Upper Colorado River Basin, meant that the light-traps would have to be set in low velocity riverine habitats. The only previous San Juan River fish investigations that had employed light-traps were in 1994 and 1995 (conducted by the National Park Service) near the San Juan River-Lake Powell confluence. That 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. Both sampling efforts were conducted during July-August but neither Colorado Pikeminnow nor Razorback Sucker was present in the 1994-1995 light-trap samples.

During the 1997 Razorback Sucker larval fish survey, light-traps were set nightly in low-velocity habitats between Aneth and Mexican Hat, Utah, from late March through mid-June. 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 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. We determined that being limited to specific collecting sites was not the most efficient means of collecting large numbers of individuals; a prerequisite for this study.

In 1998 a new study design was developed 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 throughout several river reaches. An inflatable raft was used to traverse the San Juan River and allowed us the opportunity to sample habitats that were either not formerly accessible or observable under the constraints of the previous sampling protocol. Six sampling forays were conducted at approximately bi-weekly intervals from 17 April to 6 June 1998 between the Four Corners drift station (RM 127.5) and Mexican Hat, Utah (RM 53.3). Both active (seining) and passive (light-traps) sampling techniques were used to collect larval fish. The primary sampling method was a fine mesh larval seine. If appropriate aquatic mesohabitats could be located, light-traps would be set adjacent to nightly campsites of the sampling crew.

The 1998 sampling protocol resulted in 183 collections containing over 13,000 specimens between river miles 127.5 and 53.3 with the majority of these individuals (n=9,960) being larval catostomids. This 43-fold increase in number of specimens, as compared with 1997, provided substantially better resolution of spawning periodicity of the catostomid community. In addition, the 1998 samples produced enough individuals for us 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 providing verification of spawning by the hatchery reared stocked population.

The use of active sampling to determine the reproductive success of Razorback Sucker has proven to be effective. To date, the results of this investigation have provided fifteen consecutive years of unequivocal documentation of reproduction in the San Juan River by Razorback Sucker that have been stocked as part of the San Juan River Basin Recovery Implementation Program (Table 1). The data collected during the larval Razorback Sucker survey provide not only valuable data concerning the distribution (spatial and temporal), duration, and magnitude of Razorback Sucker reproduction but also equally informative data on the reproductive efforts of other native fishes in the San Juan River.

Table 1. Collection information of Razorback Sucker (Xyrtex) collected during the larval Razorback Sucker survey, 1998 – 2013.

Year	*Sampling method*	*Study Area (River Miles)*	*River Miles sampled*	*Percent change*	*Specimens collected*	*Xyrtex n=*
1998	Larval seine Light traps	127.5 – 53.3	74.2	na	13,608	2
1999	Larval seine Light traps	127.5 – 2.9	124.6	+ 40.4%	20,348	7
2000	Larval seine Light traps	127.5 – 2.9	124.6	na	11,473	129
2001	Larval seine Light traps	141.5 – 2.9	138.6	+ 10.1%	95,629	50
2002	Larval seine Light traps	141.5 – 2.9	138.6	na	56,164	813
2003	Larval seine Light traps	141.5 – 2.9	138.6	na	41,181	472
2004	Larval seine	141.5 – 2.9	138.6	na	14,648	41
2005	Larval seine	141.5 – 2.9	138.6	na	19,142	13
2006	Larval seine	141.5 – 2.9	138.6	na	25,127	202
2007	Larval seine	141.5 – 2.9	138.6	na	22,093	199
2008	Larval seine	141.5 – 2.9	138.6	na	23,599	126
2009	Larval seine	141.5 – 2.9	138.6	na	5,843	272
2010	Larval seine	141.5 – 2.9	138.6	na	23,385	1,251
2011	Larval seine	141.5 – 2.9	138.6	na	10,504	1,065
2012	Larval seine	147.9 – 2.9	145.0	+ 4.6%	18,131	1,778
2013	Larval seine	147.9 – 2.9	145.0	na	25,179	979

Colorado Pikeminnow project history:

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 through 2001 with only minor changes in sampling protocol. Between 1995 and 2001, a total of four larval Colorado Pikeminnow were collected using this sampling method at two different collecting locations (Four Corners, NM and Mexican Hat, UT).

The limited number of wild adult Colorado Pikeminnow (versus stocked individuals) in the San Juan River was reflected in the extremely low catch rate of larval Colorado Pikeminnow. Numerous adult and sub-adult Colorado Pikeminnow have now been stocked into the San Juan River in an effort to augment the diminished wild population. The Colorado Pikeminnow augmentation plan (phase II) calls for continued stocking efforts in the San Juan River through 2020. The San Juan River Basin Biology Committee expects, as was documented with stocked Razorback Sucker, that reproduction among stocked Colorado Pikeminnow will occur and can be documented through the sampling of larval fish.

As the number of adult (reproductively mature) Colorado Pikeminnow in the San Juan River increases (due to both stocking and recruitment), so does the probability of elevated levels of spawning by this species. The San Juan River Basin Biology Committee began exploring the possibility of expanding the sampling effort for larval Colorado Pikeminnow in fiscal year 2003. One means of accomplishing this task was to include an additional sampling site (increasing from two to three sites) for the passive drift-netting study. Another suggestion was to perform targeted sampling for Colorado Pikeminnow similar to that performed for larval Razorback Sucker. In the case of the latter sampling effort, discussion regarding sampling that would target larval Colorado Pikeminnow centered around expanding the duration of the current larval Razorback Sucker survey (April-June) or development of a discrete (new) project. These and other items were considered and evaluated during the February 2002 San Juan River Basin Biology Committee meeting. The Committee recommended the immediate expansion of the larval Razorback Sucker survey (April-June) to include the months of July, August, and September with seining efforts to target larval Colorado Pikeminnow.

Beginning in July of 2002, using funds from FY 2002 that had been appropriated for use at the two larval drift-netting stations, Museum of Southwestern Biology (MSB) personnel began an active sampling regime that mirrored the sampling protocol successfully used in the larval Razorback Sucker survey. The results from the temporal expansion of the larval surveys have produced forty wild larval Colorado Pikeminnow to date. Larval Colorado Pikeminnow were collected in surveys during 2004, 2007, 2009, 2010, and 2011 at fourteen discrete sites, within the study area. There were no larval Colorado Pikeminnow collected in 2012. Between 1995 and 2011 the combined sampling methodologies (passive and active) resulted in the collection of forty-four larval Colorado Pikeminnow. Back-calculated spawning dates, based on those forty-four individual larvae, range from 10 June to 18 July (Table 2) and are generally associated with the descending limb of spring run-off and mean river temperatures >18^{o}C.

Over 1,000,000 fish have been collected between 1995 and 2012 under the larval Colorado Pikeminnow survey. Of those, about 86% (N=866,321) were collected after 2001 when the sampling protocol switched from passive to active sampling (2002).

Table 2. Summary of larval and YOY Colorado Pikeminnow collected in the San Juan River during larval drift-netting/larval seining (1993-2013) and back-calculated dates of spawning.

Year	*Sample Method*	*Study Area (River Miles)*	*N=*	*Length mm TL.*	*Collection Date*	*Spawning Date*
1995	Drift Netting	127.5, 53.3	2	9.0, 9.2	02, 03 Aug	15, 17 Jul
1996	Drift Netting	127.5, 53.	1	8.6	02 Aug	18 Jul

2001	Drift Netting	127.5, 53.	1	8.5	01 Aug	17 Jul
2004	Larval Seine	141.5 – 2.9	2	14.2, 18.1	22, 26 Jul	24, 25 Jun
2007	Larval Seine	141.5 – 2.9	3	14.9-17.5	25 Jul	27 Jun
2009	Larval Seine	141.5 – 2.9	1	25.2	27 Jul	10 Jun
2010	Larval Seine	141.5 – 2.9	5	12.6-21.4	20-23 Jul	15-27 Jun
2011	Larval Seine	141.5 – 2.9	29	10.0-21.3	20, 21 Jul, 10,11 Aug	23 Jun- 6 Jul
2013	Larval Seine	147.9 – 2.9	12	14.1-28.7	17-30 Jul ,	23 May-3 Jul

Project Modifications:

There have been numerous modifications to the field methodology of the larval fish survey over time as well as changes in reporting priorities, protocol, and format. The extent of the study area and aspects of the longitudinal sampling have been modified to improve spatial comparisons. The study area was expanded in 1999, 2001, and 2012 by a total of 70.8 river miles (nearly double the length of the original study area) to include most of Reach 5 (Shiprock, New Mexico) through Reach 1 (Clay Hills Crossing, Utah; a total of 145.0 miles of critical habitat sampled). Beginning in 2003, the entire study area was sampled in single uninterrupted trips (10-12 field days per trip) rather than in two temporally discrete sections as done in previous years (1998 – 2002). Because of the increasing numbers of larval Razorback Sucker collected (as well as detailed information regarding the native fish community), the SJRBRIP Biology Committee voted to elevate the larval fish surveys from an "experimental" project to a monitoring program. This change allowed for comparisons of catch per unit effort (CPUE) data with the programs monitoring activities (i.e., small bodied fish, adult monitoring, habitat, etc).

Conducting the larval Razorback Sucker and Colorado Pikeminnow surveys under this new protocol not only provided discrete reach information but also provided greater temporal resolution in respect to the longitudinal distribution of Razorback Sucker larvae and the ability to correlate potential environmental cues required by Razorback Sucker for spawning. These same advantages would also apply to Colorado Pikeminnow however, to date, very few larval Colorado Pikeminnow have been collected. Disadvantages to this top to bottom approach were that the duration of the monthly sampling trips (10-12 field days) made them more subject to abiotic fluctuations (floods, flow spikes). Large flood events reduce sampling efficiency as many low velocity habitats become flooded by rising water levels thereby transporting larval and early juvenile fish downstream. In addition, large flood events have necessitated premature termination of some survey runs, reducing the temporal resolution of the single-continuous pass effort. Annually, at least one trip (an average) had to be cut short due to large flood events or low water events in the lower canyon. The abbreviated trips were subsequently resumed once conditions improved (usually 1-2 weeks later). Additional costs were incurred because of the need to return to the field to complete the sampling effort for that month.

To reduces the variability of abiotic conditions as well as gain even greater temporal resolution of the longitudinal distribution of Razorback Sucker larvae, the protocol was modified to survey the upper and lower halves of the study area simultaneously. This effort began in 2007 and utilized two fully equipped

and autonomous crews (Table 3). In 2008, additional participation of our staff with other SJRBRIP projects made the new simultaneous sampling effort a necessity so that our staff could meet obligations to assist the other researchers with their work.

Beginning in 2009, larval fish specimens collected in the field were preserved in 95% ethanol (as opposed to 10% buffered formalin). This change in preservation technique assured that specimens could be used for a variety of purposes, (such as genetic analysis) that were not possible under the formalin preservation protocol. Beginning in 2011, the September sampling trip was discontinued. The Biology Committee felt that the September survey did not provide enough data with respect to endangered fishes to warrant continuation.

The study area expanded 6.4 miles upstream in 2012. The expansion of the study area was a result of captures of larval Razorback Sucker at the top of the previous study area (river mile 141.5). Collections in 2013 documented larval Razorback Sucker in this newly expanded area.

In 2013 a new analysis of Colorado Pikeminnow and Razorback Sucker trend data was developed using mixture models (White, 1978; Welsh et al., 1996; Fletcher et al., 2005; Martin et al., 2005.). Mixture models can be particularly effective at modeling ecological data with multiple zeros to estimate occurrence and abundance separately (e.g., combining a binomial distribution with a lognormal distribution). Data collection for this new approach meant each seine haul was preserved independently along with physical descriptors of each haul.

Table 3. Summary of annual projects and project modifications of the larval fish surveys from 1997 to 2012.

Year	*Sampling method*	*Study area (River Miles)*	*Specimens collected*	*Field modification*	*Laboratory modification*
1997	Light Trap Drift-nets	99 – 75	297		
1998	Larval Seine Light Trap Drift-nets	127.5 – 53.3	13,608	study area expanded; active sampling	
1999	Larval Seine Light Trap Drift-nets	127.5 – 2.9	20,711	study area expanded; upper-lower reaches sampled separately; nonsynchronous	
2000	Larval Seine Light Trap Drift-nets	127.5 – 2.9	13,549		
2001	Larval Seine Light Trap Drift-nets	141.5 – 2.9	95,629	study area expanded; upper-lower reaches sampled separately; nonsynchronous	

2002	Larval Seine Light Trap	141.5 – 2.9	138,601	study period expanded to September. Drift-nets no longer used.	
2003	Larval Seine Light Trap	141.5 – 2.9	112,842	upper-lower reaches sampled monthly in one uninterrupted trip (11-12 day runs)	CPUE data used for integration in reporting
2004	Larval Seine	141.5 – 2.9	160,292		Reports merged Trend data
2005	Larval Seine	141.5 – 2.9	109,368		
2006	Larval Seine	141.5 – 2.9	50,616		
2007	Larval Seine	141.5 – 2.9	53,084	Two rafts-two crews; upper-lower reaches samples synchronous	Analyzed catch with habitat data
2008	Larval Seine	141.5 – 2.9	40,855		
2009	Larval Seine	141.5 – 2.9	72,404	Specimens preserved in 95% ethanol	
2010	Larval Seine	141.5 – 2.9	70,610		
2011	Larval Seine	141.5 – 2.9	28,045	September survey dropped from the monitoring	
2012	Larval Seine	147.9 – 2.9	29,384	Study area expanded	
2013	Larval Seine	147.9 – 2.9	26,557	Individual seine hauls preserved independently	Mixed Model analysis used for trend data

Objectives:

This work is being conducted as required by the San Juan River Basin Recovery Implementation Program Monitoring Plan and Protocol (2012). The objectives of this specific monitoring effort are identified and listed below. Where applicable, these objectives are related to the specific tasks listed in the 2013 Long Range Plan set forth by the San Juan River Basin Recovery Implementation Program (SJRBRIP).

1) Conduct larval fish sampling to determine if (Colorado Pikeminnow and Razorback Sucker) reproduction is occurring, locate spawning and nursery areas, and gauge the extent of annual reproduction. (Task 4.1.2.1)

2) Determine the spawning periodicity of Colorado Pikeminnow and Razorback Sucker (utilizing back-calculated spawning and hatching formulas) between mid-April and August and examine potential correlations with temperature and discharge.

3) Document and track trends in the use of specific mesohabitat types by larval Colorado Pikeminnow and Razorback Sucker. (Task 4.2.3.2)

4) Document and track trends in the use of specific mesohabitat types by larval Colorado Pikeminnow and Razorback Sucker. (Task 4.2.3.2).

5) Develop and revise a Standardized Fish Monitoring Plan to assess presence status and trends of Colorado Pikeminnow, Razorback Sucker and fish community (4.1.1.1).

6) Analyze and evaluate monitoring data and produce Annual Fish Monitoring Reports to ensure that the best sampling design and strategies are employed. (Task 4.1.1.2)

7) Provide detailed analysis of data collected to determine progress towards endangered species recovery in the San Juan River.

8) Identify principal river reaches and habitats used by various life stages of endangered fish. (Task 4.2.3.3)

Study Area:

The study area encompasses the San Juan River between Shiprock, New Mexico (RM 147.9) and the Clay Hills Crossing boat landing (RM 2.9) just above Lake Powell in Utah (145.0 river miles). As in all post 1999 sampling efforts, the study will include making collections in reaches of the San Juan River under the jurisdiction of the National Park Service.

Methods:

Field Work:

Sampling for Colorado Pikeminnow and Razorback Sucker larvae will be conducted in the San Juan River between RM 147.9 and RM 2.9 from mid-April through mid-August using sampling techniques that will provide sufficient numbers of fish necessary to meet study objectives. Access to the river will be gained through the use of inflatable rafts equipped with all of the necessary equipment and provisions needed for trips of up to seven days. A day and a half is added before and after each field survey for field preparation, gear maintenance, and clean up. The study area will be divided into an “upper” section (Shiprock, NM, to Sand Island, UT) and a “lower” section (Sand Island, UT, to Clay Hills crossing, UT). Separate field crews will launch simultaneously in each of the two sections and proceed through their designated study area. The vehicle and raft trailer used by the field crew working in the upper section will be left at the Shiprock launch site and subsequently be shuttled to the Sand Island BLM ranger station, UT. The vehicle shuttle (with trailer) for the upper reach sampling effort was typically performed gratis by personnel from the Farmington Office of the Bureau of Indian Affairs Office. Between 2008 and 2010, this service was performed by personnel from the N.M. Fishery Resources Office stationed in Farmington. Beginning in 2011, ASIR personnel shuttled vehicles for the upper end crew. At this time, there is no charge for this service.

The sampling crew for the lower reach will launch from, and store their vehicle and raft trailer at Sand Island, UT, where a commercial shuttle will take the vehicle to Clay Hills crossing, UT. The cost for this service is included under the travel and per diem section of our budget.

Because crews sampling the lower section of the study area will be in a high use recreational area, advance reservations are required. All trips for 2015 must be scheduled by late January 2015 and

submitted to the Bureau of Land Management (BLM) Office at Monticello, Utah. Designated camping permits for our lower reach sampling crews will be obtained and must be strictly adhered to in addition to other BLM- San Juan River Recreation Area regulations (i.e., low impact and pack-out policies). Low flow conditions often prevalent during the study period make several sections of the river more difficult to navigate (especially in the lower reach). Our field crews are required to render assistance to boaters stuck in rapids or otherwise in distress and report all such encounters to the appropriate BLM personnel.

Sampling efforts for larval fish will be concentrated in low velocity habitats and employ small mesh seines (1 m x 1 m x 0.8mm) to collect fish. Individual seine hauls will be preserved independently at each site. Habitat designations will also be recorded by seine haul. Retained specimens will be placed in Whirl-paks containing 95% ethanol and a tag inscribed with unique alphanumeric code that is also recorded on the field data sheet. For each sample site, the lengths (to 0.1 m) of each seine haul and total number of hauls will be measures and recorded. Catch per unit effort for seine samples will be reported as the number of fish per 100 m^2.

Native species large enough to be positively identified will be measured (standard length) and returned to the river. Post-larval endangered fish species collected during this study will be photographed, a small portion of tissue from the fin clipped and retained in 95% ethanol (in the case of potential Razorback Sucker hybrids) and scanned with a FS2001 PIT tag reader for the presence of a PIT tag. Specimens of sufficient size but lacking a PIT tag will be injected with a tag following the protocols established by the program (Davis 2010). All PIT tag information will be recorded in the field data sheet and subsequently forwarded to the SJRBRIP for integration in the program's PIT tag database.

For each sampling locality, river mile will be determined to the nearest tenth of a mile using the San Juan River Basin Recovery Implementation Program 2009 Standardized Map Set. Universal Transverse Mercator (UTM) coordinates and zone will be determined with a Garmin Navigation Geographic Positioning System Instrument for each sampling locality. Mesohabitat type, length, maximum and minimum depths, water clarity (determined with a Secchi disc), and substrata will be recorded for each sampling locality. A minimum of one digital photo will also be taken of each specific habitat sampled.

Field Work, Safety:

Personnel participating in field work are required to successfully complete an International Rescue Instructors Association (IRIA) level 2 swiftwater rescue class and American Red Cross CPR/AED training. Type III personal flotation devices (PFD's) will be worn by sampling personnel at all times while working. As PFD's lose flotation capacity due to UV exposure, compression of material, and oil and grit impregnation, and since each crewmember's PFD will be used for approximately 45 days per season, the PFD's will be annually replaced. Simms Guideweight Gore-Tex waders and boots will be issued to all personnel along with 3 mm neoprene gloves (necessary in April and May). In addition to personal camping gear and rain suits, all personnel will be required to provide and use wide brimmed hats, sunscreen, and sunglasses (provided at no cost to the program).

Both rafts used for this project will carry an extensively stocked first aid kit replete with items necessary for most minor medical situation. Additionally, the first aid kit will contain a suite of items (i.e., splints, neck braces, butterfly stitches, snakebite kits) needed to address more serious medical conditions. Because ethanol is used in the preservation of specimens, several vials of eyewash solution will be incorporated into each first aid kit. First aid kits will be inventoried after each sampling trip and used and/or expired items replaced. In the upper reach of the study area, personal cell phones and PDA's will be used (at no cost to the program) to contact outside parties should a medical situation arise. In the lower study area reach (canyon bound; where cell phones do not have service) a Iridium 9505-satellite phone will be provided for sampling crews to be used in case of an emergency.

