# *FISCAL YEAR 2014 ANNUAL BUDGET AND WORK PLAN*


*Approved September 4, 2013*

# SJRRIP FY2014 AWP Budget Estimate (approved September 4, *2013*)

| SOW | Title | Agency | Hydropower Revenue | Capital Project Funding | Other Funding | Grand Totals |
|---|---|---|---|---|---|---|
| | | | | | | |
| | **Element 1 - Management and Augmentation of Populations and Protection of Genetic Integrity** | | | | | |
| 7 | Horsethief Canyon Ponds O&M at Ouray NFH | FWS, GJ | $32,405 | | | $32,405 |
| 8 | Stocking & Acclimation of Age-0 CPM & Age-1+ RBS | FWS, ABQ | $38,283 | | | $38,283 |
| 9 | Colorado Pikeminnow Fingerling Production Dexter | FWS, DNFHTC | $99,047 | | | $99,047 |
| 10 | Rearing Razorback Suckers Dexter | FWS, DNFHTC | $78,533 | | | $78,533 |
| 11 | Razorback Sucker Production Uvalde | FWS, UNFH | $36,668 | | | $36,668 |
| 12 | RBS Augmentation/NAPI Pond Management | NN, FWS | $144,455 | | | $144,455 |
| | | | | | | |
| | **Subtotal** | | **$429,391** | **$0** | **$0** | **$429,391** |
| | | | | | | |
| | **Element 2 - Protection, Management, and Augmentation of Habitat** | | | | | |
| 13 | Maintenance and Operation of Model | BR, SLC | $110,050 | | | $110,050 |
| 14 | Stream Gaging and Flow Measurements | BR, USGS | $7,600 | | | $7,600 |
| 15 | Operation of PNM Fish Passage Structure | NN, FWS | $104,007 | | | $104,007 |
| 16 | SJR Channel and Floodplain Restoration, Phase II | TNC | | | $195,600 [1] | $195,600 |
| | Capital Projects Management | BR | | $56,000 | | $56,000 |
| | PNM O&M[5] | PNM | | | | $0 |
| | Capital Projects | | | | | $0 |
| | | | | | | |
| | **Subtotal** | | **$221,657** | **$56,000** | **$195,600** | **$473,257** |
| | | | | | | |
| | **Element 3 - Management of Non-Native Species** | | | | | |
| 17 | Upper/Middle River Nonnative Species Control & Rare Fish Monitoring | FWS, ABQ | $338,958 | | | $338,958 |
| 18 | Lower River Nonnative Species Control & Rare Fish Monitoring | UDWR | $185,585 | | | $185,585 |
| | | | | | | |
| | **Subtotal** | | **$524,543** | **$0** | **$0** | **$524,543** |
| | | | | | | |
| | **Element 4 - Monitoring and Evaluation of Fish and Habitat in Support of Recovery Actions** | | | | | |
| 19 | Sub-Adult/Adult Large-Bodied Fish Community Monitoring | FWS, GJ | $112,775 | | | $112,775 |
| 20 | YOY/Small-Bodied Fish Monitoring | NMDGF | $84,307 | | $40,000 [2] | $124,307 |
| 21 | RBS/CPM Larval Surveys (Combined SOW) | ASIR | $223,225 | | | $223,225 |
| 21a | Elemental Scale Analysis for Determining Natal Origin | ASIR | $79,332 | | | $79,332 |
| 22 | Specimen Curation/Identification | UNM | $29,932 | | | $29,932 |
| 23 | Integration of Long-term Monitoring Data | UNM | $88,802 | | | $88,802 |
| 25 | Habitat Imagery (videography/satellite) | BR | $22,000 | | | $22,000 |
| 29 | SJR Population Model Update, Maintenance, and Model Runs | SUIT | | | $72,000 [3] | $72,000 |
| 30 | Habitat/Temperature Monitoring (w retrospective habitat analysis) | ERI, MEC | $160,490 | | | $160,490 |
| 31 | Peer Review | BR, FWS | $55,000 | | | $55,000 |
| | PIT Tags | BR | $0 | | | $0 |
| | 2013-2014 Workshop(s) | BR, FWS | $0 | | | $0 |
| | | | | | | |
| | **Subtotal** | | **$855,863** | **$0** | **$112,000** | **$967,863** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Element 5 - Program Coordination and Assessment of Progress Toward Recovery** | | | | | |
| 32 | Program Management FWS | FWS, ABQ | $210,059 | | $200,109 [4] | $410,168 |
| 33 | Base Funds and Contract Management BR | BR, SLC | $171,655 | | | $171,655 |
| | | | | | | |
| | **Subtotal** | | **$381,714** | **$0** | **$200,109** | **$581,823** |
| | | | | | | |
| | **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** | | **$2,429,028** | **$56,000** | **$507,709** | **$2,992,737** |
| | | | | | | |
| | 2014 Estimated Base Funds (2013 Amt. x 2% CPI) | | **$2,431,113** | | | |
| | Hydropower Revenue-Funded Projects | | **$2,429,028** | | | |
| | Carry over from FY2013 | | **$0** | | | |
| | Estimated available 2014 funds to expenditures | | **$2,085** | | | |
| | | | | | | |
| | **Notes** | | | | | |
| | [1] 2014 TNC In-kind; [2] 2013 NMGFD In-kind; [3] 2013 SUIT In-kind | | | | | |
| | [4] 2014 USFWS contribution | | | | | |
| | [5] Placeholder for potential costs for extraordinary repairs at PNM fish passage | | | | | |

# Augmentation of Age-0 Colorado pikeminnow and Age-1+ razorback sucker in the San Juan River
## Fiscal Year 2014 Project Proposal

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Cooperative Agreement #'s:
USFWS – NMWFCO R11PG40011

Period of Performance: 10/01/2013 to 9/30/2014

**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 $\geq$ 300,000 age-0 and $\geq$3,000 age 1+ fish in the San Juan River until 2009. In early 2010 a revised plan, *Augmentation of Colorado Pikeminnow (Ptychocheilus lucius) in the San Juan River: Phase II, 2010-2020* (Furr 2010), was drafted that outlines the continuation of stockings through 2020. Phase II augmentation reflects changes requested by the SJRIP Biology Committee by discontinuing the stocking age-1+ Colorado pikeminnow in exchange for stocking increased numbers of age-0 fish ($n\geq$ 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 2010 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 and Protection of Genetic Integrity

**Goal 1.1**—Establish a Genetically and Demographically Viable, Self-Sustaining CPM Population.

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

**Task 1.1.1.3** Evaluate and adjust stocking goals of augmentation plan.

**Task 1.1.1.4** Review and update augmentation plan 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** Annually stock >300,000 age-0 CPM**

***Phase II modification:*

*Annually stock ≥ 400,000 age-0 Colorado pikeminnow. [2011-2020]*

**Task 1.1.2.3** Annually stock 3,000 age-1 CPM. **

** *Phase II modification:*

*discontinue annual stocking of ≥ 3,000 age-1+ Colorado pikeminnow; except in instances under Task 1.1.2.4. [2011-2020]*

**Task 1.1.2.4** Opportunistically stock available CPM in excess of those described above.

** indicates that the LRP 2010 DRAFT does not reflect modifications to the augmentation program outlined in Augmentation of Colorado Pikeminnow (*Ptychocheilus lucius*) in the San Juan River: Phase II, 2010-2020 (Furr 2010), modifications are delineated in *italics*.

**Goal 1.2---** Establish a Genetically and Demographically Viable, Self-Sustaining RBS Population.

**Action 1.2.1** Develop plans for rearing and stocking RBS.

**Task 1.2.1.3** Estimate and adjust stocking goals of augmentation plan.

**Task 1.2.1.4** Review and update RBS augmentation plan as needed.

**Action 1.2.2** Produce, rear, and stock sufficient numbers of RBS to meet stocking goals of augmentation plan.

**Task 1.2.2.1** Produce and rear RBS at Dexter NFH for stocking to grow-out facilities.

**Task 1.2.2.2** Annually stock three NAPI grow-out ponds with 3,000-3,500 fish per pond (> 200 mm TL) hatchery-reared RBS.

**Task 1.2.2.3** Produce 12,000 RBS per year (>300 mm TL) at Uvalde NFH.

**Task 1.2.2.4** Stock at least 91,200 RBS (> 300 mm TL) during 2009-2016 or 11,400 per year.

**Task 1.2.2.7** Opportunistically stock available RBS in excess of the 11,400 described above. *(i.e. stock all razorback sucker from NAPI grow-out ponds annually)*

**Goal 1.3**— Monitor and Evaluate RBS and CPM Augmentation Program and Genetic Integrity.

**Action 1.3.1** Monitor status and success of stocked RBS and CPM.

**Task 1.3.1.1** Determine survival and recruitment of stocked RBS and CPM to assess stocking success

**Action 1.3.2** Evaluate factors limiting RBS and CPM population recovery.

**Task 1.3.2.1** 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.

**Action 1.3.4** Assemble information from population management and augmentation.

**Task 1.3.4.1** Use data and information gathered from fish surveys, hatchery augmentation, and survival studies to describe best strategies for establishing wild populations of endangered fish and restoring the native fish community.