All preservation fluids will be transported in heavy-duty LPDE carboys. Extensive exposure to UV light makes the carboys susceptible to decomposition and cracking and requires that they be inspected monthly and not used for more than two years. Safety rope throw bags will be similarly inspected and retired from use accordingly. Rafts will be equipped with raft recovery (Z-line) kits, and repair kits, extra oars and oar blades, and two spare hand pumps to help ensure that crews do not become stranded due to raft damage.

Laboratory Work:

Samples will be returned to the lab immediately after each field trip is completed and processed following a multi-step procedure. To maintain the larval fish in good condition (necessary to ensure accurate identification) the samples must be transferred from whirl-packs to glass jars and the field fluids replaced with new 95% ethanol. Cyprinid and catostomid larvae are extremely small and transparent especially at early developmental stages. To minimize the potential loss of fish in individual seine hauls, it is best to retain the entire contents of each seine haul. A negative result of this technique is that, in addition to larval fish, whirl-pack samples usually contain considerable debris, detritus, and silt. Another important step in processing of individual samples is to separate fish from the detritus. This necessary portion of the process is labor intensive and can be quite tedious. During this process initial sorting of fish based on age class (age 0 [larvae] and age 1+) occurs. Samples that contain a large number of larval fish, especially proto or mesolarvae, often must be sorted twice to ensure all larvae are located with a sample.

After the fish are separated from the debris, personnel with San Juan River Basin larval fish identification expertise identify individual specimens to species. Stereomicroscopes equipped with transmitted light bases (light and dark field) and polarized filters (that enhance the delineation of myomeres, pterygiophores, and fin rays) are used to assist with the identifications. Larval fish keys are referenced to assist in species specific determinations (e.g., Contributions to a guide to the cypriniform fish larvae of the Upper Colorado River System [Snyder 1981], Catostomid fish larvae and early juveniles of the Upper Colorado River basin, Morphological descriptions, comparisons, and computer interactive key [Snyder and Muth 2004], and Identifications of larval fishes of the Great Lakes Basin [Auer 1982]). Age-0 specimens are separated from age-1+ specimens using published literature on growth and development (Snyder 1981, Snyder and Muth 2004).

Age classes are enumerated, measured (minimum and maximum size [mm standard length] for each species at each site), and catalogued in the Division of Fishes of the Museum of Southwestern Biology (MSB) at the University of New Mexico (UNM). Both total length (TL) and standard length (SL) of Colorado Pikeminnow and Razorback Sucker are obtained using electronic calipers and stereomicroscope mounted micrometers. The ontogenetic stage of Colorado Pikeminnow and Razorback Sucker obtained in this study is determined based on the definitions provided by Snyder (1981).

In addition to determining the ontogenetic stage of Razorback Sucker larvae, all specimens greater than 15 mm (total length) will be examined and for opercular deformities (see Barkstedt et. al. 2013 for detailed methodology). Material for histological analysis will also be provide at the request of the San Juan River Basin Recovery Implementation Program. Annual updates regarding opercular deformities in Razorback Sucker will presented at Program meetings and included in annual reports.

Quality Assurance and Quality Control:

The qualifications of the investigators include extensive experience working on large data sets from multiple river systems over several decades. This experience has resulted in the implementation of numerous protocols that assure the quality of the finished data files. The field sampling crew has been kept constant, which ensures that the collection of the raw data is standardized between trips and that

errors are minimized. Field notes and raw data sheets will be checked for any errors prior to being entered into spreadsheet data files. Any errors will be corrected by crossing out the original data and writing the correct data on the sheet in pencil (all corrections will include the initials of the person making them). All data will be entered into spreadsheet templates designed for the particular type of data being entered (i.e., site locality and physical conditions data, sample size and habitat data, fish species and age-class data). These template files are customized using drop-down lists to facilitate more efficient data entry while also assuring that the correct values are entered (i.e., eliminates typographical errors) within each field. After all data is imported into the main database, all data values will be checked. Data checking will include cross-referencing the field notes and raw data sheets with the values entered into the main database. Upon completion of the quality assurance and quality control steps listed above, the data will then be analyzed and tabulated. All the computed results will be examined and cross-checked with the original data files. Outlying values will be identified by using advanced sorting features on multiple data fields. Missing or incorrect data will be identified by using advanced sorting features and by running multiple queries written for this purpose. Checking the cross-tabulation of data will ensure that the sum of values is in agreement with the individual values (e.g., total number is equal to the sum of the total number of each age-class). Any corrections to the data will be made directly to individual tables within the main database.

Analysis:

Modeling ecological data with multiple zeros can be particularly effective when using mixture models (e.g., combining a binomial distribution with a lognormal distribution) to estimate occurrence and abundance separately (White, 1978; Welsh et al., 1996; Fletcher et al., 2005; Martin et al., 2005). Long-term Razorback Sucker (1999–2013) and Colorado Pikeminnow (2003–2013) sampling-site density data were analyzed using a mixture model in PROC NLMIXED (SAS, 2014), a numerical optimization procedure, following the methods outlined in White (1978). Logistic regression was used to model the probability a site was occupied, and the lognormal model was used to model the distribution of abundance given that the site was occupied. Models provided estimates of Delta (Δ = probability of occurrence), Mu (μ = mean of the lognormal distribution), Sigma (Σ = standard deviation of the lognormal distribution), and E(x) (estimated density of fish).

General linear models were used to incorporate covariates to model Δ, μ, and Σ. Covariates considered to model annual sampling-site density data for both Razorback Sucker (1999–2013) and Colorado Pikeminnow (2003–2013) were year, reach, and habitat. Isolated pool habitats were excluded from analysis since fish densities in confined habitats were not comparable to densities in freely accessible habitats. Similarly, habitats that were dry or not sampled were excluded from further analysis. Also, one habitat type (combined) was added to account for instances where multiple habitats were sampled but where fish were combined into a single collection. There were a total of five sampling reaches included in the analysis along with ten habitat types (backwater [BW], combined [CO], cobble shoal [CS], eddy [ED], embayment [EM], pool [PO], pocketwater [PW], run [RU], sand shoal [SS], and slackwater [SW]). To facilitate a valid comparison among years and minimize excessive zeros in the model, months that produced a negligible number of specimens (< 1% of the total) were excluded from further analysis. The months considered for age-0 Razorback Sucker occurred earlier in the year (May and June) compared with the months considered for age-0 Colorado Pikeminnow (July and August). In contrast, stocked age-1+ Colorado Pikeminnow occurred throughout the typical sampling season (April–August) and so those months were included in the analysis for that life stage.

The relative fit of data to various models was assessed using goodness-of-fit statistics (logLike = -2[log-likelihood] and AIC_C = Akaike's Information Criterion [Akaike, 1973; Burnham and Anderson, 2002] for finite sample sizes). Lower values of AIC_C indicate a better fit of the data to the model. Models were

ranked by AIC_C values and included AIC_C weight (w_i). Differences among null and alternative models were assessed using a log-likelihood ratio goodness-of-fit test (Zar, 2010).

Additional samples were taken in 2013 to increase the overall sample size and provide additional information on specific habitat features (i.e., habitat location and cover type). Four categories were assigned to habitat depending on where the sample was taken. Shoreline (SH) indicated all samples taken along the land-water interface, open-water (OP) indicated samples taken away from the shoreline, and mouth (MO) or terminus (TR) indicated samples taken from those locations within a backwater or embayment. Three categories were assigned to habitat depending on the type of cover encountered. Type 1 indicated the presence of inundated vegetation, type 2 indicated the presence of submerged woody debris, and type 3 indicated the presence of overhead cover (i.e., shade).

Habitat-specific density data (i.e., using information on habitat location and cover type) have only been available since 2013. These data provide information on the specific habitat features used by Razorback Sucker and Colorado Pikeminnow and may eventually allow for more precise estimates of annual population trends. Habitat-specific density data were also analyzed using PROC NLMIXED (SAS, 2013), using the same methods outlined previously, to generate larval fish density estimates ($E(x)$). As there were not enough data to provide robust estimates of density among habitats for age-0 Colorado Pikeminnow, this age-class was not included in the analysis. No analyses were conducted for age-1+ Colorado Pikeminnow since the specific habitat preferences of recently stocked individuals was not a primary research concern. For Razorback Sucker, a simplified list of habitats (BW, EM, PO, SS, and SW) was used for the purpose of statistical analysis since some habitats (CS, PW, and RU) contained very few data and other habitats were not sampled (CO and ED). General linear models were used to incorporate covariates to model Δ, μ, and Σ. Covariates considered to model habitat-specific density data were reach, habitat, habitat location, and cover type. Goodness-of-fit statistics (logLike and AIC_C) were generated to assess the relative fit of data to various models and differences among models were assessed using a log-likelihood ratio goodness-of-fit test.

The results in the annual report pertain almost exclusively to age-0 fish (i.e., age-1+ are not “larval fish” and are not the focus of this effort, they are not included in analysis). The only exception to this will be age-1+ augmented Colorado Pikeminnow. Capture data for all Colorado Pikeminnow is analyzed and trend data reported. The number of all other fish age-1+ collected during the study is presented in an Appendix. For species other than Razorback Sucker and Colorado Pikeminnow, differences in mean CPUE were determined by species among years, trips, and reaches using a one-way Analysis of Variance (ANOVA). Samples collected in isolated pools were not included in yearly or between year trend analysis. A variety of transformations (e.g., logarithmic, reciprocal, square root) were applied on the mean CPUE data for between year comparisons. A natural log-transformation yielded the best variance-stabilizing qualities and produced a relatively normal distribution. Pair-wise comparisons between years (2003 – 2013), trips and reaches were made for each species and significance (i.e., $p < 0.05$) was determined using the Tukey-Kramer HSD test. Finally, a nonparametric Analysis of Variance (Kruskal–Wallis test) was run for the various data sets to compare results to the parametric analysis.

Although both ANOVA and Kruskal-Wallis were used to analyze data, data transformations enabled use of parametric analysis in all cases. The assumption of homogeneity of variances was assessed using the more conservative variance ratio criterion of <3:1 (Box, 1954), as opposed to <4:1 (Moore, 1995), among years. All species data sets met this more rigorous criterion and in most cases the variance ratio was <2:1 among years. Additionally, the significance values between parametric and nonparametric techniques were nearly identical and so only the parametric analysis are presented.

Hatching dates of Razorback Sucker larvae are calculated by subtracting the average length of larvae at hatching (8.0 mm TL) from the total length at capture (for proto- and mesolarvae) divided by 0.3 mm (Bestgen et al. 2002), which was the average daily growth rate of wild larvae observed by Muth et al. (1998). Hatching dates for larval Colorado Pikeminnow are calculated using the formula:

$-76.7105+17.4949(L)-1.0555(L)^2+0.0221(L)^3$ for larvae <22 mm, where L=length (mm TL). For larvae 22-47 mm TL the formula A=-26.6421+2.7798L will be used.

Spawning dates for larval Colorado Pikeminnow are then estimated by adding five days to the post-hatch ages to account for incubation time at 20 – 22 ^{o}C (Nesler et al. 1988). Hatching and spawning dates for both endangered species are then compared with the discharge and temperature data during that period within the study area.

This study is initiated prior to spring runoff and completed during late summer (August). Daily mean discharge during the study period is acquired from U.S. Geological Survey Gauge (# 09379500) near Bluff, Utah and Four Corners Bridge (#09371010). Water temperatures (mean, maximum, and minimum) are acquired from our temperature loggers and additional data provided by the USGS gauging station at Mexican Hat, Utah (RM 53.3).

Reporting and Permitting:

Beginning in 2004, data from the two San Juan River larval fish surveys (Razorback Sucker and Colorado Pikeminnow) were analyzed collectively and presented in a single report. This created a whole picture of the reproductive activities of the entire ichthyofaunal community in the San Juan River using the same criterion used as the other monitoring programs. The report will be disseminated as outlined by the program office.

In addition to the annual report of the study provided to the SJRBRIP, reports summarizing fish collecting activities and specimens captured are also required annually under scientific collection permits provided by the New Mexico Department of Game and Fish, Navajo Nation, and state of Utah. The aforementioned reports include (at a minimum) site localities, GPS coordinates, and fish collected. An annual report of activities is a BLM (Monticello Field Office) requirement under our access permit to the San Juan River below San Island (Bluff UT) and designated camps in the lower reaches of the river. Annual Mussel-free permits will also be acquired by all trip leaders for use in Utah and Glen Canyon National Park.

Meetings:

Researchers are required to attend four meetings annually and report on annual monitoring projects. The two pre-set annual meetings (February and May) require researchers present PowerPoint presentations outlining the results and that years findings. Each meeting lasts about three days (which includes travel time).

Products:

A draft report of the 2014 larval Razorback Sucker and Colorado Pikeminnow sampling activities will be prepared and distributed to the San Juan River Basin Biology Committee for review by 31 March 2015. Upon receipt of written comments, that report will be finalized and disseminated to members of the San

Juan River Basin Biology Committee by 30 June 2015. Electronic copies of the 2014 collection data will be transferred to the San Juan River database manager. 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 under a MSB contract with the SJRBRIP. Original field notes will be retained in the Division of Fishes and collection information electronically stored in a permanent MSB database program. These data and any maps generated from them will be available to the San Juan River Basin Biology Committee via hard-copy reports and electronically.

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2015 BUDGET: SAN JUAN RIVER LARVAL ENDANGERED FISH MONITORING
Based on five sampling trips per year

Personnel

Field Data Collection

Upper Reach (two staff, one raft) Shiprock to Sand Island - RM 148.0 - 76.0

Fisheries Biologist I (1 staff x 5 trips x 11 days x 8 hrs/day): ..... $ 19,765

Fisheries Technician (1 staff x 5 trips x 11 days x 8 hrs/day): ..... $ 12,164

Lower Reach (two staff, one raft) Sand Island to Clay Hills - RM 76.0 - 2.9

Fisheries Biologist I (1 staff x 5 trips x 10 days x 8 hrs/day): ..... $ 17,968

Fisheries Technician (1 staff x 5 trips x 10 days x 8 hrs/day): ..... $ 11,058

Lab Work

Upper and Lower Reach Samples Combined

Fisheries Biologist I (120 staff days/sampling year): ..... $ 43,122
Tasks: Laboratory identification, developmental staging, specialized endangered fish processing, data entry, data query and review, database development

Fisheries Technician (120 staff days/sampling year):..... $ 26,539
Tasks**:** Post-trip sample processing, juvenile identification, post-identification – processing, measures, review of counts

Office Work (Report Development)

Fisheries Biologist I (80 staff days year): ..... $ 28,747
Tasks: Data analysis, draft report preparation, post-review redraft and submission, development and submission of formal responses to reviewer comments, development of presentation of study for annual meetings, annual reporting related to state and tribal permitting of sampling activities

Project Oversight

Senior Fisheries Biologist (1 staff day/month): ..... $ 7,297
Tasks: Project coordination, project and data review, data management, report review

Personnel (Field, Lab, Office, Oversight): .....Subtotal $ 166,660

SJRBRIP Meetings

Four meetings/year required; 2 days/meeting

Fisheries Biologist I (8 staff days/year): ..... $ 2,875

Senior Fisheries Biologist (8 staff days/year): ..... $ 4,865

Personnel (Meetings): ..... Subtotal $ 7,740

Personnel: ..... Total $ 174,400

Materials and Supplies

Safety dedicated first aid gear: ..... $ 1,750
Raft and rafting associated gear: ..... $ 1,416
Fish Sampling and associated electronic recording gear: ..... $ 1,234
Water quality measuring electronic meters: ..... $ 420

Materials and Supplies: ..... Total $ 4,820

Travel and Per Diem

Field Data Collection

Shiprock to Clay Hills (five trips) - RM 148.0 - 2.9 (Using two rafts & two crews)

Travel - 4 x 4 pickup truck and raft trailer (2 units x 1,380 miles x $ 0.555/mile): ..... $ 3,830
Per Diem - 10 field days per trip x 2 staff x 5 trips: ..... $ 4,500
Per Diem - 1 hotel day per trip x 2 staff x 5 trips: ..... $ 950
Truck and Trailer Shuttle from Sand Island to Clay Hills x 5: ..... $ 1,750

Travel and Per Diem (Field): ..... Subtotal $ 11,030

SJRBRIP Meetings

Travel (one vehicle at 425 miles r.t. x 4 trips x $ 0.555/mile): ..... $ 943
Per Diem (3 per diem days/meeting x 4 meetings x 2 staff): ..... $ 2,280

Travel and Per Diem (Meetings): ..... Subtotal $ 3,223

Travel and Per Diem: ..... Total $ 14,253

2015 Project Totals

Personnel: ..... Total $ 174,400
Materials and Supplies: ..... Total $ 4,820
Project Subtotal Subject to IDC: ..... $ 179,220
IDC (13%): ..... $ 23,299

New Mexico Gross receipts Tax:		**$ 12,545**
Travel and Per Diem	**Total**	**$ 14,253**
2015 Scope of Work:	**GRAND TOTAL**	**$ 229,317**

Out-year funding

FY 2016	**$235,596**
FY 2017	**$242,061**
FY 2018	**$248,722**
FY 2019	**$255,583**

San Juan River Specimen Curation by the Museum of Southwestern Biology

Fiscal Year 2015 Scope of Work

Principle Investigators: Alexandra M. Snyder and Thomas F. Turner
University of New Mexico MSC03-2020
Albuquerque, NM 87131

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Award R13SS40013
1 October 2014 to 30 September 2015

Background

Collections Curation and Data Archives -- Personnel with the Division of Fishes, Museum of Southwestern Biology (MSB), at the University of New Mexico (UNM) are responsible for the curation of collections of fishes taken by principle investigators with the San Juan River Basin Recovery Implementation Program (SJRIP). Since 1991, the MSB Division of Fishes has been the permanent repository for large numbers of voucher specimens and associated data collected by SJRIP researchers. The numbers of specimen processed each year have fluctuated depending on the availability of these collections after the field season. For example, larval and juvenile San Juan River fishes (approximately 200,000) collected in the early 1990's by the Utah Division of Wildlife Resources were not completely processed by MSB staff until 2001. Specimens of San Juan River fishes, taken by the New Mexico Department of Game and Fish during the 1991-99 secondary channel surveys, were not received by the MSB until 2007and are still being incorporated into the MSB collections. Other factors such as annual variability of sampling conditions and changes in sampling techniques has affected numbers of specimens processed by MSB staff. For example, between 2001 and 2002 drift net sampling for larval Colorado pikeminnow and razorback sucker was eliminated in favor of larval seine sampling. Given the variability in number of fishes to process, the San Juan River Biology Committee has recommended that the annual budget for the San Juan River specimen curation and larval fish identification reflect an "average" year of sample processing. The SJRIP Biology Committee recognizes that some years would require more effort from MSB staff than budgeted, while other years might not require the same high level of activity. A relatively stable budget would allow for uninterrupted processing of new collections and yet be sufficient to cover the ongoing work of processing backlogged SJRIP collections due to circumstances previously discussed.

To date, 42,944 lots or 1,680,192 fish specimens collected (1987-2013) by the San Juan River research group have been processed, cataloged, and archived at the Museum of Southwestern Biology, Division of Fishes. A total of 19,416 San Juan River collection sites have been georeferenced and can be mapped in ArcView. Approximately 18,514 pages of field notes (locality data) and data sheets have been captured in the MSB database. A total of 25,533 pages of original San Juan River field notes and data sheets have been digitally captured, cleaned, and saved in both tiff and pdf formats for the electronic archives; the original field notes and data sheets are permanently stored in acid-free document boxes for long-term conservation.

Incoming specimen collections are removed from WhirlPaks®, cleaned of debris, placed in known concentrations of fixative (either 5% buffered formalin, 10 % buffered formalin, or 95% ethanol), and organized on the accession shelves by MSB staff. Collections are later sorted and identified by the principal SJRIP investigators. Specimen collections are assigned an accession number (tracking number) and all associated documentation, like permits and field notes, are filed under that same number. Processing collections of fish specimens (adults and larvae) requires fluid transfers from formalin fixative to ethanol preservative (typically), sending out specimens for species verification as required, counting the number of individuals in each collection, recording the standard lengths for the largest and smallest specimen in each collection, entering all locality and specimen data into an electronic catalog, digital capture of field notes and data sheets, and labeling and filing vials and jars of cataloged San Juan River specimens into the permanent MSB collections. The basic principles for accessioning specimens of fishes in the MSB are standard for most museums of natural history (e.g., Smithsonian Institution, Carnegie Museum, and University of Michigan Museum of Zoology). Species identifications and locality/collection data are verified as necessary prior to incorporation into the MSB catalog. This step is very important for the SJRIP researchers so that any misleading information is not incorporated into subsequent reports on San Juan River fish species, particularly for the larval Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) studies. For purposes of permitting, the MSB provides with field and species data in museum report format. This information includes species identification, catalog number (MSB number), number of specimens and size range per lot.