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 2014**

1. Coordinate with Dexter National Fish Hatchery and Technology Center (NFH&TC) 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 Uvalde National Fish Hatchery and Navajo Nation Department of Fish and Wildlife 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 age-1+ 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. 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 Dexter NFH&TC 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 24 hours prior to release into the San Juan River.

Objective 2.a. At least 11,400 razorback sucker will be reared at Uvalde NFH, implanted with a Passive Integrated Transponder tag (PIT tag), measured for total length and weight, and delivered via standard distribution unit to the San Juan River annually. Dexter NFH&TC 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. All razorback sucker, or a subset, from Uvalde NFH will be acclimatized to riverine conditions (i.e. flow, temperature, physical/environmental characteristic, etc.) for up to 24 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 180 and determine their suitability for use as stocking locations. 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 March 2014. A draft summary report detailing findings will be submitted to the San Juan River Implementation Program, Biology Committee, by 31 March 2015. Revisions will be completed and a final annual report will be submitted by 1 June 2015.

**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.

Furr, D.W. 2010. Augmentation of Colorado Pikeminnow (Ptychocheilus lucius) in the San Juan River: Phase II, 2010-2020 (DRAFT). U.S. Fish and Wildlife Service, San Juan River Recovery Implementation Program, Albuquerque, NM. 20 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.

Ryden, D. W., and F. K. Pfeifer. 1994. An experimental stocking plan for razorback sucker in the San Juan River. U.S. Fish and Wildlife Service, Grand Junction, CO. 26 pp.San Juan River Basin Recovery Implementation Program. 2010. Long-range plan (Draft). San Juan River Basin Recovery Implementation Program, U.S. Fish and Wildlife Service, Albuquerque, NM.

Ryden, D. W. 1997. Five-year augmentation plan for razorback sucker in the San Juan River. U.S. Fish and Wildlife Service, Grand Junction, CO. 27 pp.

Ryden, D.W. 2003. An Augmentation Plan for Razorback Sucker in the San Juan River: Addendum to the Five-Year Augmentation Plan for Razorback Sucker in the San Juan River (Ryden 1997).. U.S. Fish and Wildlife Service, San Juan River Recovery Implementation Program, Albuquerque, NM. 63 pp. + appendices.

Ryden, D.W. 2008. Augmentation of Colorado pikeminnow in the San Juan River: 2007. Interim Progress Report (Final) submitted to U.S. Fish and Wildlife Service, San Juan River Recovery Implementation Program, Albuquerque, NM. 6 pp. + appendices.

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 2014 Proposed Budget:**

| | |
|---|---|
| **Personnel/Labor Costs (Federal Salary + Benefits)** | |
| **Fish Biologist (GS-11-3)** – 46 days @ $359/day | $ 16,514.00 |
| Age-0 Colorado pikeminnow stockings (Objective 1.a): (1 person x 3 days/trip x 2 trips) | |
| Age-1+ razorback sucker stockings (Objective 2.a): (1 person x 2 days/trip x 10 trips) | |
| Reporting/Data Management (Objective 2) (1 person x 20 days) | |
| **Bio. Science Technician (GS-8)** – 26 days @ $338/day | $ 8,788.00 |
| Age-0 stockings (Objective 1.a): (1 person x 3 days/trip x 2 trip) | |
| Age-1+ razorback sucker stockings (Objective 2.a): (1 person x 2 days/trip x 10 trips) | |
| **Supervisory Fish Biologist (GS-13-4)** – 5 days @ $528/day (Project oversight and review) | $ 2,640.00 |
| **Project Leader (GS-14-9)**- 4 days @$718/day | $ 2,872.00 |
| **Sub-total** | $ **30,814.00** |
| **Travel and Per Diem (Based on Published FY-2012 Federal Per Diem Rates)** | |
| Hotel Costs – 14 nights (14 nights @ $77/night – single occupancy = $1,078) | $ 1,078.00 |
| Per Diem (Hotel Rate) – 26 days @ $46/day | $ 1,196.00 |
| **Sub-total** | $ **2,274.00** |
| **Equipment** | |
| Vehicle Maintenance & Gasoline 8,000 miles @ $0.51/mile (includes costs associated with gasoline/diesel fuel vehicle maintenance) | $ 4,080.00 |
| **Sub-total** | $ **4,080.00** |
| **USFWS-NMFWCO Total** | $ 37,168.00 |
| **USFWS Region 2 Regional Office Administrative Overhead (3%)** | $ 1,115.00 |
| **USFWS Region 2 Total** | **$ 38,283.00** |

**Out-year funding**

**FY 2015 ..... $39,441**
**FY 2016 ..... $40,631**
**FY 2017 ..... $41,811**
**FY 2018 ..... $43,072**

# COLORADO PIKEMINNOW Age-0 PRODUCTION
## San Juan River
## FY-2014

## IA# R10PG40022

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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 (SNARRC).

## 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 both 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 SNARRC allow for ≥400,000 age-0 Colorado pikeminnow to be produced and stocked annually. This has been identified as the stocking target for 2014 and subsequent years unless further production capacity is identified and/or stocking targets modified by the SJRIP.

SNARRC 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 2014.

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

(3) 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 SNARRC 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 2014 a maximum of 50 paired matings (1 female X 1 male) will be spawned from the 1991/1999 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 SNARRC.

### 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°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 °F feed 3 % BW per day, Mon, Wed and Fri.
- water temp 61-78 °F feed 2 % BW per day, Mon thru Fri.
- water temp < 60 °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 |

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.

Predator Control

Historically, SNARRC 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. During the winter months Colorado pikeminnow reared for this project will be maintained in two outdoor earthen ponds covered with bird netting.

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 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.

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° F (1°C) towards equalizing per 30 minutes time. Due to the high alkalinity and TDS of SNARRC 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. 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. 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 Lab will provide bacterial and viral testing for Colorado pikeminnow propagation and rearing activities. Treatment of disease will be the responsibility of SNARRC 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 of the Phase II (2010 – 2020) "*draft*" **Augmentation Of Colorado Pikeminnow (*Ptychocheilus lucius*) In The San Juan River Plan ,** (Furr 2009). In the case of catastrophic loss (>25% of the stock) at SNARRC, 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.

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.

Reporting
Annual progress report detailing fish culture and distribution activities will be completed and provided to the SJRIP by January 31, 2015.

Schedule

Broodfish will be spawned in May 2014 and age-0 fish reared in earthen and plastic lined ponds from June - October 2014.

**Budget**

RE: Colorado pikeminnow age-0 production at Dexter National Fish Hatchery and Technology Center. The following costs are associated with producing and stocking 400,000 age-0 fingerlings in the San Juan River in 2014. Identified costs also include maintaining 400-500 adult Colorado pikeminnow broodstock for recovery efforts.

**Budget -Detailed Spending Plan 2014**

O&M Labor Costs

The labor costs identified for 2014 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 @$30.48/hr = $39,014

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

(1) Administrative Officer (240 hours- 3pay periods) - GS 341-9 @$29.82/hr =$ 7,157

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

**Subtotal = $46,171.00**

| | |
|---|---|
| **Equipment and Supplies:** | |
| Liquid oxygen and compressed oxygen 12 cylinders @ $76.75 | $ 921.00 |
| Airgas | |
| Spawning Supplies | $ 925.00 |
| Hormones (CCP 5 vials @ $185 per 10ml/vial) | |
| Fish health sampling prior to stocking | $ 3,000.00 |
| Lab supplies for bacti, viral and parasite testing. | |
| Culture equipment (nets, seines, screens, etc.) | $1,030.00 |
| Eager, Memphis Net & Twine | |
| Pond management supplies, Barrier $257.50/50# bag (20 bags) | $5,150.00 |
| Van Diest | |
| Fish feed,1.50/lb, 6,000 lbs | $9,000.00 |
| Nelson & Sons | |
| Cyclical Maintenance costs for: | $1,500.00 |
| Tractors, mowers, gators, sweepers | |
| used in pond maintenance | |
| **Subtotal** | **$ 21,526.00** |
| **Utilities:** | |
| Pumping costs | |
| Electrical 200,257 kwh @ .088 | $17,622.00 |
| Heating water for hatching eggs to swim-up | |
| Natural gas 1,525 ccf @ .93 | $ 1,418.25 |
| **Subtotal** | **$19,040.25** |

**Reintroduction Costs:**

| | |
|---|---|
| Salaries | |
| GS-9 Fish Biologist | |
| 24 hrs @ $30.49 | $731.76 |
| GS-7 Fish Biologist | |
| 24 hrs @ $22.66 | $543.84 |
| WG-7 Maintenance Worker | |
| 24 hrs @ $20.60 | $494.40 |
| WG-5 Bio Science technician | |
| 24 hrs @ $15.45 | $370.80 |
| Lodging &Per Diem $123/day (Dexter to Farmington, NM and return) | |
| $123.00/trip x 2 trips x 4 employees = | $984.00 |
| Fuel costs and truck maintenance 1200 miles @ $5.30 | $6,300.00 |
| **Subtotal** | **$9,424.80** |
| **Annual Totals (O & M Direst Costs)** | **$ 96,162.05** |
| **3% Administrative Overhead** | **$ 2,884.86** |
| **TOTAL REQUESTED FOR 2014** | **$ 99,046.91** |

**Projected out year funding request:**

FY 2015 - $110,344.33
FY 2016 - $113,666.22
FY 2017 - $117,163.84
FY 2018 - $120,326.81
FY 2019 - $ 123,478.00

**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.

Ryden, D. W. 2003. An Augmentation Plan For Colorado Pikeminnow In The San Juan River. U. S. Fish and Wildlife Service, Grand Junction , Co. 63 pp. + appendices.

Ryden, D. W. 2005. *Draft* Addendum #1, Stocking Age-1 Fish To Supplement Ongoing Augmentation Efforts. An Augmentation Plan For Colorado Pikeminnow In The San Juan River. U. S. Fish and Wildlife Service, Grand Junction , Co. 3 pages.

# Rearing Razorback Sucker Sub-Adults at the Southwestern Native Aquatic Resources and Recovery Center, Dexter NM
**FY 2014**

**IA# R11PG40012**

Prepared for:
The San Juan Recovery Implementation Program

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**Background**

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 (SNARRC). 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 at (SNARRC) to continue producing 11,000, 200+ mm razorback sucker 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 these fish to existing grow-out ponds located on the Navajo Indian Irrigation Project. SNARRC has developed production guides for the species based on historical growth rates and produces large numbers of razorback sub-adults (300+mm) for stocking into Lake Mohave, Arizona, Lower Colorado River.

The U.S. Fish and Wildlife Service (USFWS) has developed extensive infrastructure and expertise at SNARRC 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 thirty years. During that period it has successfully cultured razorback sucker, bonytail and Colorado pikeminnow of the Colorado River system and currently maintains a large genetically diverse razorback sucker broodstock. 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 1.5 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.

**Lake Mohave Razorback Sucker Broodfish**

Razorback sucker (RASU) have been maintained and cultured at SNARRC since 1981. The captive broodstock represent the Lake Mohave population. SNARRC maintains three separate broodstocks; 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 DNFH&TC 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. SNARRC's 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. SNARRC 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 SNARRC 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 to SNARRC by the SJRIP.

Methods

SNARRC will conduct captive propagation activities that include spawning of a minimum of 20 pairs of broodstock, incubation of fertilized eggs, enumeration and stocking of swimup fry into rearing ponds, harvest of target sized fish from ponds, enumeration 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.

Spawning

Broodfish will be harvested from ponds in early March and held indoor for spawning. Razorback sucker spawning protocols developed and used at SNARRC are listed in Appendix Table 3.

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 SNARRC 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.) 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 °F feed 3 % BW per day, Mon, Wed and Fri.
- water temp 61-78 °F feed 2 % BW per day, Mon thru Fri.
- water temp < 60 °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 |

Projected Harvest Dates and Delivery Date

Year 2014 marks the 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, SNARRC staff have stocked a total of 58,648 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 2014. 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).

Predator Control

Historically, SNARRC 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 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° F or (1°C) towards equalizing per 30 minutes time. Due to the high alkalinity and TDS of SNARRC 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.**

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.

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 NAPI ponds, 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 SNARRC 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 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 SNARRC, 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.

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 SNARRC could potentially continue till 2020 as per BOR RFP 04-SF-40-2250.

Reporting

A draft annual progress report detailing fish culture and distribution activities will be completed and provided to the SJRIP by January 31, 2015.

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 2014. Target sized fish are available for distribution in spring and fall of each year.

**2014 Budget**

RE: RFP #04-SF-40-2250, Rearing Razorback Sucker Sub-Adults at the Southwestern Native Aquatic Resources and Recovery Center, Costs associated with rearing 11,000 – 200mm fish for NAPI ponds annually. Detailed Budget Spending Plan, 2014.

O&M Labor Costs

The labor costs identified in the 2014 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 @ $30.49/hr = $ 31,410
* Supervision, spawning, fish health and water quality monitoring, feeding, harvest and distribution.

(1) Administrative Officer (160 hours- 2pay periods) - GS 341-9 @$29.82/hr = $ 4,771
* Budget tracking, purchasing, data base management & reporting.

**Subtotal = $36,181**

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. | $ 3,090 |
| Wet lab supplies (pipets, petri dishes, slides, probes, markers) | $ 258 |
| Theriputents- salt, furacin, formalin, MS-222, stress coat | $ 618 |
| Liquid and compressed oxygen for fish distribution | $ 206 |
| Feed | |
| Production diet RBS0301 (1.5tons) 3,000 lbs $ 1.50 per lb | $ 4,500 |
| Spawning Supplies | |
| Hormones (HCG 10 vials @ $ 51.50 per 10ml/vial) | $ 515 |
| Fertilizer | |
| Alfalfa pellets (1,000 lbs ) .26/lb | $ 260 |
| Inorganic - Super Phosphate (10 bags) 7.73/bag | $ 77 |
| Chemicals- Aquatic Vegetation Control | |
| Barrier- (6 bags) $257.50/bag | $ 1,545 |
| Diuron -(2 bags) $ 77.25/bag | $ 155 |
| **Subtotal =** | **$11,224** |
| Services | |
| Utilities & Equipment Maintenance | |
| * Electrical, fuel and phone | $ 3,605 |
| * Boiler system, heat exchanger maintenance | $ 1,030 |
| *#1 well and water tower and pumping station maintenance | $ 9,785 |

**Subtotal = $ 14,420**

Travel

- Fish stocking/distribution.

| | |
|---|---|
| Dexter to Farmington (NAPI) & return- (1640 miles @ 5.31 per mile DX truck)= | $ 8,708 |
| Fuel and routine vehicle maintenance. | |
| Perdiem- $123 per day X 2 trips X 2 individuals. = | $ 492 |
| Dexter to Uvalde & return- (960miles @ 5.31 per mile X 1 trip )= | $ 5,098 |
| Fuel and routine vehicle maintenance. | |
| Perdiem- $123 per day X 1 trip X 1 individual. = | $ 123 |
| **Subtotal =** | **$14,421** |

**Annual Totals**

| | |
|---|---|
| O&M DIRECT COSTS | $76,246 |
| INDIRECT COSTS ( Admin Overhead @ 3%) | $ 2,287 |
| **TOTAL REQUESTED FOR 2014** | **$78,533** |

**Projected out year funding request:**

FY 2015 - $87,524
FY 2016 - $90,207
FY 2017 - $92,899
FY 2018 - $95,229
FY 2019 - $97,495

**Literature Cited:**

Hamman, R. 1985. Induced spawning of hatchery -reared razorback sucker. Prog. Fish-Cult.. 47(3): 187-189

Ryden, D. W. 2003. 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 1997). U. S. Fish and Wildlife Service, Grand Junction, CO. 32 pp.

**FY 2014**

# Rear 12,000-300mm Razorback Sucker at the Uvalde National Fish Hatchery, Uvalde, Texas

Prepared for:
Biology Committee
The San Juan River Basin Recovery Implementation Program

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**Introduction**

Uvalde National Fish Hatchery (UNFH) submits the following proposal to rear remaining razorbacks for two months and stock all remaining razorback sucker on station to the San Juan River for the San Juan River Basin Recovery Implementation Program (SJRIP). The project will use approximately four- one acre ponds at the UNFH, Uvalde, Texas. The Southwest Native Aquatic Resource and Recovery Center (SNARRC) will provide technical assistance with fish health and culture methods.

The following scope of work identifies the facilities and methodologies that will be used at UNFH to rear and stock all remaining 6,000 razorback suckers on station. An initial production guide was developed for the species based on historical growth rates observed at Dexter, Willow Beach, and Achii Hanyo. The data generated from previous years of work completed at Uvalde have been incorporated into the current razorback production program. Funding is being requested for operations and maintenance of the species at UNFH. The UNFH will provide the infra-structure for stability in the production program. Fish hauling will be conducted by the Uvalde NFH.

**Background**

UNFH is located 3 miles southwest of Uvalde, Texas, on FM 481 and approximately 80 miles west of San Antonio. This is a large warm-water fish culture facility that utilizes earthen and lined ponds, and intensive culturing raceways to produce fish.

The hatchery is situated on 100 acres of former mesquite grasslands, in the Rio Grande plain of southwest Texas. There are 47 usable ponds totaling 50 surface acres of water. Five ponds were lined with high density polyethylene in FY 1987, six more in FY 1993, one in FY 2009, one in FY10, and two in FY11 for water conservation purposes. Buildings on the facility were renovated from 2001 to present, following a 100-year flood in 1998. Hatchery facilities include an office/fish culture building, shop/garage, fish holding house/nursery, feed room with cooler, two labs, and four living quarters with two double garages, two pump houses, and four outdoor concrete raceways and two outdoor fiberglass raceways. Water for fish culture purposes is pumped from two deep wells. One water tower at the tankhouse to provide a backup water source for intensive culture purposes.

**Station Operations**

Historically, UNFH has been one of the top producing warm-water fish culture facilities in the nation. During the mid-90s as many as 6 species were cultured producing 2.6 million fish, weighing 60,000 pounds. Over the past 15 years threatened and endangered fish species like Yaqui catfish, Comanche Springs pupfish, San Marcos salamander, and fountain darters have all been propagated and maintained successfully at the facility.

The climate in southwest Texas provides 300 days (10 months) of growing season. Two independent deep wells provide up to 3,000 gallons per minute of excellent water quality, year round.