Study Area

The object of this project is to process specimens of fishes collected for the San Juan River Recovery Implementation Program, capture all field information into an electronic catalog, and incorporate the SJRIP collections into a phylogenetic system in the permanent museum archives. All of these activities take place in the Division of Fishes, Museum of Southwestern Biology, on the University of New Mexico campus in Albuquerque NM.

The MSB Division of Fishes has two offices with a total of five computer workstations for data entry, a fully equipped laboratory for preparation of fish collections, and approximately 1,858 linear meters of compacted shelving for storage of cataloged collections. On average, four UNM students (three undergraduate and one graduate) are employed to process and curate the SJRIP collections.

Curation and Collections Care Objectives

1. Provide a secure and organized permanent repository for San Juan River fish collections, field notes, and associated data thereby facilitating access to these resources by SJRIP researchers.
2. Insure that all SJRIP species identifications and associated data are verified and correctly represented in the MSB electronic catalog; report discrepancies to SJRIP principal investigators.
3. Georeference collection sites for SJRIP collections; maintain license for ArcView and make collection data available in ArcView for SJRRIP researchers.

Methods

The primary task to be completed under this project is the processing and curation of fish specimens generated by research projects executed under the auspices of the San Juan River Basin Recovery Implementation Program. Specimen collections are deposited with the MSB

Division of Fishes by SJRIP principal investigators. Unlike past years, collections of SJRIP fishes are now received and processed within the year of collection.

Upon receipt of newly collected San Juan River specimens, MSB staff transfer these collections from formalin fixative into stages of 35%, 50%, and 70% concentrations of ethanol. Exceptions to this protocol are made per request of PI, as in the case of using 95% ethanol for genetic or otolith studies. Fish specimens are removed from field containers and cleaned (debris removed) and placed into museum quality jars during the fluid transfers. Principle investigators sort, identify, count and measure each lot (discrete collection) once the collections are transferred to ethanol. MSB staff catalog, label, and file the specimens once the principle investigators have completed their work. SJRIP collections are organized in the permanent archives by drainage (San Juan River) and taxa. These archives are in a room that is controlled for temperature (18° Celsius) and light (complete darkness to low light levels). All data associated with the specimens are entered and organized in the electronic MSB Division of Fishes database (MS Access 2010) and georeferenced (GeoLocate Ver. 3). All original field notes and data sheets are digitally captured and archived in acid-free document boxes for permanent storage.

Products

SJRIP fishes and data will be curated in the Division of Fishes, Museum of Southwestern Biology (MSB), at the University of New Mexico. Collection sites will be georeferenced and available in ArcView format. Original field notes will be digitized and archived by the MSB Division of Fishes and collection data electronically stored in a permanent MSB database program. Species verifications and corrections and digital copies (PDF) of their field notes will be made available to SJRIP principle investigators. A draft report of the 2013 San Juan River specimen curation and larval fish identification sampling activities will be prepared and distributed by 31 March 2014 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 by 1 June 2014. Two semi-annual reports will be submitted on 30 September 2014 and 31 March 2015.

The MSB Division of Fishes has fully incorporated backlogged San Juan River collections from 1987- 2000 received from Utah Division of Wildlife Resources, New Mexico Dept. Game and Fish, and US Bureau of Reclamation, Durango CO. In 2007 the NM Department of Game and Fish transferred all of their San Juan River collections to the MSB. These collections, taken from 1987 to 2007, are now fully incorporated into the MSB collections and database.

Budget Fiscal Year 2015 1 July 2014 to 30 June 2015

BUDGET ITEM DESCRIPTION	COMPUTATION		RECIPIENT FUNDING	OTHER FUNDING	RECLAMATION FUNDING	TOTAL COST
	$/Unit and Unit	Quantity				
SALARIES AND WAGES --Position title x hourly wage/salary x est. hours for assisted activity. Describe this information for each position.						
Curatorial Assistant	$13.00/HR	0.70 FTE			18928	$18,928.00
FRINGE BENEFITS – Explain the type of fringe benefits and how applied to various categories of personnel.						
UNM Staff and Faculty	35.5%	1			6719	$6,719.00
TRAVEL—dates; location of travel; method of travel x estimated cost; who will travel						
EQUIPMENT—Leased Equipment use rate + hourly wage/salary x est. hours for assisted activity—Describe equipment to be purchased, unit price, # of units for all equipment to be purchased or leased for assisted activity: Do not list contractor supplied equipment here.						
SUPPLIES/MATERIALS--Describe all major types of supplies/materials, unit price, # of units, etc., to be used on this assisted activity.						
Chemical Preservatives	$1,000	12 MOS			1000	$1,000.00
Specimen containers and closures	$ 800	12 MOS			800	$ 800.00
Labeling for jars and vials	$ 189	12 MOS			189	$ 189.00
Miscellaneous lab supplies						
CONTRACTUAL/ CONSTRUCTION—Explain any contracts or sub-Agreements that will be awarded, why needed. Explain contractor qualifications and how the contractor will be selected.						
OTHER –List any other cost elements necessary for your project; such as extra reporting, or contingencies in a construction contract.						
TOTAL DIRECT COSTS					$27,636	$27,636.00
INDIRECT COSTS	17.5%				$5,862	$5,862.00
TOTAL PROJECT/ACTIVITY COSTS FY15					**$33,498**	**$33,498.00**

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FY15 Scope of Work
to
US Bureau of Reclamation
from

Nathan Franssen, Ph.D.
University of New Mexico, Museum of Southwestern Biology, Division of Fishes

contact Alexandra M Snyder, PI
MSC03-2020 Dept. Biology, 505.277.6005

R13AP40007
San Juan River Basin Recovery Implementation Program
Data Integration and Synthesis
(as separate from specimen curation)

1 October 2014 to 30 September 2015

San Juan River Basin Recovery Implementation Program
Data Integration and Synthesis
University of New Mexico, Museum of Southwestern Biology, Division of Fishes

Fiscal Year 2015 Scope Of Work

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Background

Data Integration and Synthesis-- Since its inception in 1992, the San Juan River Basin Recovery Implementation Program has been instrumental in managing and restoring native fish populations in the San Juan River Basin. During this time, numerous studies have been implemented with the collective goal of characterizing biotic and abiotic components of the environment that are thought to influence endangered fish populations. Information from these studies has been used to identify and implement appropriate management strategies. Most of these long-term projects focused on relationships between habitats and flow, flow mimicry and native/nonnative fish population dynamics, nonnative fish removal, native-nonnative fish interactions, and augmentation of endangered fish populations. While data collected from these projects have helped navigate management decisions over the course of the Program, most data analyses are limited to individual projects. Limited effort has been directed toward integrating and synthesizing information across studies (e.g., larval, small-bodied, and adult fish datasets). Data accumulated over the past two decades are considerable and are a valuable and an indispensable source of information for determining future management options and opportunities.

Consequently, making this information accessible and usable is essential for assessing the current status of native and endangered fish populations, informing and guiding management actions, and evaluating the Program's progress toward achieving recovery and minimizing limiting factors as required by the Program Section 7 Principles.

The U.S. Fish and Wildlife Service's Program Office is the clearinghouse for all Program data. The Program Office is responsible for compiling, integrating, and synthesizing all monitoring data, as necessary, to meet its obligations defined in the Program Document and Long Range Plan. In 2010, the Program Office proposed adding a senior Recovery Science Biologist to the Program Office to better accomplish data integration and synthesis to assess progress toward recovery and facilitate adaptive management decision-making. The Coordination Committee approved the proposal but for various reasons, the Service has been unable to hire another staff member and does not anticipate this will occur anytime soon. Existing Program Office staff has taken on some of this work but the need for additional data integration and synthesis still exists. Additionally, the information developed will help inform important relationships for integration into the San Juan Population Model being developed by the Southern Ute Indian Tribe and Miller Ecological Consultants for Program use.

Dr. Nathan Franssen was hired (FY13) to synthesize, analyze, and integrate relevant elements of this immense database in conjunction with the Program Office biologist. The postdoctoral research associate possesses strong quantitative, writing, and research skills, and is devoted to this project without other time commitments or demands. Products of the researcher's efforts will be presented to both the Program's Biology and Coordination committees, as well as interested public audiences, and ultimately will be submitted to scientific journals for peer review and publication. The research associate will collaborate closely with those responsible for directing relevant studies (e.g., adult monitoring, nonnative fish removal, and native fish reproduction) and key researchers associated with the Program to identify critical questions for integration and analysis. Collaboration will continue with appropriate project leaders and researchers in analyzing data and drafting manuscripts detailing results of investigations. The overarching goal of these efforts will be to provide a data-driven and scientifically sound approach to making recommendations regarding flow management, recovery criteria for endangered species, and measurements of Program success.

Methods

Nathan Franssen will conduct data analyses and syntheses in an office provided by the University of New Mexico, Museum of Southwestern Biology. He will work with researchers in the Program Office, USFWS Albuquerque NM to compile and analyze SJRRIP data.

In FY(15) Franssen will attend Biology Committee meetings in Durango, CO to share progress of data synthesis and discuss research goals. In addition, Thomas Turner, Keith Gido, and David Propst will attend one Biology Committee meeting to meet with researchers to discuss data synthesis. All PI's will also meet in Albuquerque, NM in spring 2015 to discuss progress of research.

Methods

This project was initially developed to synthesize and integrate data from Fall 2012 through Fall 2014. On December 5, 2012 the PI's met to identify possible topics of investigation. Personnel involved in suggesting topics included Nathan Franssen, Tom Turner, David Propst, Keith Gido, Bill Miller, Mark McKinstry, David Campbell, Scott Durst, and Sharon Whitmore.

The following is a list of suggested investigations by the PI's during the initial meeting and potential projects outlined since that time. It is likely that discussions with key Program personnel, the Biology and Coordination Committees, and researchers will identify additional studies or alterations to those suggested here. Some of these suggested investigations have been completed are near completion and their progress to date has been noted. In FY(15), completed projects (manuscripts) will be disseminated to the Biology Committee upon submission for peer-reviewed publication.

1) What are the effects of nonnative fish removal on native and nonnative fishes in the San Juan River?
Results of this project were presented to the Biology Committee on February 21, 2013 and to the Coordination Committee on May 8, 2013. Both the Biology and Coordination Committees commented on the project during those meetings. The manuscript titled "*Fish community responses to mechanical removal of nonnative fishes in a large southwestern river*" has been accepted for publication in the American Fisheries Society journal *Fisheries*. The author list included: Nathan Franssen, Jason Davis, Dale Ryden, and Keith Gido. This manuscript was distributed to the Biology Committee in draft format after it was submitted for peer review.

2) What factors are driving the spatial distribution of Colorado pikeminnow in the San Juan River and can these factors help elucidate biotic interactions that may be limiting recruitment success?
Results of this project were presented to the Biology Committee on February 21, 2013 and the Biology Committee commented on the project during that meeting. The manuscript titled "*Prey and non-native fish predict the distribution of Colorado pikeminnow (*Ptychocheilus lucius*) in a south-western river in North America*" has been published at *Ecology of Freshwater Fish* and was authored by Nathan Franssen and Scott Durst. This manuscript has been distributed to the Biology Committee and is currently available online:
http://onlinelibrary.wiley.com/doi/10.1111/eff.12093/abstract

3) What are the growth and movement patterns of Colorado pikeminnow in the San Juan River and how are these linked to environmental variation (e.g., habitat, temperature)?
Results of this project were presented to the Biology Committee on February 21, 2013 and to the Coordination Committee on May 8, 2013. Both the Biology and Coordination Committees commented on the project during those meetings. The manuscript titled "*Movement and growth of juvenile Colorado pikeminnow* Ptychocheilus lucius *in the San Juan River, NM and UT*."
is currently published online at *Transactions of the American Fisheries Society*: http://www.tandfonline.com/eprint/H7mXFnYeVpnra6exs5p3/full#.Ux4LXfldVRo. Scott Durst and Nathan Franssen authored this paper. This manuscript has been distributed to the Biology Committee.

4) How has flow manipulation, nonnative fish removal, and endangered fish augmentation influenced the fish community of the San Juan River?
This study was divided into two separate investigations, the first focused on large-bodied fishes while the second assessed small-bodied fishes.

The first study quantified spatial and temporal variation in the large-bodied fishes in the San Juan River between 1994 and 2012. Results of this project were presented to the Biology committee

March 27, 2014. The manuscript is currently being written and will be presented to the Biology and Coordination Committees May 2014 and the manuscript will be submitted to the biology committee FY (14). Nathan Franssen, Scott Durst, Vince Lamarra, Keith Gido, and David Propst are authoring this paper.

The second project assessed spatial and temporal variation in small-bodied fishes and specifically quantified habitat use of fishes in secondary channels was also investigated in FY (14). Results of this study were presented to the Biology committee March 27, 2014 and will be presented to the Coordination committee May, 2014. This manuscript is currently being written and will be distributed to the Biology committee FY (14). Nathan Franssen, Eliza Gilbert, and David Propst are authoring this paper.

5) Quantify Razorback sucker stocking and population estimates to assess future stocking needs.

This project is ongoing but preliminary results of survival and detectability of Razorback sucker were presented to the Biology Committee March 27, 2014. We are currently running models to quantify survival of fish stocked in various locations and different seasons into the San Juan River. Additionally, Nathan Franssen, Scott Durst and personnel in the Fish and Wildlife Conservation Office in Albuquerque are designing future stocking operations to better assess stocking success and/or inadequacies. This project will be concluded in FY (15).

6) Assess survival of Colorado pikeminnow to determine if current stocking numbers will meet goals of augmentation.

In FY (14), Nathan Franssen and Scott Durst attempted to use mark-recapture data to assess survival and detectability of Colorado pikeminnow in the San Juan River. Unfortunately, it was determined that the scarcity of recaptured individuals precluded the analysis of these data. This project will likely be revisited if the numbers of recaptures are higher in the future, but currently these analyses seem unfeasible.

7) What are environmental drivers of spawning and recruitment success of Channel catfish?

This project was initially investigated in FY (14). Nathan Franssen suggested the inefficiency of electrofishing at capturing Channel catfish <300 mm TL makes linking recruitment patterns to environmental variation difficult. However, new data are available on length-at-age for Channel catfish in the San Juan River and this information will be used in FY (15) to build a Statistical Catch At Length (SCALE) model developed by NOAA's National Marine Fisheries Service that will assess stock characteristics (e.g., biomass, size structure, annual variation in recruitment) of the Channel catfish population. This model should help managers quantify the efficacy of nonnative fish removal on the catfish population as a whole. The examination of environmental drivers in the model (i.e., flow variation) should allow managers to assess the effect of managed flow releases as a means to control channel catfish populations in addition to mechanical removal.

8) How has annual variation in the San Juan River's flow regime altered densities of native and nonnative fishes?

Completion of the spatial and temporal variation assessment of small-bodied fishes revealed strong temporal declines in the densities of nonnative small-bodied fishes. However, it is currently unclear what environmental conditions may have contributed to their decline. We propose to quantify temporal variation in annual flows and temperature to determine how flow variation contributed to

their declines. Additionally, the assessment of variation in the San Juan River's flow regime on densities of native and nonnative fishes will inform fish-flow relationships as part of the evaluation and revision of the Program's Flow Recommendations.

Proposed projects 5, 7, and 8 will be completed in FY(15) and presented at Biology and Coordination Committee meetings. Completed manuscripts will be distributed to the Biology Committee upon submission for peer-reviewed publication.

Products

Manuscripts, suitable for peer-reviewed publication, will be prepared in collaboration with appropriate Program personnel, the Biology Committee, and researchers for each commonly agreed upon investigation. One manuscript was published in FY (13), three manuscripts have been accepted or published in FY (14) and at least two more will be completed in FY (14). A minimum of 3 manuscripts will be prepared in FY (15).

Schedule

This project is proposed for 1 year, beginning 1 October 2014, with the option for a 2nd year.

FY15 Budget 1 Oct 2014 to 30 Sept 2015

BUDGET ITEM DESCRIPTION	COMPUTATION		RECIPIENT FUNDING	OTHER FUNDING	RECLAMATION FUNDING	TOTAL COST
	$/Unit and Unit	Quantity				
SALARIES AND WAGES --Position title x hourly wage/salary x est. hours for assisted activity. Describe this information for each position.						
UNM Post-doctoral	$20.20/ HR	1.00FTE			$42,025.00	$42,025.00
UNM Faculty Summer	$59.00/ HR	0.04FTE			$9,408.00	$9,408.00
FRINGE BENEFITS – Explain the type of fringe benefits and how applied to various categories of personnel.						
UNM Post-doctoral	29.6%	1			$12,439.00	$12,439.00
UNM Faculty Summer	21.9%	1			$2,060.00	$2,060.00
TRAVEL—dates; location of travel; method of travel x estimated cost; who will travel						
Franssen, Propst, Turner, Gido-Durango, CO; Albuquerque, NM	$1,500/EA				$6,000.00	$6,000.00
EQUIPMENT—Leased Equipment use rate + hourly wage/salary x est. hours for assisted activity—Describe equipment to be purchased, unit price, # of units for all equipment to be purchased or leased for assisted activity: Do not list contractor supplied equipment here.						
SUPPLIES/MATERIALS--Describe all major types of supplies/materials, unit price, # of units, etc., to be used on this assisted activity.						
CONTRACTUAL/ CONSTRUCTION—Explain any contracts or sub-Agreements that will be awarded, why needed. Explain contractor qualifications and how the contractor will be selected.						
OTHER –List any other cost elements necessary for your project; such as extra reporting, or contingencies in a construction contract.						
IT, computer, telephone, publication	$292.00	12 MO			$3,500.00	$3,500.00
TOTAL DIRECT COSTS--					$75,432.00	$75,432.00
INDIRECT COSTS – 17.5%						
					$13,201.00	$13,201.00
TOTAL PROJ./ACTIVITY COSTS					$88,802.00	$88,802.00

Habitat and Water Temperature Monitoring 2015

1.0 INTRODUCTION

In 2011 the San Juan Recovery and Implementation Program (SJRIP) developed water temperature and habitat monitoring protocols. During the period of time that habitat and temperatures have been collected in the San Juan River, the river has experienced a wide variety of flows. Habitat monitoring started in the San Juan River in 1991 and 1992 with work being conducted by the BOR. That mapping, which only looked at total wetted area and backwaters, was taken directly from videography without any field inspections. In the fall of 1992, Ecosystems Research Institute (ERI) started mapping the San Juan River using the current river wide mapping methodologies and habitat types. Between 1992 and 2007, base flow river wide habitat has been mapped by ERI 19 times.

Habitat Monitoring Status

In 1998, flow recommendations were developed by the SJRIP for the San Juan River below the confluence with the Animas River (River Mile 180). Flow recommendation details were heavily based upon river channel and habitat response to flows determined from a 7-year research study of channel morphology and habitat. In 1999, long-term monitoring was established to monitor channel and habitat response to flows. The protocols were continuations of those established during the 7-year research period and continued through 2004.

During the data integration process of 2004–2005, it became evident that backwater habitat types during base flow periods (800-1200 cfs) had reduced in number and surface area since September 1995. Backwater surface areas between RM 180 to 2 decreased from 140,000 m^2 in September 1995 to less than 20,000 m^2 by October 2003. From 2005 to 2007, backwater surface areas stabilized at approximately 40,000 m^2.

Several hypotheses have been proposed as possible causes, including channel simplification, secondary channel abandonment, or lack of high runoff flows. Additionally, the channel morphology-monitoring program (specifically the across-stream transects) indicated a slightly narrower, deeper channel, which can lead to channel simplification as a potential mechanism. However, review of a limited data set from the 1960s appears to support the lack of high flows as a probable cause.

The data integration analysis in 2005 also indicated that complex channel reaches (those with high habitat diversity, islands, multi-threaded channels and complex channel margins) correlate to native fish abundance. Furthermore, capture of young-of-year (YOY) endangered fish also tends to be correlated with channel complexity. Finally, backwater and low velocity habitats are more likely to occur in reaches with high complexity. As a result, two detailed reaches were identified for long-term monitoring in the San Juan River during the summer of 2006 through 2010. The goal of this study was to better understand the

mechanism or process for creation and maintenance of these complex reaches and to understand the processes resulting in the loss or creation of backwater habitat important for the rare and native fishes in the San Juan River.