Razorback sucker have been reared at UNFH since April 2009. All fish from Uvalde NFH are inserted with a 134.2 kHz Passive Integrated Transponder (PIT) tag before being distributed. Tags are provided by the SJRIP. On November 11, 2006, 1,150 PIT tagged 300mm Age-1 razorbacks were stocked in the San Juan River (Hogback diversion area). In 2006, 16% of all razorbacks stocked into Uvalde ponds reached the 300mm target size in six months. Approximately 75% of the remaining fish were 250+ mm in length. These fish were kept on station for future grow out and eventual stocking in 2007. In 2007, Uvalde stocked approximately 5,000 razorbacks into the San

Juan River and in March 2007, transferred fish to Dexter NFH & TC, exceeding the annual commitment of 6,000 fish. In 2008, the annual commitment of fish was increased from 6,000 fish to 12,000 fish. No fish were stocked in 2008 due to the facility testing positive for Largemouth Bass Virus. In February 2008, all contaminated sources were either destroyed or removed from the hatchery. In July 2008, the station received a clean fish health inspection and became "Suspect", and in July 2009, with its second consecutive clean fish health inspection, Uvalde NFH's fish health status returned to "Class A". During FY 2010, a total of 8,018-2006 Year Class, PIT tagged razorback sucker were stocked into Animas Confluence, Hogback Diversion, and Shiprock Bridge. The stocked fish had a total weight of 15,023 pounds and averaged 433 mm in total length. During FY 2011, a total of 16,600 razorback sucker were stocked into Animas Confluence, Animas Park, Hogback Diversion, PNM Weir, and Shiprock Bridge. Fish stocked were from 2006, 2007, and 2009 Year Classes, for a total weight of 21,813 pounds and an average total length of 414mm. The amount stocked in FY 2011 exceeded Uvalde NFH's annual 12,000 fish commitment to make up for the 4,000 fish that could not be hauled the previous year due to physiological stressors associated with spawning. An additional 600 fish were also stocked. In FY 2012 Uvalde NFH drivers distributed 11,029 razorbacks from the 2009 year class into Animas (Boyd Park), PNM, and Wild Horse Road locations. Total weight of all fish stocked was 11,331 pounds, and averaged 375mm in total length. In FY 2013, Uvalde distributed 10,682 razorbacks from the 2006 and 2009 year classes into the Animas Confluence, PNM Weir, and Bloomfield stocking sites. Total weight of all fish stocked was 14,467 pounds, and averaged 398mm in total length.

**Facility**

This project will utilize hatchery ponds and indoor/outdoor raceways to fulfill the production commitments of the proposal. Ponds fitted with liners and bird deterrent netting will be utilized to rear the species. Ponds are prepared prior to the receipt of fish. Damaged liner material is repaired; and detritus material is removed through the use of specialized equipment. All ponds are fully functional with two water supply lines (one at shallow end and one at catch basin end), concrete catch basin (kettle) and drain lines. Predator control methods will be implemented throughout the production year.

**Water**

An abundant amount of fish culture water is supplied by two wells on station. The first and primary water supply (Spurgeon Well) derives its water from the Austin Chalk formation, an aquifer which has excellent water quality. The well is capable of pumping up to 1,500 gallons per minute. The well water quality is fairly constant at: 73°F, pH of 7.5-8.05, total hardness of 496 ppm, and alkalinity of 224 ppm. The station's secondary well (Wilson Well) is capable of producing an additional 1,500 gallons per minute. The Wilson Well derives its water from the Edwards Aquifer; it is a deep water well that has a year round temperature of 75°F, pH of approximately 7.1, total hardness of 380 ppm, and alkalinity of 245 ppm. These water supplies together are capable of providing up to 3,000 gallons per minute to the entire facility. Due to the potential implications to threatened and endangered species utilizing the Edwards Aquifer system, the Service has established a limit on groundwater withdrawals from the Edwards Aquifer. That self-imposed water restriction for Uvalde NFH has been determined to be 472 acre-feet per annum (USFWS, Biological Opinion 2010). Since the Spurgeon Well derives its water from a source other than the Edwards Aquifer (Austin Chalk formation), there are no internal agency groundwater pumping limits set for its water withdrawals.

**Objectives**
The main objective of this SOW is to captively rear and stock all remaining razorbacks on station into the San Juan River. The station will no longer be rearing razorback sucker after FY 2014. The goal is to provide/distribute all remaining razorback sucker sub-adults to the San Juan River for recovery purposes.

**Methods**
UNFH will conduct extensive and intensive culturing of razorback sucker and harvest the fish from ponds, enumerate, tag, and distribution the fish to the San Juan River.

Razorbacks that are to be distributed in the fall (October/November) were implanted with a 134.2 kHz PIT tag during the previous spring (March/April).

In the fall of the year when the fish reach target size they will be harvested from the ponds and transferred to the fish culture building, given a .5% flow through salt treatment, and allowed to rest. Upon completion of their rest period, all fish are scanned for the previously implanted tag, and length and weight data are collected and entered into a database. Fish are placed back into the raceway, fed, and following a 7 to 10 day rest period, will be loaded into a distribution tank and hauled to their stocking locations by the Uvalde NFH staff.

**Escapement**
Staff will reduce the potential for escapement by installing kettle screens in the ponds prior to the pond's receipt of the fish. Screen mesh size will be 250 micron in Age-0 ponds and a minimum of ¼" in Age-I ponds. All Age-I fish will be graded prior to being stocked in the rearing ponds. Staff will monitor the ponds daily and insure there are no leaks in the dam boards. Sawdust will be used to stop all leaks that develop in the catch basin. Water levels will be adjusted and maintained a minimum of six inches below the over flow mark until the fry average 30mm in length.

**Feeding Schedule**
Fish will be sampled (or projected if water temps are above 28°C) at the end of every month. Size, weight, and over-all condition will be recorded. Feed amounts will be adjusted on a monthly basis. In addition to a natural invertebrate diet, the fry and fingerlings will be hand fed a starter/grower diet. Fry will be fed 4 times daily and fingerlings twice daily, once at 10:00am 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 ≥ 70 °F (21 °C) feed 3 % BW per day, Mon through Fri.
- Water temp 60-70 °F (16-21 °C) feed 2 % BW per day, Mon through Fri.
- Water temp < 60 °F (16 °C) feed 1.5 % BW per day, Mon, Wed, Fri.

**Predator Control**
During the summer grow-out all ponds are monitored daily by on-site staff and predators are taken by gun and/or traps. Fish remaining outdoors during the winter season will be held in ponds that contain the protection of 2" X 2" block nylon bird predation netting.

**Back-Up Protection**

The hatchery has three back-up generators that are located at the water supply, concrete raceways, and outdoor fiberglass raceways. The generators are programmed to immediately engage during any power outage, thereby providing uninterrupted water flows and supplemental aeration during power outages. An automated auto-dialer system monitors the continuous operation of the station's water supply and tankhouse power, which includes supplemental aeration to its raceways. Should the back-up system fail for the water supply or tankhouse, the security system automatically alerts staff via telephone.

**Fish Health Monitoring Protocols**

All fish will be handled with the best animal husbandry practices available. A feeding schedule will be developed and followed daily. All fish rearing/holding structures on station will have their $O_2$ levels monitored daily. Routine fish health condition exams will be performed on-site by hatchery staff to monitor the overall health of the razorback population. Non-lethal methods, if available, will be employed to obtain samples. Wet mounts will be examined for parasites and bacteria. Identification and treatment of disease will be the responsibility of the UNFH staff; however, assistance will be requested of the Region's Fish Health Center to assist in the diagnosis and treatment of any suspected disease or parasite.

Per U.S. Fish and Wildlife Service's Aquatic Animal Health Policy 713 FW 1-5, all year classes of razorback sucker, and other species on station, will receive a comprehensive annual examination prior to transferring off station. The Region 2 Fish Health Center located at the Dexter NFH&TC will provide the annual fish health inspection, which includes bacterial, parasitic, and viral testing for razorback. Typically 60 fish per species, split between individual year classes, are sacrificed to have a statistically valid sample. The Fish Health Center also provides diagnostic and treatment support of the razorback program throughout the production cycle.

**Projected Harvest Dates and Delivery Date**

All remaining razorbacks on station (approximately 6,000) will be harvested from the ponds in September/October. The razorbacks will then be inventoried, length and weight data collected and recorded, scanned to ensure PIT tag retention, retagged if no tag is present, and stocked into the San Juan River in October/November of 2013.

**Disposition of Fish**

All fish propagated and cultured for this project are made available to the SJRIP for stocking and meeting augmentation requirements identified by the RIP. In the case of catastrophic loss (>25% of the stock) at UNFH, specimens will be collected for testing and diagnosis to determine (if possible) the reason for the 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 the results are available. Excluded from these reporting requirements are larvae and fish lost to natural attrition, including but not limited to incidental predation mortalities. Any additional mortality 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.

**Budget Fiscal Year 2014**

Rearing Razorback Sucker at Uvalde National Fish Hatchery; Detailed Budget Spending Plan. The budget includes funding for approximately two months of rearing, data collection, and distribution of approximately 6,000 razorbacks to the San Juan River.