To the extent possible, habitat monitoring is closely coordinated and integrated with fish community monitoring to allow assessment of changing habitat availability and fish use in response to management actions and population recovery. Standardized habitat monitoring for the San Juan River was included in the 2000 monitoring plan and was reviewed and revised for the 2011 version. The plan is designed to monitor and evaluate habitat changes through time. The data and information from habitat monitoring will be integrated with different monitoring activities to assess the effectiveness of management actions, such as flow management, fish population estimates, and nonnative fish population abundances. A focused habitat monitoring workshop was conducted in 2011 which evaluated, refined, and refocused the habitat monitoring program on the San Juan River to insure the program implements methodologies that are conducive to answering outstanding questions and provide the data necessary to evaluate and revise the SJRIP's flow recommendations. This work plan incorporates several of the workshop recommendations

Water Temperature Monitoring

Water temperatures have been recorded in the San Juan River at 15 different locations for various periods of record. Using the 1999-2003 integration studies, the Biology Committee (BC) decided to collect temperatures at eight locations to be used for long-term monitoring. The BC decided that temperatures should be recorded every 15 minutes, with a daily maximum, minimum and average calculated. These data are now being collected by the USGS at approved upon locations.

Project Justification

The SJRIP has, as one of its two primary goals, the conservation of populations of Colorado pikeminnow and razorback sucker in the San Juan River basin. To aid in the evaluation of achievement of these program goals, the following monitoring plan goals were developed (San Juan Draft Monitoring Protocols, 2010):

1) Track the status and trends of endangered and other fish populations in the San Juan River;
2) Track changes in abiotic parameters, including water quality, channel morphology, and habitat, important to the fish community in particular and the aquatic community in general;
3) Utilize data collected under Goals 1 and 2 to help assess progress towards recovery of endangered fish species; and,
4) Assess effectiveness of management actions, implemented flows, and intra- and inter-annual variability in flows on recovery of Colorado pikeminnow, razorback sucker and population status of other fish species.

Relative to this proposal, SJRIP goal (2) above will be met in part. Specifically, achievement of this goal will occur through the tracking of species important backwaters (numbers and

areas), as well as channel complexity necessary for all life stages of the two rare fish in the San Juan River. Updating the existing database and comparing the current information will provide a status and trends.

Project Objectives

The specific objectives of this Proposal correspond to the overall objectives of the draft monitoring protocols (2010) as well as several recommendations of the program work shop held in 2011. Specifically the direct linkage of objectives between thisProposal and protocol objectives (by number) that are in common include:

Objective 1) Annually, following spring runoff, document abundance and distribution of key habitats and geomorphic features (backwaters, embayments, islands and total wetted area) that indicate the response of the river channel and habitat to antecedent runoff conditions and specific management actions.

Objective 2) Maintain continuous water temperature recorders at key locations from Navajo Dam to Mexican Hat, Utah to examine the influence of artificial manipulation of water releases from Navajo Dam on water temperature.

Objective 4) Periodically map river-wide habitat abundance and distribution in the San Juan River from the Animas River confluence (RM 180) to Clay Hills Crossing (RM 2) to track long-term trends in habitat (Done in 2014)

Objective 8) Develop relationships between habitat availability and antecedent flow conditions. Use key habitats for this analysis.

Objective 9) Track long-term trends of habitat availability …

PLAN OR STUDY DESIGN

There are three major tasks included in the proposed monitoring program. They include:

Task 1) Annual Habitat Mapping using geo-referenced video imagery for Islands, Backwaters and embayments

Task 2) Field Habitat verifications of secondary channels

Task 3) Water Temperature Monitoring

Each of the above tasks are described in detail in the following sections and cover methods, data analysis, schedule and deliverables.

Tasks 1 and 2. Annual Habitat Mapping and Field Verification - General Methods

1) Using the habitat categories: backwaters, embayments, islands, and total wetted area, map aquatic habitat at a scale of 1" = 200', using geo-referenced video imagery provided to the contractor by the program,

2) Examine the relationships between hydrology (especially recent antecedent hydrology conditions) and habitat conditions throughout the river, especially backwater habitats and island complexity.
3) Field verify the conditions of secondary channels at the remote mapping flow levels

Specific Methods for Annual Habitat Mapping

Digital videography of the San Juan River from the Animas River confluence (RM 180) downstream to below Clay Hills Crossing (RM 0) will be acquired from Reclamation at a flow of from 500 to 1,000 cfs in late August or early September each year. Digital single frames will be captured from this videography to provide full coverage of the river with about 20% overlap. The digital images will be rectified to the most recent digital orthographic quads (DOQs) prior to photo-interpretation and will be archived to DVD. Photo-interpretation will be completed to identify backwaters, embayments, islands, and total wetted area annually for RM 0 to RM 180. Once the digital frames have been registered, ArcGIS will be used to digitize the boundaries of the wetted channel, backwaters, embayments and islands. The data will be processed and summarized by river-mile to match existing datasets.In 2012, using video mapping, it was difficult to determine if smaller secondary channels were flowing. In 2015, field verification will determine secondary channel conditions at the mapping flow

Data Analysis

Data analysis is the same whether photo-interpreted or field mapped, except that the number of habitats analyzed will be different. Trend analysis will be performed on all habitat types mapped to assess trend with time and flow at mapping. Trends with time will be analyzed with raw data (habitat count and area by river-mile with time) and with data normalized for flow at mapping.

Schedule

Base photography will be acquired in late August or early September 2015 (flow permitting). Image capture, and photo-interpretation will be completed by February 2014 The draft annual report will be completed by March 31, 2015 with the final report due June 1, 2015.

Deliverables

Annual tasks

1) Digital video image captures of channel and flood plane at a flow between 500 and 1,000 cfs.
2) Polygon area, perimeter and geo-referenced location of backwaters, embayments, islands, and channel margins
3) Flow at mapping (flight date) for each USGS gauge
4) Distribution and abundance (area and density) of backwaters, embayments and total wetted area in response to antecedent runoff conditions and other management actions. Channel complexity (e.g. island count and total wetted area per river mile

5) Date of mapping
6) Antecedent runoff hydrograph
7) Data summarized by river mile, geomorphic reach and full range

Introduction to Temperature Monitoring

Miller Ecological Consultants, Inc (MEC) has monitored water temperature in the San Juan River and selected tributaries since fall of 2011. During that time MEC has made several recommendations to modify the water temperature data collection. These recommendations include adding a water temperature data logger in the San Juan River upstream of the confluence with the Animas River and cease collecting water temperature data at the base of Navajo Dam. These recommendations were made to better meet the current objectives of the Long Range Plan. The added location upstream of the Animas River provided a more detailed analysis or the water temperature changes between Navajo Dam and the Animas River. The recommendation to remove the logger at Navajo Dam was based on several factors; 1) this location was originally chosen when the tailwater fishery was part of the San Juan Seven Year Research Program, the tailwater is no longer included in the San Juan annual work plans, 2) coordination with the dam tenders adds another factor to logistics for the location, and 3) the logger at Archuleta provides an upstream water temperature that is very close to the release from Navajo Dam.

The data reporting for FY2012 resulted in several other recommendations. These were:

- Transfer the water temperature monitoring to USGS real time monitoring at the following gages:
    - San Juan at Archuleta, San Juan at Farmington, Animas at Farmington, and San Juan at Four Corners.

  The USGS has a continuous monitor at Mexican Hat (USGS gage at Bluff). Transferring the data collection to USGS would provide a means to continue long term monitoring without some of the difficulties associated with separate loggers. It would provide real time retrieval for use by any researcher rather than end of year reporting. Further, the data would be archived in USGS permanent records and would simplify data base administration for the San Juan Program.

- Discontinue water temperature monitoring on ungaged tributaries to the San Juan River, such as McElmo Creek.

  The San Juan Program has no direct management of any of the tributary flows. The flows and resulting water temperatures are outside the control of the Program and therefore the Program does not have a means to directly change water temperature (e.g. through modified flow regimes). In addition, the remote PIT tag readers have the capability to monitor water temperature data.

- Continue the annual summary of water temperature data for inclusion in the annual meeting discussions and annual report.

- Conduct an analysis of water temperatures and the number, timing, and size of larval fishes in the San Juan River for the years 1998 through 2012, and, if practicable, for the years 1992 – 1997.

The following sections describe the tasks for the continued water temperature monitoring tasks

Task 3) Water Temperature Monitoring

The water temperature monitoring in the San Juan River and the Animas River at Farmington, New Mexico is now being collected by the USGS. The locations are as follows: San Juan River at Archuleta, NM; San Juan River at Farmington, NM; San Juan River at Four Corners, NM; San Juan River at Bluff (Mexican Hat), UT; and the Animas River at Farmington, NM. All locations except the Animas River at Farmington are real-time reporting stations at the USGS gage location. The Animas River at Farmington will be real-time reporting later in 2014.

Data Base and analysis

At the end of each water year, data for the water year will be compiled and the daily average temperatures plotted along with the daily hydrograph of the San Juan River at Four Corners, New Mexico. A summary report will be prepared that will include presentation of the daily average temperature data with a discussion of data collection procedures, data quality and repair requirements during the season. Anomalous data, if any, will also be discussed.

There will be an additional analysis in FY2054 that reviews the historical water temperature data base, USGS gage records and larval monitoring reports. This analysis will evaluate the data to determine if any patterns showing larval response in growth, number or timing of larval presence are apparent from the data set.

Proposed Methods

Data Collection

The data collection will be completed by USGS according to their standard protocols. Water temperature data for each location will be downloaded from the USGS web site and compiled for analysis.

Data Storage

The records will be maintained in a Microsoft Access database. The main data table will store the 15-minute data and will be constructed as shown in Table 3. Data tables summarizing daily maximum, minimum and average temperatures will be generated for each of the sites by query of the main data table and stored in the database in the format

shown in Table 4. Table 5 shows the information stored to describe each session, including geo-spatial data to allow importation into a geographic Information System.

Data Analysis and Reporting

After the fall download, data for the water year will be compiled and the daily average temperatures plotted along with the daily hydrograph of the San Juan River at Four Corners, New Mexico. A summary report will be prepared that will include presentation of the daily average temperature data with a discussion of data collection procedures, data quality and repair requirements during the season. Anomalous data, if any, will also be discussed.

In addition to the data reporting, a retrospective analysis will be conducted on the existing water temperature data sets and larval fish data. The water temperature data for all years available will be evaluated in conjunction with the timing, size and number of larvae captured in the larval fish study. The objective of the analysis would be to determine if the data shows a linkage between the water temperature regime and the timing, size and number of larvae. These analyses would be used in evaluation of the review of flow recommendations and potential impacts from the water temperature depression on native fish larvae.

Deliverables

The water temperature monitoring will be conducted by USGS as per the FY2013 report recommendations. The tasks for FY2015 are analysis and evaluation of existing data. This analysis, while useful for integration with review of the flow recommendations, could be conducted in FY2015 with the initial work on the flow recommendation review.

The tasks for FY 2015 are:

Daily mean flow at each USGS gage

- Retrospective review of water temperature data for year data is available.
- Comparisions of larval capture rates, sizes and timing of capture with water temperatures.
- Report summarizing the analysis and submitted by March 31st of each year
- A final report submitted by June 1 of each year
- October 1, 2014 – September 30, 2015 data set from USGS gages for Recovery Program files
- An updated temperature database with all data collected to date, updated through September 2015 by June 1, 2016.
- Attendance at the annual report meeting and one additional Biology Committee meeting

Table 2. Water temperature monitoring locations

Location	RM
Archuleta - San Juan at USGS Gage Location	218.6
Farmington - San Juan at USGS Gage Location	180.1
Four Corners - San Juan at USGS Gage Location	119.4
Mexican Hat - San Juan at Bluff Gage Location	52.1
Farmington - Animas at USGS Gage Location	n/a

Table 3. Temperature database main table format

Temp			
ID	**RecDate**	**RecTime**	**DegC**
4C	7/9/1999	4:04:27 PM	23.48
4C	7/9/1999	4:49:27 PM	23.74

Table 4. Daily temperature summary table format

AnimasFarminton				
ID	**RecDate**	**Tmax**	**Tmin**	**Tavg**
AF	7/8/1999	22.11	18.36	19.2
AF	7/11/1999	20.13	15.81	17.9

Table 5. Temperature station description database table

StationID					
ID	**Location**	**Notes**	**Lat**	**Lon**	**Datum**
4C	Four Corners	Located at the Four Corners USGS gage	37.00195	-109.0311	NAD83
AF	Animas at Farmington	Located an the Animas at Farmington USGS gage	36.72154	-108.2017	NAD83
AR	Archuleta	Located at the Archuleta USGS gage	36.80278	-107.699	NAD83
FM	Farmington	Located at the Farmington USGS gage	36.72221	-108.2251	NAD83
MH	Mexican Hat	Located right bank near the USGS mini-monitor enclosure upstream of Mex Hat bridge	37.15059	-109.8669	NAD83

2015 Budget

Option Year Budget: 2015

TASK	Labor	Direct Costs	Total by Task
Task 1 and 2 Habitat Mapping and Verification			
Videography Clipping	$2,493.00		$2,493.00
Image rectification	$47,960.00		$47,960.00
Digitizing Mapped River	$10,951.50		$10,951.50
Back Water/ Embayment Identification	$2,962.60		$2,962.60
Data Analysis	$3,957.97		$3,957.97
Reporting	$4,972.39	$182.07	$5,154.46
Meetings	$636.00	$759.49	$1,395.49
Task 3 Water Temperature Monitoring			
Logger Deployment	$0.00		$0.00
Quarterly monitoring	$2,049.28		$2,049.28
Data analysis	$6,926.56		$6,926.56
Draft report	$4,593.28		$4,593.28
Final report	$1,603.65		$1,603.65
Meetings	$1,272.00		$1,272.00
Final report data delivery	$424.32		$424.32
Total Cost Estimate	**$90,802.55**	**$941.56**	**$91,744.11**

San Juan River Population Model runs.
Fiscal Year 2015 Project Proposal

Principle Investigator: Bill Miller
Miller Ecological Consultants
2111 S. College Ave., Unit D, Fort Collins, CO 80525

and

Principle Investigator: Vince Lamarra
Ecosystems Research Institute Research Institute
975 South State Highway, Logan, UT 84321

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 Goal 4.3 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 Colorado pikeminnow and razorback sucker in the river. A mechanistic population model has been constructed from the original conceptual model.

The San Juan River population model includes 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 population model was demonstrated to the Biology Committee, Researchers and Peer Review Panel in May 2007. The model was updated in 2011 through 2013 with funding from the Southern Ute Indian Tribe to Stella Version 9 software. The model update is complete and capable of use for making model runs.

The Coordination Committee requested a Scope of Work for additional model runs that could not be completed during Biology Committee meetings. The FY2015 SOW program is to make model runs that can not be made during the normal Biology Committee meetings.

Objective

Make model additional model runs as requested through the Program Office and approved by the Coordination Committee that incorporate the information from the monitoring data to evaluate SJRIP Program actions.

Methods

Model simulations will be made to evaluate the change in population dynamics as a result of Program management actions or other activities that may affect recovery of Colorado pikeminnow and razorback sucker. Model simulations will be conducted for a maximum of 10 different simulations.

Model Workshop

The Coordination Committee requested a one day workshop for the SJRRIP program that provides an overview of the Population Model. The workshop would provide the following:

- A background of the modeling work from 1998 through the model workshop in 2007.
- A presentation of the updates completed to move the model from Stella 8 to Stella 9

- Description of model inputs and outputs.
- Example model runs for several management action scenarios.

Schedule

Model runs will be made as requested and after approval by the Coordination Committee on an as needed basis for FY2015.

Products

A brief report will be prepared that documents the model runs. Summary tables of model simulations will be produced for each model run.

Budget FY-2015

All funding for FY 2015 activities are requested from the recovery program. Total funding requested is shown in the following table.

Population Model Runs	Miller		ERI		total cost
	Staff days	**Cost**	**Staff days**	**Cost**	
Labor	10	$9,240	4	$5,120	$14,360
Travel		$600		$600	$600
Supplies (software updates etc)		$-			$-
Total cost		$9,840		$5,720	$14,960

DETERMINING THE NATAL ORIGIN OF SAN JUAN RIVER RAZORBACK SUCKER THROUGH ISOTOPIC SIGNATURES AND ELEMENTAL ANALYSIS OF FIN-RAYS FISCAL YEAR 2015 PROJECT PROPOSAL

Principal Investigators:
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Introduction

Razorback Sucker, *Xyrauchen texanus,* were listed as endangered under the Endangered Species Act in 1991. Due to low numbers and natural recruitment to spawning age (Minckley 1983, Bestgen et al. 2002), population supplementation has been provided by hatcheries. Two hatcheries that spawned and supplement wild populations in the San Juan River were the Dexter National Fish Hatchery & Technology Center (Dexter) and Uvalde National Fish Hatchery (Uvalde). As of 2014, Razorback Sucker from Uvalde National Fish Hatchery were no longer raised for stocking into the San Juan River. However, production of Razorback Sucker by U.S. Fish and Wildlife Service at Grand Junction, Colorado, will provide fish for stocking into the San Juan River. To more effectively manage this endangered species, it is necessary to determine wild versus hatchery stock representation in the San Juan River. Wild fish will be referred to fish naturally spawned in the San Juan River, and hatchery fish will refer to fish propagated in a hatchery.

While it is easy to determine natal origin of fish that have passive integrated transponder (PIT) tags, it is not always possible to ascertain if fish captured without PIT tags are actually wild fish due to non tagging of hatchery fish or tag loss. The percent of non-PIT tagged razorback sucker taken in the San Juan River has fluctuated from 8.2% in 2004 to over 38% in 2006. Of the 1,633 sub-adult and adult razorback sucker collected in the San Juan River in 2011, 254 (15.6%) were not PIT tagged (Table 1). If fish captured without tags are considered wild fish, wild fish numbers may be inflated and may not accurately represent natal origin composition in the San Juan River. The inability to differentiate between wild and hatchery fish (i.e., determine natal origin) can hinder progress in recovery of the species (Barnett-Johnson et al. 2007).

Otolith microchemical analysis can be used to determine natal origins of fish, but this technique requires euthanizing specimens. Alternatively, scale microchemistry offers a non-lethal method to determine natal origins of fish. Although otoliths may provide more accurate classifications of fish origin (Wells et al. 2003; Clarke et al. 2007), Ramsay et al. (2011) showed that there was similar classification accuracy between using scales and otoliths for *Salmo trutta*, brown trout. While our initial investigations (2012) of Razorback Sucker natal origin using scales looked promising, the extensive preparation time for each scale, need to analyze multiple scales from each specimens, and difficulty in producing repeatable results led us to investigate use of fin rays as an alternative hard-body part for microchemical analysis.

Pangle et al. (2010) reveal the importance of a fine-scale approach to analyze how individual stocks contribute to the population using otolith microchemical analysis. We hope to do the same using non-lethal fin-ray microchemistry (isotope and elemental) analysis. If this analysis is able to accurately determine natal origin of fish, it will provide a more complete understanding of razorback sucker stock (Dexter, Uvalde, Grand Junction, wild) survival and natal origin composition in the San Juan River. This information will help guide restoration and

supplementation efforts to be maximally effective.

YEAR	Number w/o PIT tags	Number with PIT Tags	Percent w/o PIT Tags	Total number collected	Number of larval rzb collected
2002					815
2003					472
2004	34	381	8.2	415	41
2005	34	307	10.0	341	19
2006	213	338	38.7	551	202
2007	357	708	33.5	1,065	200
2008	184	382	32.5	566	126
2009	184	440	29.5	624	272
2010	164	873	15.8	1,037	1,251
2011	254	1,379	15.6	1,633	1,065

Table 1. Number of sub-adult and adult razorback sucker collected per year and the number of specimens lacking PIT tags.

Project Objectives:

1. Using isotopic and elemental concentration data generated from LA-ICP-MS to determine a method for categorizing fish by natal origin (Dexter, Uvalde, wild).
2. Create a robust dataset of isotopic and elemental measurements from hatchery specimens, so fish can be accurately classified by natal origin through statistical modeling.
3. Test the dataset for accuracy by using known natal origin fish rays (PIT tagged) from fish captured in the San Juan River or the San Juan River Arm of Lake Powell that are not included in the hatchery dataset.
4. Report results, accuracy of statistical model, and all pertinent findings.

Study Area:

The study area is the San Juan River and San Juan River Arm of Lake Powell.

Methods:

Field — Fin rays will be removed from study specimens using antiseptic techniques. Field crews will be provided a water-proof scale sampling kit containing sampling instructions, special fin ray clippers, water-proof pens and pencils, isopropyl wipes, and pre-labeled sample envelopes. The fin-ray clippers will be used to remove a 20 mm portion of the second fin ray from the right pectoral fin. After fin ray is removed from an individual fish, it will be placed in a pre-labeled # 1 coin envelope (2.25 inches x 3.5 inches). The species, date of collection, PIT tag number, length (standard and total), weight, and location (river mile) of the captured individual will be recorded on each envelope. The fin ray clippers will be cleaned with an isopropyl wipe each time fin rays have been removed from a specimen.