O&M Labor Costs-Specific to San Juan River RIP

The labor costs identified in this proposal are broken down as follows, and include benefits and payroll additives for each position identified:

Uvalde National Fish Hatchery

| | |
|---|---|
| (1) Fishery Biologist (3 pp) - GS 482-9 @ $31.59/hour<br>* On-site fish rearing, razorback aquaculture, water quality monitoring, fish tagging, data collection, and distribution activities. | $7,600 |
| **Subtotal =** | **$7,600** |

Equipment, Materials and Supplies

Cost based on UNFH historical purchases:

| | |
|---|---|
| Fish Health | |
| -Therapeutants- Salt, Oxygen | $400 |
| **Subtotal =** | **$400** |

Distribution

| | |
|---|---|
| -6 trips @$4,600 per trip (2 drivers; per diem, overtime, fuel, oxygen, vehicle maintenance) | |
| **Subtotal =** | **$27,600** |

**TOTALS:**

| | |
|---|---|
| **O&M DIRECT COSTS** | **$35,600** |
| **INDIRECT COSTS (Admin Overhead @ 3%)** | **$1,068** |
| **TOTAL O&M REQUESTED FOR FY 2014** | **$36,668** |

**Razorback Sucker Augmentation at NAPI Grow-Out Ponds**
**Fiscal Year 2014 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 2012.

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 10,500 (≥ 200mm) razorback sucker from Southwestern Native Aquatic Resources and Recovery Center (SNARRC) into three grow-out ponds (3,500 per pond).

3) Harvest all ponds on an annual basis (targeted to be ≥ 300 mm by fall).
   a. Implant all untagged 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% survival rate in the ponds).
   3c. Investigate and utilize multiple stocking localities.

4) Experimentally acclimatize, as guided by SJRRIP – 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.

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 three seasons (2010 and 2012) 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 2014, SNARRC will deliver 10,500 ≥ 200 mm RBS to the three NAPI grow-out ponds. In the fall of 2014, 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 December 2014. A draft report will be submitted by 31 March 2015 and finalized by 1 June 2015. Maintenance, repairs, installations, and billing records from NAPI will also be included in the annual report.

**Budget Fiscal Year 2014**

| **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 $43,805 | $ 30,896 | $ 21,903 |
| Wildlife Technician .5 FTE NNDFW X $22,734.40 | | $ 11,367 |
| Fringe Benefits $33,270 X 42.96% | | $ 14,293 |
| **Personnel Subtotal** | **$ 30,896** | **$ 47,563** |
| **Travel** | | |
| Per Diem Lodging and Meals | $ 538 | $ 1,030 |
| Vehicle Mileage and Maintenance | $ 2,040 | $ 18,540 |
| **Travel Subtotal** | **$ 2,578** | **$ 19,570** |
| Office Supplies and Equipment | | $ 515 |
| General Operating Supplies (includes fish transport costs, i.e. oxygen, salt, stress coat, etc.) | | $ 2,575 |
| Electricity Costs (Aeration) | | $ 1,030 |
| Feed Cost ($1.55/lb – 5,000 lbs) | | $ 7,983 |
| Uniforms | | $ 515 |
| Printing/Binding/Photocopying | | $ 103 |
| Fuel – Propane/Cannon Guns | | $ 206 |
| Repairs and Maintenance – Paint, sealant, lubricants, plumbing supplies, water quality probes, etc. | | $ 515 |
| **Support Subtotal** | **$ -0-** | **$ 13,442** |
| **NAPI maintenance (Large repairs/installations)** | | |
| Irrigation line and valve repair/installation | | **$ 5,150** |
| Heavy equipment operation (graveling, dirt work, etc) | | **$ 5,150** |
| Parts and labor | | **$ 5,150** |
| **NAPI maintenance Subtotal** | | **$ 15,450** |
| **Total** | **$ 33,474** | **$ 96,025** |
| NNDFW Admin charge (17%) $96,025/1.17 X .17 = $13,952 | $ 1,004 | $ 13,952 |
| **USFWS/NNDFW Totals** | **$ 34,478** | **$ 109,977** |
| **Grand Total** | | **$ 144,455** |

**Razorback Sucker Augmentation at NAPI Grow-Out Ponds**
**Fiscal Year 2014 Project Proposal**

**Under the heading "Funding for participation of other agencies." Costs for participation of the U.S. Fish and Wildlife Service, New Mexico Fish and Wildlife Conservation Office, Albuquerque, NM in FY-2014.**

| | |
|---|---|
| Daily pond management activities | |
| .30 FTE (GS-8; $76,003*/year) | $ 25,081.00 |
| Active Harvest | |
| Fish Biologist (GS-9-3*) - 5 days @ $297/day | $ 1,485.00 |
| Biological Science Technician (GS-8*) – 5 days @ $338/day | $ 1,690.00 |
| Project Oversight and contract management | |
| Supervisory Fish Biologist (GS-13) – 5 days @ $528/day | $ 2,640.00 |
| Personnel subtotal | $ 30,896.00 |
| **Travel and Per Diem (Based on Published FY-2012 Federal Per Diem Rates)** | |
| Hotel Costs – 4 nights (4 nights @ $77/night – single occupancy) | $ 308.00 |
| Per Diem (Hotel Rate) – 5 days @ $46/day | $ 230.00 |
| Travel subtotal | $ 538.00 |
| **Equipment** | |
| Vehicle Maintenance & Gasoline 4,000 miles @ $0.51/mile (based on GSA rates established on 01 January 2011 and includes costs associated with gasoline/diesel fuel vehicle maintenance) | $ 2,040.00 |
| Equipment subtotal | $ 2,040.00 |
| **USFWS – NMFWCO Total** | $ 33,474.00 |
| **USFWS Region 2 Regional Office Administrative Overhead (3%)** | $ 1,004.00 |
| **USFWS – Region 2 Total** | **$ 34,478.00** |

*includes 3% overhead for benefits

# FY 2014 Project Proposal
# San Juan River Basin Hydrology Model Development, 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. FY2013 activities are expected to include completion of the revised hydrologic baseline and its incorporation into the model, as well as validation and calibration, through collaborative work with Program participants. The FY2014 scope of work includes updating model documentation, continued model streamlining, as well as annual operation and maintenance of the model and data management. FY2014 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, work on developing 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 further streamlining the model development performed in FY2013 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 FY2014 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. At the Coordination Committee's discretion, begin work on a natural flow model. Document all modifications to the model, communicate changes to Program and interested parties. Continue streamlining of the various models, data sets and data loaders.

**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 FY2015 budget and track FY2014 expenditures.

# Improve Stream Gauging and Flow Measurements
# San Juan River Basin Recovery Implementation Program
# Fiscal Year 2014 Project Proposal

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## Background

There are five United States Geological Survey (USGS) streamflow gauging 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 gauging 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-2014:**

| 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 | 6,200 | | |
| Travel | | | 1,400 | |
| **Equipment and supplies** | | | | 0 |
| Total | | | | $7,600 |

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

| | |
|---|---|
| Fiscal Year 2015 | $8,000 |
| Fiscal Year 2016 | $8,300 |
| Fiscal Year 2017 | $8,660 |

## Budget Summary FY 2014

| | |
|---|---|
| Model Development | $38,090 |
| Model Maintenance | $12,160 |
| Model Runs | $22,400 |
| Program Management | $37,400 |
| **Grand Total** | **$110,050** |

| | | |
|---|---|---|
| **FY-2015** | **$75,000** | † |
| **FY-2016** | **$77,250** | †* |
| **FY-2017** | **$79,570** | †* |

† Assumes major model development, documentation completed in Sep 2014, with ongoing model maintenance, model runs, tech transfer, documentation and program management
* 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, and work on natural flow model. Continued model streamlining | UCRO[1] and TSC[2] Eng | $80 | 20 | $12,800 |
| | WCAO[3] Eng | $80 | 10 | $6,400 |
| Documentation | UCRO Eng | $80 | 20 | $12,800 |

#### B) Travel

| Purpose | Destination | Trips | Days/ Trip | Airfare/ trip | MI&E, Car, Lodging/day | Total Cost |
|---|---|---|---|---|---|---|
| TSC meeting w/ UCRO | SLC | 1 | 3 | $400 | $230 | $1,090 |

#### 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 | UCRO 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 | SLC | 1 | 2 | $800 | $230 | $1,260 |

| | | | | | | |
|---|---|---|---|---|---|---|
| UCRO meet for Coordination | Durango | 1 | 2 | $800 | $250 | $1,300 |

**Task 3 Model Runs**

**A) Labor**

| Task | Position | Salary total/hr | Total Days | Total Cost |
|---|---|---|---|---|
| Model Runs and Analyses | UCRO and 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 | UCRO Engineer | $80 | 25 | $16,000 |
| | WCAO Engineer | $80 | 15 | $9,600 |
| Budget | UCRO Engineer | $80 | 5 | $3,200 |

**B) Travel**

| Purpose | Destination | Trips | Days/ Trip | Airfare/ trip | MI&E, Car, Lodging/day | Total Cost |
|---|---|---|---|---|---|---|
| UCRO to Hydro Wk Grp Mtg | Alb | 3 | 2 | $1,000 | $200 | $4,200 |
| WCAO to Hydro Wk Grp Mtg | Alb | 3 | 2 | $400 | $200 | $2,400 |
| UCRO to Annual Hydro Mtg | Alb/Den | 1 | 2 | $600 | $200 | $1,000 |
| WCAO to Annual Hydro Mtg | Alb/Den | 1 | 2 | $600 | $200 | $1,000 |

[1] Upper Colorado Regional Office (Salt Lake City)
[2] Western Colorado Area Office (Durango)
[3] Technical Services Center (Denver)

**Operation of Public Service Company of New Mexico Fish Passage Structure**
**Fiscal Year 2014 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 April 1 to October 31, for each year of the five year proposed budget (2012 – 2016). 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' 2013. 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 April 1 to October 31, 2014. 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 – 2014 Budget**

| BUDGET WORKSHEET<br>Operation of San Juan/PNM Fish Passage | | |
|---|---|---|
| **Personnel (salary and benefits)** | **USFWS Funding** | **NNDFW** |
| Fisheries Biologist<br>13 PPE | | $21,905 |
| Wildlife Technician<br>13 PPE | | $11,367 |
| Temporary Employment | | $10,550 |
| Fringe Benefits $33,272 X 42.96%<br>$10,550 X 9.26% | | $14,294<br>$977 |
| **Personnel Subtotal** | | **$59,093** |
| **Travel** | | |
| 1 Tribal Vehicle | | $18,000 |
| Per Diem Lodging and Meals | | $3,000 |
| **Travel Subtotal** | | **$21,000** |
| Office Supplies | | $ 882 |
| Office Equipment – LCD Projector and screen | | $1,500 |
| General Operating Supplies Plumbing supplies, Hardware Supplies, Neoprene Waders, rubber boots, wet suit, landscaping supplies | | $3,527 |
| Nenahnezad Phone | | $ 800 |
| Uniforms | | $500 |
| Printing/Binding/Photocopying | | $100 |
| Fuel – Gasoline for water pump | | $710 |
| Sewage Services – Fish Passage | | $700 |
| Repairs and Maintenance – Paint, sealant, lubricants, water pump repairs | | $1,000 |
| | | |
| **Support Subtotal** | | **$9,719** |
| Training and Conference Registration | | $1,000 |
| **Consultant/ Professional Subtotal** | | **$1,000** |
| | **USFWS Funding** | **Base Funding** |
| **Budget Subtotal** | | **$90,812** |
| **FY 2013 Carry over funds** | | **0** |
| **Total** | | **$90,812** |
| **Administrative charge (17.0%)<br>90,812/1.17 X .17 =$13,194** | | **$13,195** |
| **Grand Total** | | **$104,007** |

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

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## 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 test case for evaluating methods of habitat restoration. The general method used for this project was to clean and excavate the inlets of selected secondary channels in order to re-establish a continuous flow of 5-10 cfs at a San Juan River base flow of 500-700 cfs. Cleaning the channel inlets will facilitate much larger flows during future storm events and spring runoff resulting in significant flushing of existing sediment. The expectation is that areas of low velocity habitat will increase as the main channel flow drops. 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 has made a commitment to pursue a second phase of channel and floodplain restoration at 2-4 additional sites along the San Juan River, following up on the RERI project. They expect to contribute non-federal funds to the SJRRIP for the next three federal fiscal years, FY 2012-2015, to conduct this work. 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.

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

*Project administrative overhead, including administrative support.

| | Federal Fiscal Year | | | TOTAL |
|---|---|---|---|---|
| | 2013 | 2014 | 2015 | |
| Personnel | 20,000 | 20,000 | 20,000 | 60,000 |
| Contractual | 30,000 | 120,000 | 30,000 | 180,000 |
| Equipment & Supplies | 20,000 | 20,000 | 10,000 | 50,000 |
| Travel | 4,000 | 3,000 | 3,000 | 10,000 |
| *Subtotal* | *74,000* | *163,000* | *63,000* | *300,000* |
| *Indirect Costs** | *14,800* | *32,600* | *12,600* | *60,000* |
| **TOTAL** | **88,800** | **195,600** | **75,600** | **360,000** |

# Endangered Fish Monitoring and Non-native species Monitoring and Control in the Upper/Middle San Juan River
## Fiscal Year 2014 Project Proposal

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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: 09/30/2013 to 10/01/2014

**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 element in the San Juan River Basin Recovery Implementation Programs Long Range Plan (2011). Actions and Tasks associated with this Element encompassed within this scope of work include:

Goal 3.1 Control problematic nonnative fishes as needed

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 fishes to achieve objectives

Task 3.1.1.5 Develop a comprehensive non-native species management plan, including measurable river wide objective to determine effects of removal effort on native and nonnative fishes.

Task 3.1.1.6 Establish target criteria for reduction of problematic nonnative fish species to estimate time, effort, and cost for controlling nonnative fishes.

Task 3.1.1.7 Evaluate and implement effective alternative nonnative fish reduction methods.

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 1.2 Evaluate RBS and CPM Augmentation Program and Genetic Integrity.

Action 1.2.1 Evaluate status and success of stocked RBS and CPM

Task 1.2.1.2 Determine survival and recruitment of stocked RBS and CPM to assess stocking success and to determine when to implement mark-recapture population estimates.

Action 1.2.2 Evaluate methods to improve RBS and CPM stocking successes.

Task 1.2.2.1 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

Goal 4.1 Monitor Fish Populations of the San Juan River.

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.

Action 4.1.4 Obtain reliable population estimates of RBS and CPM.

Task 4.1.4.1 Implement pilot mark-recapture population estimates to develop target criteria for full implementation of population estimates consistent with recovery goals requirements

Task 4.1.4.2 Use mark-recapture population estimators, when feasible, and in conjunction with catch rate estimators, to provide reliable estimates of adults, subadults, survival, and recruitment consistent with recovery goals criteria to gauge recovery of CPM and RBS

Intensive removal of non-native 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 non-native 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). These efforts are ongoing with a total of eight (three passes/trip) trips divided between both reaches annually.

Multi-pass removal efforts were successful, to a degree, in suppressing non-native numbers within intensive removal reaches (Davis et al. 2009, Davis 2006; Jackson 2006). However, long term trend data collected during annual fall monitoring trips indicate an apparent increase in channel catfish abundance riverwide beginning in 2004. Much of this can be attributed to increased abundance of channel catfish in reaches that are between (RM 147.9 – 52.9) those where intensive removal efforts occur (Ryden 2006). Prior to 2006, non-native 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 non-native 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 non-native 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 efforts of nonnative removal from Shiprock to Mexican Hat to reflect similar efforts to intensively sampled reaches upstream. Therefore, we propose to continue our number of sampling trips to include four trips from Shiprock to Mexican Hat in FY 2011. These additional trips will allow removal crews to expand removal into areas of increased importance 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 riverwide mark/recapture to determine exploitation rates for channel catfish.
3. Evaluate distribution and abundance patterns of non-native 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. Captured channel catfish will be measured (nearest 1 mm) for standard (SL) and total lengths (TL), weighed (nearest 5 g), and, if not sacrificed for study purposes, transported by hatchery truck to isolated recreational angling impoundments. All other nonnative species sampled during these efforts will be sacrificed and appropriate data recorded for location, length, and mass.

Removal efforts from Shiprock to Mexican Hat will be conducted four times a year. Three of these four 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 1-2 hours after the initial two rafts begin essentially accomplishing two sampling passes per trip. Captured channel catfish will be measured (nearest 1 mm) for standard and total lengths, weighed (nearest 5 g), and, if not sacrificed for study purposes, transported by hatchery truck to isolated recreational angling impoundments. All other nonnative species sampled during these efforts will be sacrificed and appropriate data recorded for location, length, and mass.

In addition to nonnative fishes, all rare fishes seen will be netted. Rare fishes will be measured (nearest 1 mm) for standard and total lengths, weighed (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 total length a tag will be implanted. At the time of collection, GPS coordinates will be recorded using a hand held GPS

unit. Preliminary population estimates for Colorado pikeminnow > age 2 and razorback sucker will be generated using data collected during NMFWCO and UDWR nonnative fish removal efforts.