Laboratory processing of fin rays – After removal and return to the laboratory, fin rays will be sonicated in Milli-Q water for and subsequently embedded in epoxy resin and cut transversely using an Isomet low-speed saw with

diamond wafering blades to expose annuli. Fin rays will be mounted on microscope slides using double-sided tape, rinsed with 3% ultrapure nitric acid, sonicated in Milli-Q water for five minutes, and air-dried for 24 hours. Sample slides will be placed in clean plastic petri dishes and taken to the Woods Hole Oceanographic Institution Plasma Mass Spectrometry Facility, Woods Hole, Massachusetts, for geochemical analysis.
Laboratory – (Woods Hole Oceanographic Institution) – Water samples will be analyzed using inductively coupled plasma mass spectrometry for Strontium isotopes (isotopic analysis) and elemental concentrations of Barium, Calcium, Magnesium, Manganese, and Strontium to determine if hatchery, San Juan River, and San Juan River arm of Lake Powell water signatures differ enough from each other to de detectable in our scale samples. We will also use this data to determine if scale elemental signatures are linearly related to water elemental signatures.

Fin rays will be analyzed at WHOI via laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) for Strontium isotopes (isotopic analysis) and elemental concentrations of Barium, Calcium, Magnesium, Manganese, and Strontium. Fin rays obtained from hatcheries will serve as reference and create a reference data set of measurements for known origin fish. Fin rays from non-tagged razorback suckers will be compared to the data set of known origin fish to determine natal origin.

Precision and accuracy of sample analyses are determined by periodic analysis of reagent blanks and Canadian (FEBS-1; National Research Council [Canada] Institute for National Measurement Standards; Sturgeon et al. 2005) and Japanese certified otolith reference materials (NIES-022; Japan National Institute for Environmental Studies fish otolith; Yoshinaga et al. 2000). These materials are not only analyzed at the beginning and end of the daily session but are also introduced to the mass spectrometer (analyzed) after every fifth fin ray has been sampled. Analysis of the blanks and standards is the same as performed on the fin rays (i.e., same five elements and same 10 isotopes per element). As these samples are a liquid, they are not ablated but instead transported into the analytic chamber via argon gas and analyzed at approximately one-second intervals for about one-minute. These data are used to determine and correct (if necessary) the "drift" in the mass spectrometer during the daily session so that adjustments can be made to the elemental values of the individual fin rays.

Analysis:

Data Analysis — Because of the complicated nature of the data generated, we were strongly advised to have an expert in analytical chemistry review our data before attempting analyses and interpretation. ASIR will hire an expert to perform this review of the data prior to and after analyses to ensure that our interpretations are sound. Data analysis will include importing all data into a useable format for analysis using statistical software. Elemental concentration readings for each scale will be examined for analytical suitability. Adequate fin rays are those with readings above the limit of detection (LOD) for each element. The LOD for each element will be determined after blanks are run for each element; however, LOD will likely follow calculations used by Miller and Miller (1993). Following data manipulation, to establish natal origin signature from concentrations, a predictive model will be created and tested for classification accuracy. A data set (or library) of known natal origin fish fin rays will be created to determine if fish fin rays from unknown origin fish can be correctly classified to their site of propagation and rearing (specific hatchery or wild).

Products:

A draft report will be presented to the San Juan River Basin Biology Committee for review by 31 March 2016. Upon receipt of written comments, that report will be finalized and disseminated to members of the San Juan River Basin Biology Committee by 30 June 2016. Electronic copies of the data will be transferred to the San Juan River database manager. Fish fin rays 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 under a MSB contract with the SJRBRIP.

Meetings:

Researchers are required to attend a minimum of two meetings annually and report on annual monitoring projects. The two meetings (February and May) require researchers present PowerPoint presentations outlining the results

and that years findings. Each meeting lasts about three days (which includes travel time). No additional costs will be required for the presentation of this material as it will be incorporated into the San Juan River larval fish monitoring presentation.

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Yoshinaga, J., A., M. Nakama, M. Morita, and J. Edmonds. 2000. Fish otolith reference material for quality assurance of chemical analyses. Marine Chemistry 69:91-97.

Project Title: Determining the natal origin of San Juan River Razorback Sucker through isotopic signatures of fin rays

Proposed budget based on fin ray samples from 500 fish and isotopic/elemental analysis performed on one fin ray per fish

Personnel			
FIELD WORK			
MATERIAL GATHERED UNDER CURRENT SOW'S			
Lake Powell Project	no charge	$	0
Non-native Removal	no charge	$	0
PNM Fish Ladder	no charge	$	0
Adult Monitoring	no charge	$	0
FIN RAY PREPARATION (500 fish, 500 fin rays)			
Fisheries Technician	10 staff days	$	2,212
TASKS: *Class 100 clean room processing of fin rays: selection, examination, sonification, preparation, mounting, and accounting of sample materials*			
WHOI ANALYTICAL RUNS (500 fish, 500 fin rays)			
Fisheries Technician	10 staff days	$	2,212
Five staff days per trip x 2 trips (one individual)			
TASKS: *Perform analytical runs of fin rays*			
Fisheries Biologist I	10 staff days	$	3,594
Five staff days per trip x 2 trips (one individual)			
TASKS: *Perform analytical runs of fin rays*			
OFFICE WORK (ANALYSIS OF DATA & REPORT PRODUCTION)			
Fisheries Biologist I	40 staff days	$	14,374
Office effort – 50 staff days			
TASKS: *Post-ablation data processing (photography, review, lengths), data analysis, draft report preparation, review redraft and submission, development of presentation of study for annual meetings*			
PROJECT OVERSIGHT AND REVIEW			
Senior Fisheries Biologist			
*Supervise all aspects of the project (per project year *)*	5 staff days	$	3,040
TASKS: *Project oversight, data review, reporting duties, meeting presentation, updates of progress*			
	Personnel: Total	**$**	**30,582**

Materials and Supplies			
Fin Ray Preparation (Class 100 cleaning facility)			
Slides and mounting media		$	100
Washing/cleaning (sonicator, hydrogen peroxide, HCl, etc.)		$	200
Non-metallic (ceramic) cleaning and mounting tools		$	200
Isomet 5" saw blade (11-4254)		$	375
Buehler EpoThin^2 Resin and Hardener (48 oz)		$	200
		$	
	Fin Ray Preparation: Subtotal	$	1,075
Analysis at WHOI (published rates) for two five-day trips			
Element 2 argon plasma mass spectrometer (daily user fee) x 5	$ 1,300/day	$	6,500
Neptune isotope plasma mass spectrometer (daily user fee) x 5	$ 1,545/day	$	7,725
193 nm LASER (daily user fee) x 10	$ 115/day	$	1,150
"Night" argon daily user fee (for long analytical sessions) x 10	$ 115/day	$	1,150
	Mass Spectroscopy: Subtotal	$	16,525
	Materials and Supplies: Total	$	**17,600**

Travel and Per Diem			
Elemental Analysis at WHOI			
Off-season rates (15 November - 15 April)			
Travel - (airlines; Albuquerque, NM to Providence, RI)	$ 700/r.t.	$	2,800
Round-trip (r.t.) tickets x 2 staff x 2 trips			
Travel - (car rental and fuel)	$ 90/day	$	900
Five days per trip x 2 trips			
Per Diem - (food and expenses)	$ 50/day	$	1,000
Five days per trip x 2 staff x 2 trips			
Hotel - (Falmouth/Cape Cod)	$ 100/night	$	2,000
Five days per trip x 2 staff x 2 trips			
	Travel and Per Diem (WHOI): Total	$	**6,700**

Personnel Total	$	**25,432**
Materials and Supplies Total	$	**17,600**
Travel and Per Diem Total	$	**6,700**
Project Subtotal	$	**49,732**
IDC (20%)	$	**9,946**
2015 Estimated Costs: GRAND TOTAL	$	**59,687**

Proposal

San Juan River Phase II Channel Restoration Site Monitoring

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INTRODUCTION

Since the 1930s, the San Juan River's channel has become narrower, deeper and less complex; expansive sand bars and open portions of the floodplain have become vegetated by nonnative Russian olive and saltcedar, and stream banks have become densely armored by nonnative vegetation (Bleisner and Lamarra 2006). In addition, many of the secondary channels that historically supported backwaters and other low-velocity habitats are now disconnected from the main channel (perched above the river's primary channel) and are choked with nonnative vegetation (Stamp et al. 2006). As a result of these changes, there has been a greater than 50% loss of backwaters and secondary channel habitats between 1998 and 2005 (Miller 2006). Large floods that create and maintain these habitats are virtually nonexistent in the system and flow recommendations implemented since 2000 have not been successful in opening up secondary channels or in maintaining backwaters due to the extensive bank armoring by nonnative vegetation; this armoring reduces the capacity of high flows to scour sediments from secondary channels and reconnect them to main channel (Miller 2006; Michels-Boyce 2013). Backwaters and secondary channels are critical to the survival of young of the year and juvenile native fish, including Colorado pikeminnow and razorback sucker (Propst and Hobbes 1999; Archer et al. 2000). Retention studies after stocking of Colorado pikeminnow and razorback sucker showed that secondary channels are important habitats for stocked endangered fish, especially during the initial months after stocking (Golden and Holden 2005).

In 2009, The Nature Conservancy (TNC) received funds from the New Mexico Environment Department through their River Ecosystem Restoration Initiative to implement a large-scale restoration experiment—restoring channel complexity at six sites using a variety of methods including: 1) re-establishing the secondary channel inlet (connection with the river) and cleaning out (excavating) the secondary channel; and 2) mechanical clearing and chemical treatment of Russian olive and saltcedar along the secondary channel banks.

The initial channel restoration project, which was completed in the fall of 2012, was monitored using existing resources from the Small Bodied Fish, Larval Fish, and Habitat Monitoring programs. In early 2013, TNC received additional funds for a Phase II restoration effort and in August, a complex site, located between RM 134 and 137, was selected (Figure 1).

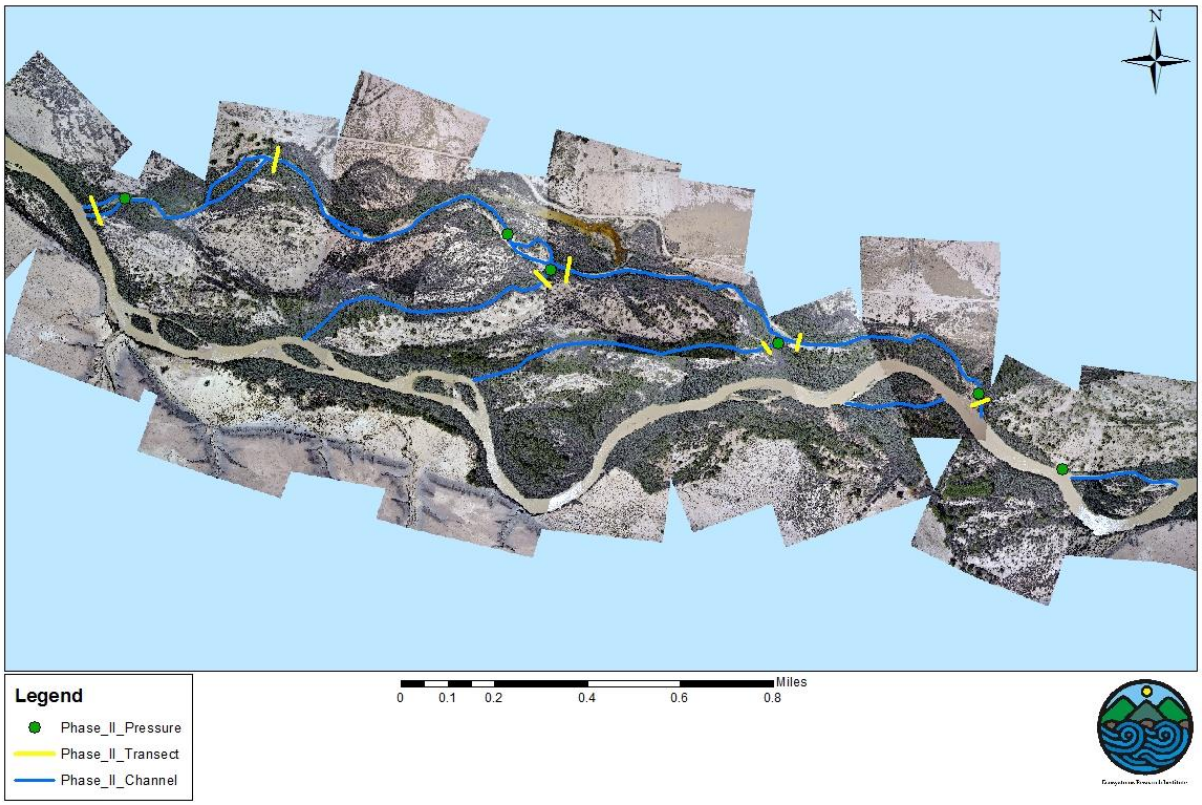

Figure 1. Phase II restoration site with proposed location of channel cross-sections, pressure sensors, and field camera.

As part of the site selection process, the historical habitat and the larval and small-bodied fish monitoring databases were queried to determine all available data that had been collected at the site. These data can be used as a baseline prior to construction. In terms of the Small Bodied Monitoring Program, the historical data are summarized in Table 1. There have been a total of 21 observations between 1998 and 2013. Similarly, there have been 36 collections of larval fish made during this time period.

In a similar manner, the historical habitat mapping data was queried specifically for the Phase II restoration site. The intent was to determine the status of the channel (flowing or non-flowing) at

the time of mapping. In total, there were 31 observations between June 1993 and August 2013. Flows at mapping ranged between 479 cfs and 9,453 cfs. A temporal summary can be seen in Figure 2.

Table 1. Summary of the historical collections from the Small Bodied Monitoring Program between RM 134 and 137.

Query19						
Year	Site (RM)	Channel	UTM Zone	UTM East	UTM North	Coordinate System
1998	135.2	Secondary				
1998	136.5	Secondary				
1999	136.5	Secondary				
2000	134.3	Secondary				
2000	136.6	Secondary				
2001	134.25	Secondary				
2001	136.6	Secondary				
2002	134.4	Secondary				
2002	136.55	Secondary				
2003	135.5	Secondary				
2003	136.8	Secondary				
2004	136.5	Secondary				
2006	134.3	Secondary				
2006	136.5	Secondary	12S	694014	4084091	
2007	134.3	Secondary	12S	108.86046	36.8923	
2010	133.9	Secondary	12S	690100	4085104	NAD83
2010	135.9	Secondary	12S	692934	4084055	NAD83
2011	134.3	Secondary	12S	690635	4085068	NAD83
2012	134.3	Secondary	12S	690646	4085061	NAD83
2013	135.1	Secondary	12S	691404	4084314	NAD83
2013	136.4	Secondary	12S	690041	4084140	NAD83

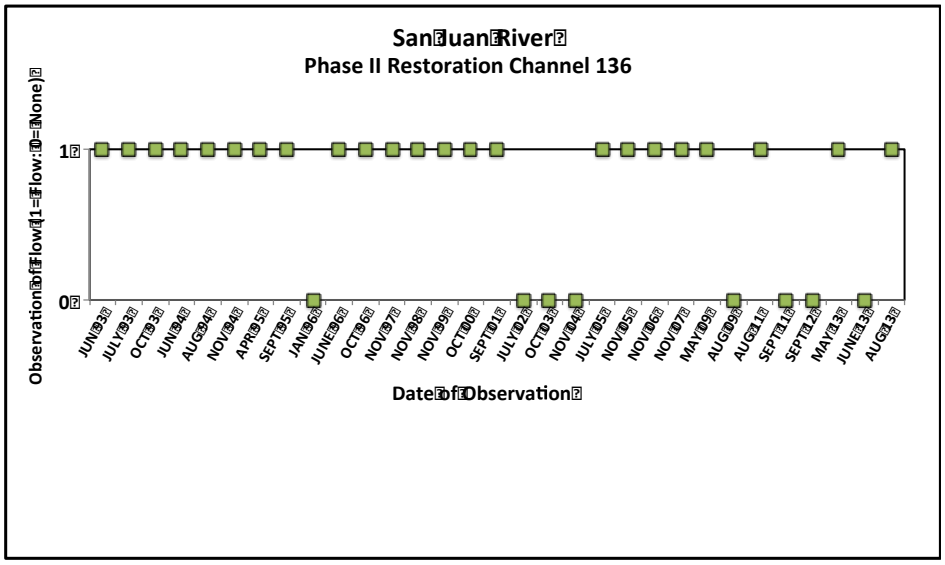

Figure 2. Temporal summary of the status (flowing or non-flowing) of the secondary channel located at River Mile 136 in the San Juan River.

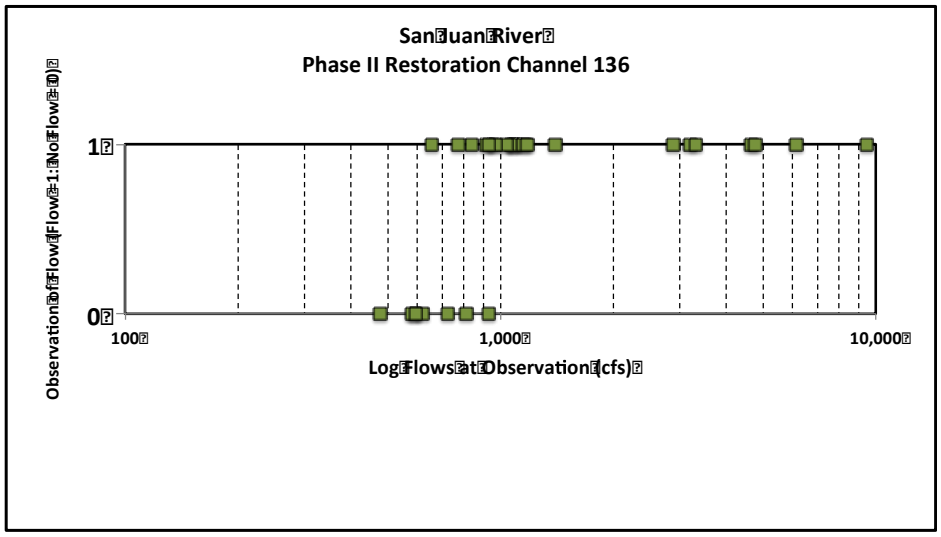

Figure 3. Status (flowing or non-flowing) of the secondary channel located at River Mile 136 in the San Juan River as a function of flow at the time of observation.

As noted in Figure 2, there were three periods where there were over 5 continuous observations where the main secondary channel was flowing. In a similar manner, the data were plotted as a function of flow at observation time and status (Figure 3). As shown in this figure, the channel historically did not flow at river flows at or below 659 cfs and always flowed at river flows above 930 cfs. Between these two flows the channel was intermittent.

These three data sets obtained from the historical Larval Fish, Small-Bodied Fish and Habitat Monitoring Programs will be valuable in assessing the success of the restoration process. The restoration work at this site will be completed in late fall 2014. Because of the size and complexity of the Phase II site and the need for better information on the availability and persistence of aquatic meso-habitats at the restored site and the occurrence and relative abundance of larval and small-bodied fish in these habitats over time and as a function of flow conditions, an integrated, stand-alone monitoring program is required. The intent of this proposal is to develop and implement a monitoring study that will address the following objectives:

1) To measure changes in habitat features of the restored secondary and tertiary channels, larval fish abundance, and small-bodied fish abundance over three years following completion of restoration treatments at the Phase II site; habitat features include: a) the number and surface area of different aquatic meso-habitats in restored channels, and b) channel cross-sections established in restored secondary and tertiary channels.
2) To measure seasonal changes in habitat features of the restored secondary and tertiary channels, larval fish abundance, and small-bodied fish abundance from prior to spring runoff to late fall during each of the three years following completion of restoration treatments.
3) To compare the relative abundance of small-bodied fish collected in different meso-habitats in the restored site to determine whether preferences for specific meso-habitats exist.

4) To measure changes in habitat features of the restored secondary and tertiary channels associated with environmental flow releases or large floods that may occur over three years following completion of restoration treatments.
5) To compare habitat features, larval fish abundance and small-bodied fish abundance between restored channels and a control secondary channel site.

These objectives were derived from four monitoring questions that were presented and discussed as important information needs for assessing the effectiveness of the channel restoration effort at the May and August Biology Committee meetings.