Channel catfish collected during a trip early in the calendar year (i.e. April) will receive a T-bar anchor tag and returned to the river. Each tag will have a unique alphanumeric code for identification of individual fish. Additionally, each tagged fish will receive an adipose fin clip to estimate tag retention. The first 100 channel catfish captured each day will be measured for TL, SL and weight. All other channel catfish collected will be measured for TL only. Channel catfish collected on subsequent trips will be removed from the river. Population estimates 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 (Elevrud 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 2014):

| | |
|---|---|
| PNM to Hogback- | 2 trips |
| Hogback to Shiprock- | 3 trips |
| Shiprock to Mexican Hat | 4 trips |
| Shiprock to Sand Island/Mexican Hat | 1 trip (tagging trip) |
| **Total # of trips-** | **10 trips in FY 2014** |

**Products/Schedule**

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

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***Fiscal Year 2014 Budget***
***Labor Costs (Federal Salary and Benefits)***

PNM Weir to Hogback Diversion:

Fish Biologist (GS-9-3)-10 days @ $297/day
(1 person X 5 days/trip X 2 trips) ..... $ 2,970.00

Biological Science Technician (GS-8)-10 days @ $338/day
(1 person X 5 days/trip X 2 trips) ..... $ 3,380.00
**$ 6,350.00**

Hogback Diversion to Shiprock Bridge:

Supervisory Fish Biologist (GS-13-4)-10 days @ $528/day
(1 person X 5 days/trip X 2 trips) ..... $ 5,280.00

Fish Biologist (GS-9-3)-15 days @ $297/day
(1 person X 5 days/trip X 3 trips) ..... $ 4,455.00

Biological Science Technician (GS-8)-15 days @ $338/day
(1 person X 5 days/trip X 3 trips) ..... $ 5,070.00
**$ 14,805.00**

Shiprock to Mexican Hat:

Supervisory Fish Biologist (GS-13-4)-12 days @ $528/day
(1 person X 6 days/trip X 2 trips) ..... $ 6,336.00

Fish Biologist (GS-9-3)-48 days @ $297/day
(1 person X 12 days/trip X 2 trips) ..... $ 14,256.00

Biological Science Technician (GS-8)-48 days @ $338/day
(1 person X 12 days/trip X 4 trips) ..... $ 16,224.00

Fish Biologist (GS-5-1)-48 days @ $183/day
(1 person X 12 days/trip X 4 trips) ..... $ 8,784.00

Biological Science Technician (GS-4-1)-24 days @ $164/day
(2 people X 12 days/trip X 1 trip) ..... $ 3,936.00
**$ 49,536.00**

Shiprock to Mexican Hat (tagging trip):

Supervisory Fish Biologist (GS-13-4)-12 days @ $528/day
(1 person X 12 days/trip X 1 trip) ..... $ 6,336.00

Fish Biologist (GS-11-3)-12days @ $359/day
(1 person X 12 days/trip X 1 trip) ..... $ 4,308.00
Fish Biologist (GS-9-3)-12 days @ $297/day
(1 person X 12 days/trip X 1 trip) ..... $ 3,564.00

Biological Science Technician (GS-8)-12 days @ $338/day
(1 person X 12 days/trip X 1 trip) ..... $ 4,056.00

Fish Biologist (GS-5-1)-12 days @ $183/day
(1 person X 12 days/trip X 1 trips) ..... $ 2,196.00
**$ 20,460.00**

Administrative and Reporting Costs

Administrative Officer (GS-9-8)-12 days @ $305/day ..... $ 3,660.00

Project Leader (GS-14-9) – 12 days @ $718/day ..... $ 8,616.00

Supervisory Fish Biologist (GS-13-4)-50 days @ $528/day ..... $ 26,400.00

Fish Biologist (GS-9-3)-35 days @ $297/day ..... $ 10,395.00
**$ 49,071.00**

**Sub-Total for Labor Costs..... $ 140,222.00**

***Travel and Per Diem (Based on published FY 2012 Per Diem Rates)***

Hotel Costs – 56 nights @ $77/night ..... $ 4,312.00

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.... $ 12,493.00**

***Equipment***

**Removal Trips**
PNM Weir to Hogback/Shiprock Diversion
3,000 miles @ $0.51/mile (400 miles/trip X 5 trips + 1,000 shuttling miles) ..... $ 1,530.00

Shiprock to Mexican Hat
8,400 miles @ $0.51/mile (700 miles/trip X 4 trips X 3 vehicles) ..... $ 4,284.00

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 @ $0.51/gallon (700 miles roundtrip X 2 vehicles) ..... $ 714.00
**Sub-Total for Equipment..... $ 13,528.00**

**USFWS – New Mexico Fish and Wildlife Conservation Office ..... $ 166,243.00**

**USFWS– Administrative Overhead (3%)..... $ 4,987.00**

**FY 2014 USFWS – Region 2 Total ..... $ 171,230.00**

**Funding for participating agencies**
U.S. Fish and Wildlife Service – Colorado River Fishery Project..... $ 83,774.00
Utah Department of Wildlife Resources – Moab Field Station ..... $ 24,011.00
New Mexico Department of Game and Fish- Conservation Services Division..... $ 11,089.00
American Southwest Ichthyological Researcher, LLC..... $ 44,911.00
Navajo Nation Department of Fish and Wildlife ..... $ 3,942.61
**Sub-Total for participating agencies ..... $ 167,727.61**

**Grand Total for FY 2014..... $ 338,957.61**

**Out-year funding**
**FY 2015..... $ 348,373.98**
**FY 2016..... $ 358,471.69**
**FY 2017..... $ 369,984.02**
**FY 2018..... $ 380,743.19**

**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-2014 nonnative removal activities.**
**Fiscal Year 2014 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-2014 costs)
**Personnel/Labor Costs (Federal Salary + Benefits)**

| | |
|---|---|
| Principal Biologist (GS-11) – 304 hours @ $46.53/hr<br>(1 person X 5 days/trip X 1 hotel trip)<br>(1 person X 11 days/trip X 3 camping trips) | $ 14,145.00 |
| Bio. Tech. Crew Leader (GS-6) – 392 hours @ $30.88/hr<br>(1 people X 5 days/trip X 1 hotel trip)<br>(1 person X 11 days/trip X 4 camping trips)<br>(+ 100 hours overtime at $46.32/hr = $4,632.00) | $ 16,737.00 |
| Biological Technicians (GS-5) – 528 hours @ $18.39/hr<br>(3 people x 11 days/trips x 2 trips)<br>(+ 25 hours overtime each at $27.59/hr = $2,069.00) | $ 11,779.00 |
| | $ 42,661.00 |

**Administrative Support (Federal Salary + Benefits)**

| | |
|---|---|
| Administrative Officer (GS-9) – 125 hours @ $42.15/hr | $ 5,269.00 |

| | |
|---|---|
| Project Leader (GS-14) – 109 hours @ $78.63/hr | $ 8,571.00 |
| | $ 13,840.00 |
| **Reporting/Data Management (Federal Salary + Benefits)** | |
| Principal Biologist (GS-11) – 260 hours @ $46.53/hr | $ 12,098.00 |
| | $ 12,098.00 |
| **Travel and Per Diem (Based on Published FY-2013 Federal Per Diem Rates)** | |
| Hotel – 5 nights in Farmington, NM X 2 people/trip X 1 trip (10 nights @ $77/night – single occupancy = $770) | $ 770.00 |
| Hotel – 1 night in Cortez, CO 2 people/trip X 2 trips (4 nights @ $112/night – single occupancy = $1,386) | $ 448.00 |
| Hotel – 1 night in Cortez, CO 4 people/trip X 2 trips (8 nights @ $112/night – single occupancy = $1,386) | $ 896.00 |
| 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) | $ 1,016.00 |
| | $ 5,302.00 |
| **Equipment** | |
| Vehicle Maintenance & Gasoline (@ $345/month lease = $11.50 per day based on 30 days in an "average" month + $0.31/mile) | |
| 1 trip from Grand Junction, CO to Farmington, NM X 1 truck X 6 days/trip<br>(296 miles one-way = 592 miles round-trip) = $184<br>(+ 56 miles shuttling/day X 5 days = 280 miles) = $87<br>(1 truck X 6 days/trip X 1 trip X $11.50/day) = $69 | $ 340.00 |
| 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<br>(610 miles/trip X 2 trips X 1 truck = 1,220 miles) = $378<br>(1 truck X 10 days/trip X 2 trips X $11.50/day) = $230 | $ 608.00 |
| 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<br>(610 miles/trip X 2 trips X 2 trucks = 2,440 miles) = $756<br>(2 truck X 10 days/trip X 2 trips X $11.50/day) = $460 | $ 1,216.00 |
| Generator Gasoline | |
| (25 gallons/trip X 1 trip @ $4.00/gallon)<br>5 days @ 5 gallons/day X 1 raft X 1 trip | $ 100.00 |
| (45 gallons/trip X 2 trips @ $4.00/gallon)<br>9 days @ 5 gallons/day X 1 raft X 2 trips | $ 360.00 |
| (120 gallons/trip X 2 trips @ $4.00/gallon)<br>4 days @ 5 gallons/day X 1 raft X 2 trips<br>5 days @ 5 gallons/day X 4 rafts X 2 trips | $ 960.00 |

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:

- Synthetic oil for generators - 5 quarts at $7.00 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/hypoalon) – 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 laterns, Gott 5-gallon water jugs, shovels, 5-gallon buckets, cargo nets, fix chips or cracks in vehicle winshields, 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 | $ 3,849.00 |
| | $ 7,433.00 |
| **USFWS-CRFP (Grand Junction) Total** | $ 81,334.00 |
| **USFWS Region 6 Regional Office Administrative Overhead (3.00%)** | $ 2,440.00 |
| **USFWS Region 6 Total** | $ 83,774.00 |

**Under the heading "Funding for participation of other agencies." Cost for participation of Utah Department of Wildlife Resources– Moab, UT in FY-2014 nonnative removal activities.**

**UDWR Budget FY-2014**

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

| | Salary/day | Days | Cost |
|---|---|---|---|
| Project Leader | $310.00 | 7 | $2,170 |
| Biologist | $265.00 | 25 | $6,625 |
| Technician | $185.00 | 35 | $6,475 |
| | | **subtotal** | **$15,270** |