To address these objectives, we propose a monitoring protocol that involves simultaneous collection of habitat, larval fish, and small-bodied fish data so that spatial habitat data can be linked with fish species composition and abundance information. The monitoring activities and measurements include:

Aquatic habitat mapping: 1) hand-mapping of aquatic habitats in restored secondary and tertiary channels using methods developed by Lamarra (Bliesner el al. 2008); 2) surveying of channel cross-sections along permanent transects established along restored channels; and 3) electronic data collection using sensors that simultaneously record water temperature and pressure which will be used to measure water depth in the channel. The sensors will be placed strategically in restored secondary channels and the main channel (Figure 1) and the two field cameras will be employed, one placed in the mouth and the other near the outlet of the restored secondary channel.

At the same time that habitat mapping and surveying of channel cross-sections occur, a sample of available aquatic habitats in restored secondary and tertiary channels will be sampled for larval and small-bodied fish (see Methods for details). With these data, we can address the first four objectives. Our intent is two-fold: first, to determine the number, surface area, and proportionate abundance of different meso-habitats in the restored channels, and second, to estimate the relative abundance of identified larval and small bodied fish in different meso-habitats. To detect changes in the occurrence and relative abundance of habitats, small-bodied fish and larval fish, comparisons will be made in these parameters between sampling visits (e.g., from before spring runoff to late fall) and across years.

A secondary channel site located at RM 129 that is flowing more frequently than the restored site is flowing prior to the proposed restoration (e.g., has water and habitat at almost all times and flows) has been selected as a control (Figure 4). A parallel set of measurements will be collected at the control site; the control site will be instrumented with a field camera and a pressure-temperature sensor. This channel is located just downstream of the proposed restoration site and was used as a control site for the RERI restored channels. There are no tributaries between the two sites and there close location to each other should insure similar physical conditions. In addition, historic larval and small-bodied fish collections made over multiple years exist for the Phase II site prior to restoration so that a comparison of fish captures (abundance, species composition) for specific meso-habitats can be made before and after treatment. If the restoration effort is successful, we expect that the restored channels will provide aquatic habitat for larval and small-bodied fish when flows are between 500-700 cfs and higher just as the control channel does. Comparisons of the relative abundance of meso-habitats in restored and control channels and the relative abundance of identified larval and small-bodied fish collected in these meso-

habitats will provide additional information to assess restoration success; the comparisons between restored and control channels will be made seasonally from before spring runoff to late fall within a year and between years. In addition, comparisons of the relative abundance of small bodied fish collected in different meso-habitats will indicate whether fish are distributed randomly with respect to habitat or whether small-bodied fish disproportionately occur in certain meso-habitats (Table 2); these comparisons can be made seasonally from before spring runoff to late fall and between years.

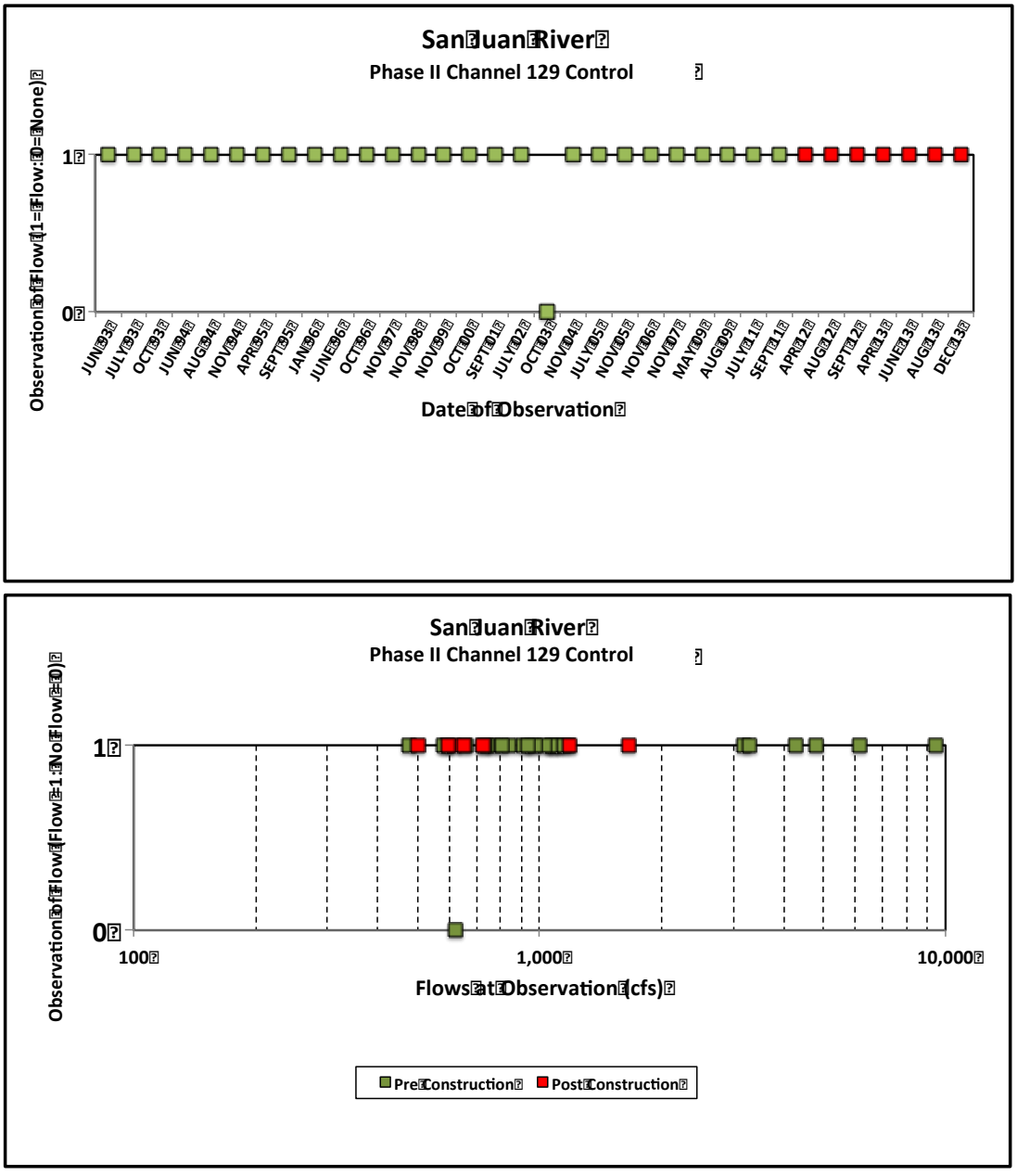

Figure 4. A temporal summary of the status (flowing or non-flowing) of the proposed control secondary channel located at River Mile 129 in the San Juan River (above) and the observations of that same secondary channel as a function of flow at the time of observation (below). This channel was monitored as a control site before and after the Phase I channel restorations activities.

METHODS

To address the five objectives and measure changes in aquatic habitat in the restored and control sites seasonally, from pre-runoff to late fall, and between years as a function of changing flow conditions, we propose a combination of habitat mapping, measurement of channel cross-sections, and electronic data collection.

Habitat Mapping

Post-construction geo-referenced base photography maps will be used at a scale of approximately 1 inch = 200 feet for the secondary and tertiary channel mapping. Photos will be printed on 11 x 17 inch pages with the river-miles marked and provided in sheet protectors for field mapping. Ten aquatic habitat types and three associated terrestrial types (Table 1) will be delineated on the base photographs by visual inspection in the field. The high resolution photos allow the mapper to have a high degree of confidence as to the visual location of the habitat being mapped and available reference points on the photos (IE debris piles, cobble bars, shoreline cover, etc.). Each polygon delineated will be marked with its corresponding code as noted in Table 2. The date of mapping and the mapper's name will be recorded on the first map sheet for each day's mapping. ERI staff has direct experience in mapping the San Juan River using the proposed methodology and will train a second mapper (TNC) in this task. In as much as the mapping process is interpretive, the mappers will initially overlap 10 percent of the area of the channels to be mapped during each mapping effort. Variability in habitat interpretation and surface areas of habitats will be determined based upon the comparison between mapping results.

Following field mapping, the field sheets will be reviewed and missing codes or non-closed polygons will be corrected prior to processing. Following this review, the habitat polygons will be digitized and coded in ArcGIS to produce shape files. Within each channel, all polygons areas and perimeters for each habitat type will be quantified and summarized by total count and total area in each channel and date mapped.

Table 2. The categories of habitat types on the San Juan River that will be used in this investigation.

(1) Backwater	(10) Inundated Vegetation
(2) Embayments	(11) Rootwad Piles
(3) Riffle	(12) Dry (Sand bar)
(4) Runs	(13) Dry (Channel)
(5) Rapids	(14) Dry (Cobble Bar)
(6) Slackwaters	(15) Islands

(7) Low Velocity Types: (7A) Pools, (7B) Eddies, (7C) Pocketwater

(8) Shoals (Sand and Cobble)

(9) Isolated Pools

Channel Cross Sections

Across channel transects will be established at the inflow area of the restored secondary and tertiary channels (Figure 1). At each transect location, a field survey will be conducted and referenced to benchmarks established on the initial survey such that the year-to-year variations in the secondary and tertiary channel stream beds can be determined. The overall control benchmark will be outside the floodplain of the river with individual transect benchmarks being established on each side of the individual transects.

The survey will use a metered tape strung across the inflow channel starting at the established benchmark. The bed elevation will be measured every 0.5 m across the channel as well as in major landform topographic breaks (i.e. steep banks, substrate changes, root-wad piles, etc.). In addition, the location and elevation of the water's edge will be surveyed. All elevations will be measured to the nearest 2 cm using a metered stadia rod and a Spectra LL300N Self Leveling Laser. Surveys will occur at the time of field mapping. The main secondary channel entrance will have three transects, spaced 8 m apart, due to the size of the existing cobble/sand bar at its mouth. If sand or cobble shoals are mapped at the mouth of the restored secondary and tertiary channels, water and sediment depth will be measured. A transect and benchmarks, including an overall control benchmark outside of the floodplain, have already been established at the channel entrance of the control site; the cross-section has been surveyed annually from 2012-2014.

Electronic Surveillance

Electronic water level (pressure) and temperature sensors and loggers (HOBO U20L-001) will be used to collect hourly water levels at three locations in the secondary channel and one location in each tertiary channel immediately downstream of each channel split. Sensors will be installed in an "L" shaped stilling basin adjacent to the channels. The bottom of the "L" will be underwater and facing downstream; basins will be cleaned, if necessary, during each trip. The relative elevations of the sensors will be surveyed. In addition, a sensor will be placed in the main stream of the San Juan River upstream of the reclaimed secondary channel. A relationship between gaged flows (USGS 0936800, San Juan River at Shiprock) and the pressure sensor in the main channel (Figure 1) and the entrance to the secondary channel will be established. It is anticipated that these initial relationships will change with time as the channels become altered. The sensors will, however, provide a continuous record of when the secondary and tertiary channels have water.

A Moultrie M-1100i mini game field camera will be placed at both the entrance and outlet of the reclaimed secondary channel, pointing down- and upstream respectively. Each camera will be housed in a metal box, supported on pole, and will be placed (camouflaged), if possible, in the surrounding vegetation to reduce the incidence of vandalism and theft. Cameras will be programmed to take photographs three times a day and will provide a near-continuous record of the flow conditions at the channel complex entrance and outlet and field verification of the water level (pressure) sensor readings (e.g., sensors recording water and not sediment depth). No sensors or cameras will be placed at the control site since the site has been flowing in 98% of the observations since 1993. Sensor readings and visual confirmation of the entrance and outlet conditions from the cameras will provide information on: 1) the persistence of aquatic habitats in restored channels between field visits; and 2) the effect of high flows on flow conditions in restored channels (e.g. flowing or not flowing). Habitat mapping and channel cross-sections will

provide additional data to address the five study objectives, as well as periodic field calibration of the electronic data.

Larval and Small Bodied Fish

To measure changes in species composition and relative abundance (catch per unit effort) seasonally, from pre-runoff through late fall, and between years, small bodied fishes will be collected with a 2.2 m x 1.9 m x 3.0 mm mesh drag seine. During the first sampling period (April 2015), habitats will be mapped in restored secondary and tertiary channels and at the control site and, using the map, seven 100-m transects will be established at the restored site and one 100-m transect at the control site. The cover of each habitat along these transects will compared to the overall habitat maps and transect locations adjusted so that all habitat types are represented on the combined transects roughly in proportion to their overall occurrence at each of the sites. At the restored site, we anticipate that one transect will be located upstream and another downstream of each secondary-tertiary channel junction and three transects will be located up- and downstream of islands at the downstream end of the restored secondary channel (Figure 1). The upstream end of each transect will be marked with a fence post placed away from the restored channel and its location surveyed to the control benchmark outside of the floodplain at the restored and control sites. These transects will be sampled throughout the study. Within each of these transects, 6 to 8 samples (seine hauls) will be taken following the small-bodied fish protocol where habitats are sampled roughly in proportion to their occurrence along the transect (Gilbert 2014). This gives a total of 42-56 small-bodied fish samples at the restoration site and 6-8 samples at the control site each field visit (Table 3). Each catch will be inspected to determine presence of protected species. Total length (TL) and standard length (SL) will be measured on all Colorado pikeminnow and razorback sucker to be consistent with information gathered by the San Juan River Basin and Upper Colorado River Basin programs. Once measured, the fish will be released. Other native species will also be measured and released. When >50 individuals of a particular species are collected in a seine haul, these individuals will be fixed in formalin and taken back to the laboratory where a subsample of >50 individuals will be selected to approximate the proportion of sizes present and measured; non-selected individuals will be counted. If native fishes are too small to identify they will be fixed in formalin and returned to the laboratory. Nonnative fishes will be removed from the river after measurements are taken and recorded. If nonnative fishes are found in such abundance that it is not feasible to measure them in the field, they will be fixed in formalin and returned to the laboratory. For each meso-habitat sampled along the transect, the length (in meters) of each seine haul will be determined in addition to the number of seine hauls per meso-habitat.

Collection efforts for larval fishes will differ from the small-bodied fish sampling and will be concentrated in low velocity habitats, such as backwaters and embayments, along transects using fine-mesh larval fish seines (1 m x 1 m x 0.8 mm). Several seine hauls (between two and seven) will be made through an individual meso-habitat (Table 2) depending on the size of that habitat. Fishes collected in a seine haul will be preserved together as a single sample. For each meso-habitat sampled, the length (in meters) of each seine haul will be determined in addition to the number of seine hauls per meso-habitat. We will target 20 larval fish collections (meso-habitats sampled) per sample period (Table 3) with roughly 70% of collections made at the restored site and the rest at the control. For additional details on the larval fish sampling protocol, see the 2013 larval fish survey report (Farrington et al. 2014).

Habitat designations used in this study will follow the descriptions given in Table 2. All larval and small-bodied fish sample locations will be referenced on the habitat maps developed during that specific sample period.

The project team reserves the right to adjust the proposed sampling design for small-bodied and larval fish (e.g., where and how many samples are taken) during the first field visit depending on field conditions and the abundance of fish collected.

Laboratory Processing

All retained larval specimens will be placed in plastic bags (Whirl-Paks) containing a formalin solution and a tag inscribed with a unique alpha-numeric code that was also recorded on the field data sheet and maps. Samples will be returned to the laboratory where they will be sorted and identified to species. Specimens will be identified by personnel with expertise in San Juan River Basin larval fish identification. Stereo-microscopes with transmitted light bases and polarized light filters will be used to aid in identification of larval individuals. Ontogenetic stage will be determined for all razorback sucker and Colorado pikeminnow collected. Age-0 specimens will be separated from age-1+ specimens using published literature to define growth and development rates for individual species (Auer 1982; Snyder 1981; Snyder and Muth 2004). Both age classes will be enumerated, measured (minimum and maximum size [mm standard length] for each species at each site), and cataloged in the Division of Fishes of the Museum of Southwestern Biology (MSB) at the University of New Mexico (UNM).

Monitoring Frequency

The frequency and timing of field visits to measure habitat and fish at the restoration and control sites are summarized in Table 3. These correspond to times before and after spring runoff and monsoonal storm events when changes may occur to the channels and habitats at restored and control sites and when razorback sucker and Colorado pikeminnow larvae are present in the system. The sampling in late fall and early spring pre-runoff will be particularly interesting since it isn't known with certainty how small-bodied fish use secondary channels during the overwinter period.

Table 3. Proposed field-sampling schedule for habitat, larval fish (LF), and small-bodied fish (SBF). Habitat measurements include aquatic habitat mapping (M) in secondary and tertiary channels, surveying channel cross-sections (XS) to assess changes in channel morphology after large flow events, and checking and downloading data from camera and sensors (E).

Sampling Date	Measurements
Pre-spring runoff (April)	M, XS, E, LF, SBF
Post-spring runoff; includes environmental flow releases, Navajo Dam; timed with presence of razorback sucker and Colorado pikeminnow larvae (mid- to late July)	M, XS, E, LF, SBF
Post-monsoon (August-September)	XS, E
Late fall (October); after irrigation season	M, XS, E, LF, SBF

Analysis

The focus of our analyses will be to address the five study objectives. Comparisons within and between the Phase II restoration site and the control site will be made for a number of variables to determine how habitat, larval fish and small-bodied fish abundance change over time (across the three sampling periods) at both sites and how changes in the restoration site compare to those in the control (Table 4). The habitat-fish data will also be analyzed to determine whether small-bodied fish are distributed randomly with respect to aquatic habitats at restored and control sites or whether preferences or avoidance of specific habitats exist; this information will assist in identifying and refining fish-habitat relationships for small-bodied fish. Finally, the sensor and field camera data will provide information on the persistence of aquatic habitat at the restored site and, if they occur, the effect of large flows on channel cross-sections and status (flowing vs. not flowing) at both sites.

Products

A draft report summarizing the activities and analyzed results of the 2015 Phase II Channel Restoration Site monitoring will be submitted to the Biology Committee for their review by March 31, 2016. The report will be revised and finalized based on comments received and re-submitted to the Biology Committee and Program Office by June 30, 2016. In addition, digital copies of all habitat and fish data collected in 2015 will be delivered to the SJRIP database manager.

Project Duration

This monitoring project is designed as 3-year study, with reports submitted each year of the study. At the end of the third year, the final report (submitted in 2018) will contain recommendations to the Biology Committee on: (1) the effectiveness of restoring secondary channels in recovery of razorback sucker and Colorado pikeminnow; and (2) how the electronic equipment and survey transects may be used in the future to test specific hypothesis about the effect of environmental flow releases on restored channel morphology and function.

The proposed monitoring project supports Goals 4.2 *Monitor Habitat Use and Availability* and 4.3 *Evaluate Habitat Restoration Strategies and Monitor Habitat Restoration Projects* and associated Actions (4.2.3 4.2.4, 4.3.1, 4.3.2) and Tasks (4.2.3.1, 4.2.3.2, 4.2.3.4; 4.2.4.4; and 4.3.1.1, 4.3.1.2, 4.3.1.3; 4.3.2.1) in the 2014 Long Range Plan.

Table 4. List of planned comparisons and statistical tests and the study objectives they address.

Objective No.	Comparison	Statistical Test
1	Comparison of number (count) of meso-habitats by habitat type seasonally (from before spring runoff to late fall) at restored site; comparison of the total areal cover of meso-habitats by habitat type seasonally (3 field visits in 2015) at the restored site; flow conditions will vary at time of field visits and between field visits which may result in changes in the count and areal cover of meso-habitats over time.	None required, all habitats mapped and counted in restored channels; table or graph for visual inspection Once we have sufficient data (more than three observations), use regression analysis to determine relationship between count and area of habitat by type and the flow at mapping.
5	Comparison of number (count) of meso-habitats by habitat type seasonally (from before spring runoff to late fall) at control site; comparison of the total areal cover of meso-habitats by type seasonally (3 field visits in 2015); flow conditions will vary at time of field visits and between field visits which may result in changes in the occurrence of meso-habitats over time.	None required, all habitats mapped and counted in control channel; table or graph for visual inspection. Once we have sufficient data (more than three observations), use regression analysis to determine relationship between count and area of habitat by type and the flow at mapping.
1, 5	Comparison of the relative proportion of different meso-habitats between field visits (from before spring runoff to late fall) at the restored site; similar comparison at the control site	Chi-square test, N (meso-habitats) x 3 (field visits); N x 3-way table
5	Comparison of the relative proportion of meso-habitats at restored vs. control sites	Chi-square test for each sampling visit
1, 5	Comparison of the relative abundance of native larval fish (CPUE) between sampling periods and by site (restored vs. control); same comparison using relative abundance of non-native fish; summarize data for razorback sucker and CO pikeminnow although probably too few individuals collected for statistical analysis.	Analysis of variance with season (sampling period) and site (restored vs. control) as factors; pairwise comparisons between field visits and between sites using the Tukey-Kramer HSD test. Alternatively, could adopt approach of larval fish monitoring study and use mixed linear models to estimate occurrence (presence-absence) and abundance separately with habitat, season, and site (restored vs. control) as covariates (Farrington et al. 2014). If samples sizes are insufficient to conduct the above analyses, restrict analysis to fewer factors, e.g., combine data across seasons and compare restored and control sites. If analyses are restricted, may use non-parametric Kruskal-Wallis one-way analysis of variance. Data will be summarized in table or graph to highlight specific comparisons of interest.
1, 5	Comparison of relative abundance of larval fish for specific species of interest between sampling periods and by site; these species may include bluehead and flannelmouth sucker, channel catfish, fathead minnow and redshiner.	Analysis of variance with season (sampling period) and site (restored vs. control) as factors. See above comments for additional details and possibilities.
1, 5	Comparison of number (count) of meso-habitats sampled for larval fish by type between sampling periods; comparison of the number of meso-habitats sampled for larval fish by type at restored vs. control site	Sample sizes probably too small but, if not, Chi square test w/ continuity correction

Objective No.	Comparison	Statistical Test
1, 5	Comparison of the composition of native larval fish (number of individuals collected by species) by season for restored site and control site; comparison of the composition of native larval fish by site (either combining seasons or holding season constant depending on the results of the previous analysis); similar analysis for non-native larval fish	Chi-square test for independence
1, 3, 5	Comparisons of relative abundance of native small-bodied fish (CPUE) by meso-habitat type and by site for each of the 3 sampling periods; could add season as a factor if sample size permits; similar comparisons for non-native small-bodied fish (non-native spp. combined)	Analysis of variance with meso-habitat type and site as factors; pairwise comparisons between meso-habitats and sites using Tukey-Kramer HSD test. If sample sizes of fish abundance in specific meso-habitats are insufficient, restrict analysis to certain meso-habitats and compare restored vs. control sites. If analyses, are restricted may use non-parametric Kruskal-Wallis one-way ANOVA. Data will be summarized in a table or graph to highlight specific comparisons.
1, 5	Summarize number of small-bodied RBS & CPM individuals captured by meso-habitat type and by site for the 3 sampling periods	Probably not sufficient sample sizes for statistical comparisons between meso-habitats, sampling periods and sites.
1, 3, 5	Comparisons of the relative abundance of small-bodied fish (CPUE) for specific species (where we have an adequate sample) by meso-habitat, by season, and by site.	Repeated measures analysis of variance with meso-habitat type, season, and site as factors (see above). If sample sizes are insufficient, restrict analyses to specific meso-habitats, hold season constant, and compare by site.
3	Comparisons of the number of small-bodied fish by species captured in different meso-habitats by season; analyze restored and control site separately; can also combine restored and control sites to increase sample size.	Chi-square test for independence; two types of chi-square analysis will be used to test null hypothesis of "no selection"—Pearson chi square statistic (driven by differences between observed and expected number of fish collected in meso-habitats of each type) and log-likelihood Chi-square statistic; the latter tests the selection ratio, w, calculated by dividing the proportion of fish using a specific habitat type by the proportion of that habitat sampled (Bliesner et al. 2010).
1, 5	Comparison of the composition of native small-bodied fish (number of individuals collected by species) by season (holding site constant) and by site (either combining or holding season constant depending on the results of the previous analysis); similar comparisons for non-native small-bodied fish	Chi-square test for independence
1	Comparison of status of the restored site (flowing vs. not flowing) before vs. after restoration (see Figure 3)	Contingency table—status (flowing vs. not flowing) by flow category: 500-569, > 569 cfs; chi-square test of independence.
1	Summarize the number of larval RBS & CPM captured by meso-habitat type at the restored site before and after treatment	Probably not sufficient sample sizes for statistical comparisons between meso-habitats and between time periods (before & after restoration).

Objective No.	Comparison	Statistical Test
1	Comparison of relative abundance of native larval fish (CPUE) at restored site by meso-habitat, by season and by time (before vs. after treatment); a separate comparison/analysis will be run for non-natives.	Analysis of variance with habitat, season, and time (pre- vs. post-treatment) as factors. Alternatively could use the approach of larval fish monitoring study and use mixed linear models to estimate occurrence and abundance separately with habitat and time as covariates. If samples sizes are insufficient to conduct the above analyses, restrict analysis to fewer factors, e.g., analyze meso-habitats separately, combine data across seasons and compare restored and control sites. Data will be summarized in table or graph to highlight specific comparisons of interest.
1	Summarize the number of larval RBS & CPM captured by meso-habitat type at the restored site before and after treatment	Probably not sufficient sample sizes for statistical comparisons between meso-habitats and between time periods (before & after restoration).
1	Comparison of relative abundance of native small-bodied fish (CPUE) at restored site by meso-habitat, by season and by time (before vs. after treatment); a separate analysis will be run for non-natives small-bodied fish.	Analysis of variance with habitat, season, and time (pre- vs. post-treatment) as factors; see above comments regarding restricting analyses if sample sizes are insufficient for full analysis.
1	Comparison of the composition of native small-bodied fish (number of individuals by species collected) at restored site before and after treatment; could do a similar analysis for non-native small-bodied fish	Chi square test for independence

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PROJECT BUDGET

Budget for Participation of Ecosystem Research Institute and The Nature Conservancy under BOR Cooperative Agreement No. R09AP0004 to The Nature Conservancy

Task 1A Habitat Mapping (3 Trips)	**Cost**
Field Labor: Salary & Benefits	
Director of Science (TNC)	$7,072
Senior Fisheries Biologist (ERI)	$13,770
Travel & Per Diem (TNC & ERI)	$3,891
Laboratory Labor: Salary & Benefits	
Technician (ERI)	$7,800
Materials & Supplies (ERI)	$600
Task 1B Physical Transects (1 Trip)	
Field Labor: Salary & Benefits	
Director of Science (TNC)	$1,459
Senior Fisheries Biologist (ERI)	$2,880
Laboratory Labor: Salary & Benefits	
Technician (ERI)	$650
Travel & Per Diem (TNC & ERI)	$1,167
Task 1C Pressure Sensors & Electronic Data	
Field Labor: Salary & Benefits	
Senior Fisheries Biologist (ERI)	$450
Laboratory Labor: Salary & Benefits	
Technician (ERI)	$650
Equipment (pressure sensors, field camera) (ERI)	$2,300
Final Report	
Office Labor: Salary & Benefits	
Director of Science (TNC)	$1,796
Senior Fisheries Biologist (ERI)	$7,200
Editor (ERI)	$800
Materials & Supplies	$500
Total Habitat Monitoring & Report (Direct)	**$52,985**
TNC Federal Indirect Cost Rate (22.48%; FY15)	**$11,911**
TOTAL HABITAT MONITORING & REPORT	**$64,896**

(Budget continued on next page)

Budget for Participation of American Southwest Ichthyological Researchers, L.L.C. under Contract No. GS10F0249X-12PD40037

Laboratory Labor (Pre-Spring Runoff and late Fall samples): Salary & Benefits	
Fisheries Biologist	$3,350
Fisheries Technician	$1,030
Laboratory Labor (Post-Spring Runoff sample): Salary & Benefits	
Fisheries Biologist	$2,093
Fisheries Technician	$515
Materials & Supplies	$435
TOTAL LARVAL FISH IDENTIFICATION	**$7,423**

Budget for Participation of New Mexico Game and Fish Department (NMDGF) under Agreement Number SJ2631

Field Labor: Salary & Benefits	
NMDGF Biologists (3)	$9,588
Office Labor (Final Report Assistance): Salary & Benefits	
NMDGF Project Leader	$2,660
Travel & Per Diem	$3,120
TOTAL FISH COLLECTION & REPORT ASSISTANCE	**$15,368**

TOTAL PROJECT COST (HABITAT, FISH & REPORT) $87,687

San Juan River Basin Recovery Implementation Program
Fish Entrainment Scope of Work

PROGRAM DESCRIPTION

The San Juan River Basin Recovery Implementation Program (SJRIP) was initiated in October 1992 to protect and recover populations of two federally-listed endangered fish species in the San Juan River Basin (Basin) while water development proceeds in compliance with all applicable federal, state, and tribal laws. The two listed fish species are the Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*). Activities and actions within the Program serve as the "reasonable and prudent alternative" for projects in the San Juan River Basin and help to ensure that those projects will not jeopardize the continued existence of the endangered species. It is anticipated that actions taken under the Program will benefit other native fishes in the Basin and prevent them from becoming endangered.

The Program has identified actions needed to recover these endangered fish including: habitat management (e.g., flow modification), habitat restoration (e.g., fish ladders), non-native species control, and native species augmentation. All offerors are encouraged to examine SJRIP documents and guidelines at http://southwest.fws.gov/sjrip/ especially those pertaining to monitoring fish which are found at http://www.fws.gov/southwest/sjrip/DR.cfm. This RFP will address SJRIP needs specific to fish monitoring as identified in the Long-Range Plan.

PROGRAM AUTHORITY

This RFP is issued in accordance with the authority under the Upper Colorado and San Juan River Basins Endangered Fish Recovery Programs (Public Law 106-392).

INTRODUCTION

The San Juan River historically provided habitat for Colorado pikeminnow and razorback sucker; however, fishery surveys indicated that both species were essentially extirpated by 1992 (see Holden 2000). Colorado pikeminnow were listed as endangered in 1967 (U.S. Fish and Wildlife Service 2002a) and razorback sucker were listed in 1991 (U. S. Fish and Wildlife Service 2002b). In addition, in 2009 New Mexico listed the roundtail chub (*Gila robusta*) as endangered; Colorado classified the flannelmouth sucker, (*Catostomus latipinnis*), bluehead sucker (*Catostomus discobolus*), and roundtail chub as species of special concern; and Utah listed the roundtail chub and Colorado River cutthroat trout (*Oncorhynchus clarkipleuriticus*) as sensitive species.

In 1991, the SJRIP was developed to provide stable funding and dedicated resources and personnel to assist in the recovery of the two species while ensuring that water development could continue (http://www.fws.gov/southwest/sjrip). Various management actions conducted under the SJRIP have been undertaken to increase the abundance and distribution of these two fish in the San Juan River including stocking of the two endangered fish, nonnative fish removal, instream flows for habitat, fish passage and barrier elimination, and habitat creation.

Through stocking, populations of both endangered fish have improved over the long-term (http://www.fws.gov/southwest/sjrip/pdf/DOC_Long_term_monitoring_sub-adult_adult_large-bodied_fishes_San_Juan_River_2009.pdf.). Furthermore, recent larval sampling indicates that spawning is occurring for both endangered species, and for razorback sucker it is comparable to larval fish numbers of the other two native species of suckers that have well-established populations, bluehead sucker and flannelmouth sucker (*Catostomus (Pantosteus) discobolus, Catostomus latipinnis*, respectively) (http://www.fws.gov/southwest/sjrip/pdf/DOC_Colorado_pikeminnow_and_razorback_sucker_larval_fish_surveys_in_the_San_Juan_River_2010.pdf)

Entrainment of subadults and adults at diversion/out-take structures is identified as a potential impediment to recovery in the recovery goals for both the razorback sucker and Colorado pikeminnow (Service 2002a, 2002b). Evaluating the need for fish screens or deflection weirs at other diversion and out-take structures along the San Juan River is also identified by the Service in SJRIP's Sufficient Progress Report as an activity that the Program should implement to benefit the recovery of the endangered fish in the San Juan River and for the Program to serve as the ESA compliance mechanism for water development projects within the San Juan River Basin http://www.fws.gov/southwest/sjrip/pdf/DOC_2013_SJRRIP_Final_Program_Assessment%20.pdf). The SJRIP includes recovery actions and tasks to minimize or remove the threat of entrainment and/or impingement of fish under Goal 2.4 in its Long Range Plan (http://www.fws.gov/southwest/sjrip/pdf/DOC_2014_SJRRIP_Long_Range_Plan.pdf).

The diversion of river water for irrigation or power-generating purposes is well known to have deleterious effects on fish populations (Jensen et al. 1982, Edinger and Kolluru 2000, Carter and Reader 2000). Fish either become entrained into water diversion intakes or become impinged on intake screens. Fishes with drifting early life history phases (i.e., young- of-year) are very likely to become entrained into water diversions as they are passively transported downstream with the current (Carter and Reader 2000). Highly mobile fish species (juvenile and adults) are also quite likely to become entrained into water diversions, often as a result of their seasonal movements throughout the river channel (Hallock and Van Woert 1959, McKinley et al. 1998). Both Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) are known to undertake extended spawning migrations (Colorado pikeminnow: Tyus and McAda1984, Irving and Modde 2000; razorback sucker: Tyus and Karp1990, Karp and Mueller, 2002, Durst and Franssen 2014). The extensive movement inherent in these fish increases their risk of becoming entrained in irrigation canals, such the one at the Hogback Diversion Canal on the San Juan River near Shiprock, NM.

The scope and magnitude of this problem has also been recognized in California where policies have been implemented to help minimize the mortality of fishes caused by water diversions. The California Department of Game and Fish has adopted a statewide fish screening policy for the purpose of excluding salmon, steelhead, and federally (ESA) listed species from irrigation diversions. The installation of fish screens is now mandated for any new or modified diversions and for all diversions within the critical habitat boundaries of federally listed species.

Similar concerns for Colorado River endangered fishes (Colorado pikeminnow, razorback sucker, bonytail [*Gila elegans*], and humpback chub [*Gila cypha*]) have also been recognized by resource managers in the Colorado River Basin. Construction of fish screens are the recommended alternative for several Environment Assessments addressing this problem within the Basin (U.S. Bureau of Reclamation 2003), although there are many problems that arise with the use of screens.

Augmentation of Colorado Pikeminnow, through stocking of hatchery fish, is one of the principal management actions conducted by the SJRIP. Between 1996 and 2001, approximately 830,000 Colorado pikeminnow were stocked (Furr 2010). In 2002, the U.S. Fish and Wildlife Service implemented a formal stocking program (Ryden 2003) for Colorado pikeminnow. Since then, approximately 4.0 million age-0 and age-1 Colorado Pikeminnow have been stocked into the San Juan River (Furr 2014a, Furr and Davis 2009a). Annually, the number of fish stocked has varied from 175,000 to more than 600,000.

Stocking of razorback sucker has also been a major goal of the SJRIP. Between 1997 and 2001, a total of 5,896 razorback sucker were stocked into the San Juan River (Furr and Davis 2009b, Ryden 1997). In 2003, an 8-year augmentation plan was developed (Ryden 2003) and an additional 41,093 fish were stocked between 2002 and 2008. In 2009, the 8-year augmentation period was reset and between 2009 and 2013, an additional 86,726 125,000 razorback suckers were stocked in the river (Furr 2014b).

Fish biologists always knew that some proportion of fish were being entrained in the various diversions located along the San Juan River, with the primary risk being to juveniles and smaller fish that passively drift downstream. In 2004, a research project was initiated by Renfro et al. (2006) to evaluate the level of entrainment of fish in the

Hogback canal. This study was concluded in 2005 after two years of surveying several canals along the river. A total of 11,399 fish representing five families and 14 species were collected during 2004-2005 in the Hogback Diversion Canal. Red shiner (*Cyprinella lutrensis*) was the most abundant species comprising 70.6% of the catch with speckled dace (*Rhinichthys osculus*) being the second most abundant taxon accounting for 17.1% of the catch. The next two most abundant fishes, flannelmouth sucker (*Catostomus latipinnis*) and bluehead sucker (*Catostomus discobolus*), were 4.8% and 3.3% of the catch, respectively. The remaining 10 species collectively were 4.2% of the catch. A total of 199 Colorado pikeminnow were collected in the canal but razorback sucker were not captured. As expected, small bodied fish (e.g., both small bodied taxa < 200 mm and age-0 or juvenile individuals of large fish) comprised the majority (97.3%) of the Hogback Diversion Canal catch.

In 2007, a Value Engineering (VE) Team was commissioned to develop and evaluate various proposals to modify Hogback Diversion Canal to continue to deliver water, yet eliminate or drastically reduce the entrainment of fish in the canal (Good et al. 2007). Value engineering is a systematic method to improve the value of a product by increasing the function, reducing the cost, or both. The ultimate goal with value engineering is to obtain the best results for the least cost. Members of the VE Team included fish biologists, construction engineers, cost engineers, design engineers, and irrigation specialists. Through the VE effort a design was selected whereby a weir would be constructed in the canal to divert fish away from the canal and back to the river. This weir has been constructed and has been operational since April, 2013. Efforts are now underway to evaluate the effectiveness of this weir at preventing fish entrainment.

Through the process of evaluating entrainment in the Hogback canal and construction of the weir, members of the SJRIP questioned entrainment from other diversions and sources along the river. Since Renfro et al. assessed entrainment at several diversions in 2004 and 2005, the SJRIP has been stocking endangered fish in the San Juan River and the Animas River on an annual basis and populations of the two endangered fish have increased considerably. Entrainment hazards in the San Juan River and in the Animas River need to be re-assessed. Potential entrainment sites need to be identified and quantified and specific details about each described. Several diversions known that could potentially pose a threat of entrainment on the San Juan River include, but are not limited to: Public Service Company (APS) Weir, Fruitland Canal, Jewett Valley Ditch, San Juan Generating Station Diversion, and Farmer's Mutual Ditch, as well as several unidentified diversions on the Animas River. The goal of this project is to identify and quantify all potential diversions and entrainment hazards in the San Juan and Animas rivers.

MONITORING GOAL AND TASK FOR THIS SOLICITATION

The monitoring goal for this proposed project is:

Qualitatively and quantitatively assess the entrainment hazards in the San Juan and Animas rivers from Mexican Hat, UT upstream to Bloomfield, NM (RM 196) in the San Juan River and in the Animas River to Durango, CO.

The relevant task from the SJRIP's Long-Range Plan (http://www.fws.gov/southwest/sjrip/pdf/DOC_2014_SJRRIP_Long_Range_Plan.pdf) for this solicitation is Goal 2.4-Minimize fish entrainment at diversion structures in the San Juan Basin.

STUDY OBJECTIVES

This RFP specifically seeks to request proposals from interested parties that:

1) Identify locations in the San Juan and Animas rivers where entrainment and/or impingement could be a potential threat to the Colorado pikeminnow and razorback sucker
2) Document withdrawal amounts (CFS and acre-feet) for each diversion and relate these to proportion of river flows

3) Document withdrawal locations using a GIS and legal descriptions
4) Identify ownership of diversion facilities
5) Document diversion locations with digital images and descriptions of diversions (aspect to river, height, width, gate structure, width of canal, etc.)
6) Produce a draft and final report that documents 1-5 above.

METHODS

TECHNICAL APPROACH

The Contractor shall perform the following work:

1. Use GIS and legal descriptions to identify potential diversions.
2. Conduct field visits to document diversions and record information about the diversions (width, orientation, amount of water diverted, diversion type).
3. Identify ownership of all diversions.
4. Attend a preliminary one-day meeting with members of the SJRIP and other interested parties to identify potential locations of diversions and finalize methods for data collection. Meeting will be held in February 2015 and located in Durango, CO, Albuquerque, NM, or Farmington, NM.
5. Prepare a draft report (using appropriate analytical techniques and following protocols and guidelines of SJRIP) detailing results of the findings and submit it to the COTR and SJRIP Program Office for review and comment 30 days prior to submission of the final report.
6. Attend a SJRIP biology Committee meeting (one day) and present the initial results for review and comment. Meeting will be held in February, 2016 and located in Durango, CO, Albuquerque, NM, or Farmington, NM.
7. Attend one annual SJRIP Public Meeting (two days) scheduled in May, 2016 and present the results of the work to the public. Meeting will be located in Durango, CO, Albuquerque, NM, or Farmington, NM.
8. Prepare a final report that details all of the findings of the work, incorporates comments from the COTR and SJRIP Program Office, and submit the report to the COTR and SJRIP Program Office.
9. Submit an electronic copy of the final report as well as all supporting documentation for each diversion and potential entrainment source.

Schedule

Task	Date
Award of contract or grant	February 2015
Attend Initial meeting with SJRIP participants and COTR	February/March 2015
Conduct field work and prepare draft report	March, 2015 through December 2015
Submit Draft Final report	January 31, 2016
Attend SJRIP Biology Committee meeting and present results	February 2016
Attend Annual SJRIP meeting and present results	May 2016
Submit Final Report	June 30, 2016
Terminate Contract	July 2016.

DELIVERABLES

The following deliverables will be required under this contract.

1) Draft Final Report due January 30, 2016
2) Oral presentation (30-60 minutes) at SJRIP Biology Committee meeting February, 2016.
3) Oral presentation (15 minutes) at Annual SJRIP meeting May, 2016.
4) Final Report due June 30, 2016

DATA PROVIDED TO THE CONTRACTOR

The following information will be provided to the Contractor:

1. Historical data collected from a previous study on potential entrainment.
2. Digital video and photo files from which digital images can be used for documenting sampling locations in the San Juan River downstream of Farmington, NM.
3. Reports of past analysis and conclusions dealing with larval fish sampling as well as other projects conducted under the SJRIP (available on-line)

PROJECT DURATION

This is a short-term monitoring effort meant to collect a discrete amount of information within an 18-month period. This contract is for an 18-month period—no long-term monitoring will result from this project, although a project documenting actual entrainment may result from this work and will be funded under a separate solicitation.

PROJECT FUNDING

A single award will be made. This RFP is issued in accordance with the authority under the Upper Colorado and San Juan River Basins Endangered Fish Recovery Programs (Public Law 106-392)

PROJECT FUNDING INSTRUMENTS

The awards made under this RFP may include Cooperative Agreements, Grants, Interagency Acquisitions and Procurement Contracts.

AWARD DATE
Funding is expected to be available for work to begin in February 2015.

COST SHARING OR MATCHING
There is no requirement of a cost share.

PERMITS AND PERMISSIONS
No special permits or permissions are required to conduct this work.

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San Juan River Recovery Implementation Program
Program Coordinator's Office
Fiscal Year 2015 Draft Proposal

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Cooperative Agreement #: R10PG40064 (08-AA-40-2713) and R10PG40086 (07-AA-40-2629)
Period of Performance: 10/01/2014 to 9/30/2015

Background

The San Juan River Recovery Implementation Program (Program) is designed to simultaneously address endangered fish species recovery and development of water resources within the Basin. The Program includes representatives from not only Federal agencies, but also the States of Colorado and New Mexico, the Jicarilla Apache Nation, the Southern Ute Indian Tribe, the Ute Mountain Ute Tribe, the Navajo Nation, conservation interests, and water development interests, most of which have legal mandated responsibilities to the endangered fish and/or the water resources.

The Service is responsible for directing and coordinating the Program. As stated in the Program Document, the Service will appoint a Program Coordinator who will be responsible for overall Program coordination and dissemination of information about Program activities. Element 5, *Program Coordination and Assessment of Progress toward Recovery*, of the Program's Long Range Plan (LRP) identifies Program coordination goals, actions, and tasks that the Program Office will undertake to administer the Program. Numerous additional Program Office tasks are included in the LRP under other Recovery Elements. The Program Office staff includes a Program Coordinator, Assistant Program Coordinator, Program Biologist, and part-time Program Assistant.

Tasks

Specific Service responsibilities for Program coordination are described in the September 23, 2010 Program Document as follows:

1. coordinating the activities of the Coordination Committee and the Program's technical committees, including providing notices, agendas, information packets, and providing draft and final summaries for committee and subcommittee meetings and conference calls as per the committee meeting procedures described in this document;
2. preparing and updating the LRP with research, monitoring, and recovery elements and goals;
3. ensuring consistency of the LRP with Service-approved species Recovery Plans;
4. prioritizing projects based on the LRP, and preparing AWPs, annual budgets, and annual progress reports;
5. ensuring the approved recovery activities as defined in the LRP and species Recovery Plans are implemented;
6. evaluating project accomplishments and shortcomings and providing an annual report to the Program;
7. monitoring implementation of all Program actions, including those Program actions identified as RPAs and RPMs in BOs, and reporting results to the Service on an annual basis;
8. developing an annual integration report that assesses the preceding year's monitoring data, progress toward recovery, and adaptive management recommendations, including recommendations for changes in direction, termination of projects, new projects, or other pertinent recommendations;
9. coordinating and overseeing development of any revisions to the Program's flow recommendations;

10. maintaining records showing the distribution and expenditures of all annual base and capital funds expended under AWPs by each funding source, and providing to the Coordination Committee at the end of each federal fiscal year an accounting of funds expended during the preceding year;

11. reporting to the Coordination Committee at each of its meetings the status of Program activities, the accomplishment of milestones or delays in meeting milestones, and any problems with maintaining Program work schedules along with recommendations for solving the problems;

12. disseminating information to state, federal, and tribal agencies;

13. ensuring that appropriate collecting permits are provided to each principal investigator;

14. advising Program participants of requests for initiation of consultation;

15. maintaining a list of interested parties as described in the committee meeting procedures provided in this document;

16. managing and maintaining the Program's data, central database, library, website, and listserves;

17. coordinating activities among the Program, the Upper Colorado Program, and the Colorado River Fishes Recovery Team, including participating in the five-year status review and in the updating of recovery goals for Colorado pikeminnow and razorback sucker;

18. implementing Coordination Committee recommendations to resolve problems or issues that may arise with regard to accomplishing Program activities;

19. providing materials and technical support to the non-federal participants for briefings with the members and committees of the U.S. Congress and state legislatures;

20. reviewing BOs for consistency with the Program's Principles;

21. preparing on a biennial basis a written "Sufficient Progress" assessment of the Program's progress towards recovery, the Program's ability to provide ESA compliance for water development and management activities, and any corrective actions needed to ensure future ESA compliance, in accordance with the Program's Principles;

22. working with Reclamation and other Program participants to improve, maintain, and utilize the Hydrology Model; and

23. implementing other activities needed to ensure the success of the Program as assigned by the Service or by the Coordination Committee.

It is recognized in the Program Document that some of these responsibilities will be carried out with the assistance from Program committees as more specifically defined in the Program Document sections entitled, "Biology Committee," "Long Range Plan Development and Annual Revision Process," and "Annual Work Plan Development Process" of the Program Document.

Update and Maintenance of San Juan River Basin Recovery Implementation Program Database

San Juan River research efforts that preceded the establishment of the Program, in combination with those that have subsequently resulted from that program, form the basis of the suite of decisions already made and those to be made regarding biologic and hydrologic issues. An immense amount of information has been gathered through the San Juan River monitoring and research activities that have been conducted over the last 15 years. Most of this information has been synthesized and made available in the form of reports or publications. For example, in 2003 and 2004 researchers consolidated and analyzed data from their individual long-term research projects and presented it as an integrated report of five years of research (1999-2003). Likewise, the flow recommendations report released in 1999 represented a synthesis between biological, hydrological, and habitat research activities.

Preparation of integration reports was difficult due to the absence of an updated, standardized, and easily accessible Program database. Keller-Bliesner Engineering, LLC, was originally responsible for maintaining the database and produced and distributed to the researchers CDs containing the updated Program database until 1998. In 2002, responsibility for maintaining the database was transferred to UNM. They initiated a project to develop and maintain a web-based system. This project was terminated in 2006. In 2007, the responsibility for managing Program data was transferred to USFWS-NMESFO.

A great deal of effort was required to inspect, transfer, and integrate UNM's GIS Database into existing and new Program data housed in the NMESFO Program database. Between 2007 and 2008, USFWS-NMESFO IT staff transferred and incorporated a myriad of researchers' data into a Program database. They maintained, performed quality control, annually updated, and distributed the GIS researcher database using appropriate formats, and established electronic archives of the aforementioned database at the repository for this information (U.S. Fish and Wildlife Service Region 2 Office, Albuquerque, New Mexico).

In 2008, the Program created a full-time biologist position. One of the tasks of the position was to take over the responsibility of maintaining the Program database. During 2009, the Program biologist developed a data management system and performed Program data management activities.

Relevant Long Range Plan Tasks

Task 1.2.1.1 Maintain a standardized database for all stocked and recaptured RBS and CPM in order to determine the fate of stocked fish.

Task 4.4.2.1 Develop a centralized database that incorporates all data from standardized monitoring and integrate into the Program database.

Task 5.2.1.1 Establish and maintain a Program database of information collected under the various Program projects including all rare fish collections.

Study Area

This project will encompass the San Juan River Basin downstream of Navajo Reservoir but may ultimately be expanded to include the entire San Juan River Basin.

Objectives

1. Maintain and incorporate researchers' data into the Program's Database.
2. Maintain, perform Quality Control, annually update, and distribute current Program researcher database using appropriate format.
3. Establish electronic archives of the aforementioned database at the ultimate repository for this information (U.S. Fish and Wildlife Service, Region 2, Program Office, Albuquerque, New Mexico).
4. Maintain and update Program website with reports, data, and other relevant documents.

Methods

1. Update and Maintain Database in consultation and coordination with Program researchers, the Program Biologist will integrate existing and new data into the existing Program Database. Data will be checked for Quality Control and updated as necessary.
2. Contact and Coordinate with appropriate personnel in the Upper Colorado River Recovery Program and Glen Canyon Environmental Studies offices to investigate the feasibility of linkage of the proposed San Juan River Recovery Implementation Database with other regional fish databases.

Products

The database will be disseminated to all committee members and be made available via a password-protected project website. The database will reside with the Program Office NMESFO -Region 2 (Albuquerque) of the U.S. Fish and Wildlife Service, the designated repository for the data.

Program Coordinator's Office Education and Outreach

Element 6 of the Program's LRP identifies the goals, actions, and tasks the Program Office will undertake to accomplish Program Education and Outreach. The Program works jointly with the Upper Colorado River Recovery Program to conduct outreach activities for both Recovery Programs. Both programs operate under similar recovery elements with management actions that are consistent with the recovery goals for humpback chub, bonytail, Colorado pikeminnow, and razorback sucker. These goals are reviewed and revised every five years.

The Recovery Programs' continued success depends on coordinated efforts. Communication and outreach are areas where it makes sense to coordinate efforts. Using a shared approach helps to ensure that common audiences receive accurate, consistent information about the endangered fish species and efforts to recover them. Both programs reach out to the general public, elected officials, American Indian tribes, landowners, anglers, river rafter and guides, environmental organizations, water and power developers, teachers, students and Recovery Program participants. The geographic reach of some of these audiences differ by Recovery Program.

Education and Outreach Mission

To support the San Juan Program's success in recovering the endangered fishes by assuring that the public understands what is being done and why, and has confidence that the process is honest, open, sensitive, clear, and understandable. Education and Outreach efforts will be coordinated with the Upper Colorado River Recovery Program.

Goals

- To develop public involvement strategies at the beginning of any and all projects.
- To educate target audiences about endangered fish and to increase their understanding of, and support for, the recovery of these fish species at local, state, and national levels.
- To provide opportunities for the public to actively participate in activities that support recovery.
- To improve communication within the Recovery Program.

Target Audiences

- General public
- Elected Officials
- Land and pond owners
- Anglers
- River rafters and guides
- Environmental organizations
- Water users
- Power user interests
- Educators
- Recovery program participants (includes local, state and federal agencies)

Tasks

1. Coordinate San Juan Program outreach activities with the Upper Colorado River Recovery Program.
2. Disseminate information on Program activities to the public through brochures, newsletters, and/or the websites.
3. Coordinate outreach activities with Water Users Student Fairs and local schools fairs.

Fiscal Year 2015 Program Management Budget	**USFWS Funding**	**Base Funding**
Personnel/Labor Costs (Federal Salary + Benefits):		
Program Coordinator (GS-13) 1040/0 hours@ 61.35/hr	$63,803	$0
Assistant Program Coordinator (GS-12) 1040/1040 hours@ 64.57/hr	$67,155	$67,155
Recovery Science Biologist (GS-12) 520/1560 @ 44.23/hr	$23,000	$69,000
Program Biologist (GS-9/11) 2080 hours @ 30.29/hr	$0	$63,000
Program Assistant (GS-7) 416/416 hours @ 31.71/hr	$13,193	$13,193
USFWS IT-Support	$14,000	--
USFWS Budget Analyst	$15,000	--
Personnel Sub-total	**$196,151**	**$212,348**
Travel/Lodging & Per Diem (based on published FY-2014 Federal Per Diem Rates):		
Hotel – 43 days in Farmington, NM @ $82/night		$3,526
Hotel – 22 days in Durango, CO @ $118/night		$2,596
Hotel – 15 days in Denver, CO @ $156/night		$2,340
Hotel - 6 days in St. George, UT @ $85/night		$510
Hotel – 8 days in Las Vegas, NV @ $92/night		$736
Per Diem – 43 days in Farmington, NM @ $46		$1,978
Per Diem – 22 days in Durango, CO @ $61		$1,342
Per Diem – 15 days in Denver, CO @ $66		$3,526
Per Diem - 6 days in St. George, UT @ $51		$306
Per Diem – 8 days in Las Vegas, NV @ $71		$568
Per Diem – 20 days camping @ $29 night		$580
Registration Fee – UT Water Users Workshop, St. George, UT		$300
Registration Fee CRWUA, Las Vegas $250 *2		$500
Travel/Lodging & Pier Diem Subtotal	**$0**	**$18,808**
Travel/Airfare & Mileage:		
Airfare to Denver, CO - $300 trip/6 trips		$1,800
Airfare to Las Vegas, NV - $600 trip/2 trips		$1,200
Airfare to St. George, UT - $800/1 trip		$800
Mileage to Farmington - 20 trips@190mi/trip*18 MPG=10.5gpt*4.00pg=$42.20)		$844
Mileage to Durango - 12 trips@220mi/trip*18 MPG=12.5gpt*4.00pg=$48.80)		$586
Rental Car @ $120/day*8 days		$960
Travel/ Airfare & Mileage Sub-Total	**$0**	**$6,190**
Equipment and Supplies:		
Supplies	$5,700	$5,700
Stamps		$515

Public Notices - costs for publishing public meeting notices in local newspapers; $40-150/meeting@ 50 meetings		$2,575
Printing/publication costs		$4,120
Computer Hardware Upgrades		$1,500
Computer Software (ESRI GIS license fees, GIS extension (Spatial Analyst, Xtools, etc.), FTP software license, Stella license)		$1,500
Outreach Materials		$3,000
Equipment and Supplies Sub-total	**$5,700**	**$18,910**
Facilities Rental Costs for Meetings:		
Farmington@ $100/day *35		$3,500
Durango @$300/day *15		$4,500
Facilities Rental Sub-Total	**$0**	**$8,000**
2015 Budget Subtotal	**$213,851**	**$264,256**
Administrative charge (3%)		**$7,928**
FY2015 Total	**$213,851**	**$272,183**
Carry-Over from 2014		**$20,000**
Grand Total	**$213,851**	**$252,183**

FY 2015 Reclamation Program and Funds Management

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Relationship to SJRIP: Supports Program goals and management by supporting approved activities

Study Goals, Objectives, and End Product: Program Management funds support Reclamation staff involved in program management. Funds are used for the administration of funding agreements, including issuing requisitions for program supplies, and the preparation and oversight of work conducted under interagency agreements, cooperative agreements, contracts, and grants. The funds are also used for formation and participation of the technical and peer-review committees, implementation of committee assignments not specifically identified in a scope of work, reporting, and coordination of water operations. Management support for Capital fund projects, including technical oversight, budgeting, preparation of bids and funding agreements is covered in a separate scope of work. Participation in Hydrology and Biology Committee meetings and business is paid for separately by Reclamation with funds unrelated to the SJRIP.

Task Description and Schedule

Task 1: Manage and administer funding for Recovery Program projects related to the Biology Committee activities. Funding Recovery Program projects requires establishment or modification of approximately 20—30 Reclamation funding agreements or contracts each year. Each financial agreement requires multiple steps and activities, including: submission of requests for Federal assistance for Recovery Program-approved projects; working with Recovery Program's office on funding issues; reviewing and approving (if warranted) project budgets; writing SOWs for RFPs, requesting obligations to cover funding agreement or contract awards; awarding agreements or contract funding to recipients; maintaining agreement and contract filing system including agreement instruments, invoices, and accruals; reviewing and tracking budgets; participating in audits; reviewing and approving invoices; performing periodic site visits to monitor project performance and progress; filing advanced procurement reports; organizing and participating on TPECs; drafting requests for proposals (RFPs); evaluating proposals and awarding contracts; performing agreement closeouts; answering agreement inquiries from auditors, assistance recipients, and the Recovery Program; recording project performance and status of deliverables; and filing recipient performance reports.

Deliverables/Due Dates: Requests from the Recovery Program for funding are processed as they are received. Other deadlines for committee activities are set by the Recovery Program participants during the development of the annual workplan. An annual report on program management activities will be delivered during the annual meeting each year (usually April/May).

Budget FY15
Task 1: Biology Committee Annual Funding Administration

A) Labor

Position	Salary total/hr	No. persons	Total Hours	Total cost
Reclamation Acquisitions Manager	$120.00	1	30	$3,600.00
Biology Committee Technical Representation for Contracts and Agreements*	$90.00	1	700	$63,000.00
Lead Contract Officer	$120.00	1	40	$4,800.00
Contract Specialist	$70.00	1	700	$49,000.00
Contract and agreement Auditor	$120.00	1	100	$12,000.00
Agreement specialist	$55.00	2	800	$44,000.00
Total				$176,400.00

** Funding for Reclamation to participate in the Biology Committee is funded by Reclamation and not the SJRIP.*

B) Travel

Position	Destination	Purpose	Days	Lodging per day/total	Per diem per day/total	Other*	Airfare total	Total
Reclamation Technical representative	Farmington, Durango, or Albuquerque	Contract support for CC meetings, program funding meetings	3 trips @ 2 days/trip	$100/$600	$50/$300	$400	$2,500	$3,800.00
Reclamation Technical representative	Farmington	Project evaluation or field trips	2 trips @ 6 days/trip	$100/600	$50/$300	$400	$2,000	$3,300.00
Reclamation Technical representative	Boise, ID; Kennewick, WA; various	Contract administration with suppliers	2 trips @ 3 days/trip	$100/$300	$50/$300	$400	$1,000	$2000.00
Lead agreement	Farmington, Durango	CC/BC mtg., or contract admin	1 trips @ 2 days	$100/$200	$50/$200	$100	$2,000	$1,500.00

officer								
Lead contract officer	Various locations	Contract Admin	1 trip @ 2 days	$125	$65/$130	$100	$300	$655.00
Total								$11,255.00

*Taxi $20; Parking $10; Rental car $100/trip

Budget Summary
FY-2015

Total labor	$176,400.00
Total travel	$11,255.00$11,255.00
Grand total	**$187,655.00**[1]

[1] **This total budget represents a 9% increase over the FY2014 budget due to the fact that the PIT Tag contract will need to be recompeted in FY2015 with a projected additional cost of $16,000.**

Peer Review for 2015
Fiscal Year 2015 Project Proposal

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Background

A Peer Review Panel was established in 1997 to assist the SJRIP with reports and plans for future studies. The four members of the panel participate in meetings and comment on pre-draft, draft, and final Scopes of Work, Workplans, reports, Integration analyses and reports, and other Program Documents.

This proposal provides for funding for the Peer Review Panel activities during 2015. It is anticipated that the Panel will meet with the Biology Committee at three meetings during the year; the December 2014 Planning meeting, the February/March, 2015 Researcher's meeting, and a May, 2015 BC meeting (combined with the Coordination Committee) to draft 2016 SOWs. Additionally, the Peer Reviewers will likely be asked to attend an additional workshop meeting whereby they are asked to comment as a group on all aspects of specific Program Elements.

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 and Program Staff to produce scientific credible documents and will assist the Biology Committee in maintaining a scientific basis for the Program.

Methods

The Peer Review Panel will meet with the Biology Committee in FY2015 three to four times to review monitoring and research progress, discuss scopes of work for 2015 and 2016, and participate in a workshop. They will provide verbal input during the meetings and provide written reviews of the progress of the Program. Their reviews will be provided to the Biology Committee through Mark McKinstry and David Campbell in letter form, or on the Biology Committee list server, and through discussions at the Biology Committee 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 either Mark McKinstry or David Campbell.

Products

Peer review participation at 3 Biology Committee meetings and 1 workshop, letter or verbal reports from each peer reviewer on an as-requested basis.

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Budget FY-15:
Payment for serving on the Peer Review Panel includes expenses for travel to and from meetings, and an hourly rate for services. It is anticipated that Panel Members will spend approximately 25-40 days each in 2015.

The total budget is distributed among the four peer reviewers through individual Services Contracts with Reclamation.

Salaries:	$50,000
Travel:	$15,000
Total	**$65,000**

Future use of the Peer Review Panel is not known but they likely will be used each year to provide guidance to the Biology Committee.

Estimated Outyear Funding:

2016	**$65,000**