Food and Transport (current expense)

| | Rate | Quantity | Cost |
|---|---|---|---|
| Mileage (2 trucks, 1 to shiprock, 1 to Bluff) | $0.49 | 2250 | $1,103 |
| Fleet services (1 truck, 2 months) | $250.00 | 2 | $500 |
| Food (2 people for 10 days/trip, 3 trips) | $38.00 | 60 | $2,280 |
| | | **subtotal** | **$3,883** |

Equipment (current expense)

| | Rate | Quantity | Cost |
|---|---|---|---|
| Camping gear repair/replacement: | | | |
| straps | $4.00 | 14 | $56 |
| dry bags | $80.00 | 1 | $80 |
| Pacos | $100.00 | 1 | $100 |
| Sampling gear repair/replacement: | | | |
| foot pedals | $50.00 | 1 | $50 |

| | | | |
|---|---|---|---|
| wiring | $50.00 | 1 | $50 |
| anode/cathode repair | $50.00 | 1 | $50 |
| measuring boards | $50.00 | 1 | $50 |
| scales | $50.00 | 3 | $150 |
| Rafting gear repair/replacement: | | | |
| oars | $100.00 | 2 | $200 |
| oar hardware | $25.00 | 2 | $50 |
| Fuel for generator (30 gallons/trip, 3 trips) | $4.00 | 90 | $360 |
| | | **subtotal** | **$1,196** |
| Total Expenses | | | $20,349 |
| Administrative Overhead (18%) | | | $3,663 |
| **UDWR- Moab Total** | | | **$24,011** |

**Under the heading "Funding for participation of other agencies." Cost for participation of New Mexico Department of Game and Fish in FY-2014 nonnative removal activities.**

**Personnel/Labor Costs (State Salary + Benefits)**

| | |
|---|---|
| Biologists - 20 @ $360/day | |
| (1 person x 5 days/trips x 4 trips) | $ 7,200.00 |
| | $ 7,200.00 |

**Travel and Per Diem (Based on Published FY-2007 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** | **$ 10,089.00** |
| **Administrative Overhead (10%)** | | **$ 1,009.00** |
| **NMDGF – Santa Fe – Total Budget** | | **$ 11,098.00** |

**Under the heading "Funding for participation of other agencies." Cost for participation of American Southwest Ichthyological Researchers, LLC – Albuquerque, NM in FY-2014 nonnative removal activities.**

**2014 BUDGET: SAN JUAN RIVER NON-NATIVE FISH REMOVAL**
Based on four sampling trips per year: Shiprock to Mexican Hat

## 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 $ 43.96/hr): ..... $ 30,948
**Personnel: ..... Total $ 30,948**

## 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 $ 0.59/mile): ..... $ 1,062
(roundtrip Albuquerque to Farmington and return) [1]
Travel - (1 vehicle x 4 trips x 600 miles x $ 0.59/mile): ..... $ 1,416
(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 $ 6,478**

## 2014 Project Totals

**Personnel: ..... Total $ 30,948**
**Materials and Supplies: ..... Total $ 0**
**Travel and Per Diem: ..... Total $ 6,478**
**Project Subtotal: ..... Total $ 37,426**
**IDC (20%): ..... Total $ 7,485**
**2014 Scope of Work: ..... GRAND TOTAL $ 44,911**

## Out-year funding

**FY 2015 ..... $ 46,177**
**FY 2016 ..... $ 47,958**
**FY 2017 ..... $ 49,291**
**FY 2018 ..... $ 50,609**

**FY 2019** ..... **$ 51,960**

We did not use our GSA rates for the San Juan River non-native removal project but instead used rates without G & A or IDC included in them. A breakdown of the costs and fringe associated with our Fisheries Biologist I follows. The rates below do not have profit associated with them.

**FY 2014 Fisheries Biologist I Costs ($ 77,725 annually = $ 43.96/hour or $ 351.70/day)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Personnel Costs:[1] | Hour: | $ 32.84 | Day: | $ 262.76 | Annual: | $ | 58,068 |
| Benefit Costs:[2] Hour: | $ | 8.67 Day: | $ | 69.36 Annual: | $ | | 15,329 |
| Benefit Costs: [3] | Hour: | $ 2.45 | Day: | $ 19.58 | Annual: | $ | 4,328 |
| Total Costs: | Hour: | **$ 43.96** | Day: | **$ 351.70** | Annual: | **$** | **77,725** |

| | |
|---|---|
| Personnel Costs:[1] | Hourly base pay * |
| Benefit Costs:[2] | Family health and dental insurance benefits (100% Company Paid) |
| Benefit Costs:[3] | For legally required benefits (Social Security, Medicare, Unemployment Insurance, Worker's Compensation Coverage) |

*Leave benefits for employees are comprised of 18 vacation days, 9-11 paid holidays, and 12 paid sick/personal days. Therefore, salary and benefit breakdown is based on 221 days.

**Out-year Fisheries Biologist I Costs (rates adjusted annually by 3%)**

**FY 2015** ..... **$ 45.28**
**FY 2016** ..... **$ 46.64**
**FY 2017** ..... **$ 48.04**
**FY 2018** ..... **$ 49.48**
**FY 2019** ..... **$ 50.96**

**Under the heading "Funding for participation of other agencies." Cost for participation of the Navajo Nation Department of Fish and Wildlife in FY-2014 nonnative removal activities.**

**Personnel/Labor Costs (Salary + Benefits)**

| | |
|---|---|
| Fish Biologist – 6 days @ $158.78/day (1 person x 3 days x 2 trips) | $ 952.68 |
| Biological Technician – 6 days @ $86.93/day (1 person x 3 days x 2 trips) | $ 521.58 |
| Sub-Total | $1,474.26 |
| Fringe Benefits X 42.48% | $ 626.27 |
| **Total Personnel/Labor** | **$ 2,100.53** |

**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** | **$3,339.78** |
| **Navajo Fish and Wildlife Administrative Overhead (18.05%)** | **$ 602.83** |
| **Navajo Nation Total** | **$3,942.61** |

# FY 2014 Scope of Work to Bureau of Reclamation:

## Nonnative Species Control and Rare Fish Monitoring in the Lower San Juan River
## Fiscal Year 2014 Project Proposal and Estimated Budget for 2014-2018

Principal Investigator: Brian Hines
Prepared by: Katie Creighton
Utah Division of Wildlife Resources, Moab Field Station
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(435) 259-3782, (435) 259-3780
**Katherinecreighton@utah.gov**

**BOR Cooperative Agreement #**

UDWR Moab Field Station: R08AP40722

Navajo Nation: R11AP40089

New Mexico Department of Game and Fish: 07FG402630

USFWS Grand Junction: R10PG40123

Reporting Dates: 10/1/2013 through 9/30/2014

**Nonnative Species Control and Rare Fish Monitoring in the Lower San Juan River**
**Fiscal Year 2014 Project Proposal and Estimated Budget for 2014-2018**

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). One of the most encouraging findings from 2004 was the collection of two wild spawned Colorado pikeminnow larvae at RM 46.3 and 18.1 (Brandenburg et al. 2005).

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 86,000 channel catfish and approximately 3,000 common carp were mechanically removed from the lower San Juan River from 2002 to 2010. A decrease in mean total length (TL) of channel catfish was observed between 2002 and 2010, indicating that removal efforts may 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 2010. Between 2002 and 2010, 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 and 2004. 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 2010. Preliminary population estimates for juvenile Colorado pikeminnow residing in the lower San Juan River were generated from 2004 to 2010 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, sub-element 4.1 of the Long Range Plan, in the lower San Juan River from Mexican Hat to Clay Hills. 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. 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 Mexican Hat (RM 53) to Clay Hills (RM 2.9), Utah. The river from Mexican Hat to RM 16 is part of Geomorphic Reach 2 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.

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

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

4. 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 Mexican Hat 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. When feasible, a third boat will follow behind to pick up nonnative fish missed by the electrofishing boats. These fish will not be included in catch rate calculations so that comparisons can be made between trips and years. Nine five-day trips with 6 people are anticipated, and timing of sampling will be dependent on catch rate from past data. Bimonthly trips will be conducted, which will likely translate into every other week sampling from March through August. Data from the adult fall monitoring conducted by U.S. Fish and Wildlife Service- Grand Junction in October 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**

An electronic data file will be provided for inclusion in the centralized database by 31 March 2015. 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 2015. 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 2015. Electronic copies of the field and collection data will be transferred to the San Juan River database manager following the successful protocol previously employed.

**Literature Cited**

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**Nonnative Species Control and Rare Fish Monitoring in the Lower San Juan River Fiscal Year 2014-2018 Project Budget. BOR Cooperative Agreement with UDWR: R08AP40722**

**Fiscal Year 2014 Budget**

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

| | Salary/day | Days | Cost |
|---|---|---|---|
| Project Leader | $310.00 | 20 | $6,200 |
| Biologist | $265.00 | 152 | $40,280 |
| Technician | $185.00 | 260 | $48,100 |
| | | **subtotal** | **$94,580** |

Food and Transport (current expense)

| | Rate | Quantity | Cost |
|---|---|---|---|
| Mileage (3 trucks, 400 miles/trip, 9 trips) | $0.49 | 10,800 | $5,292 |
| Shuttle (9 trips) | $510.00 | 9 | $4,590 |
| Fleet services (3 trucks, 6 months) | $250.00 | 18 | $4,500 |
| Food (6 people, 5 days/trip, 9 trips) | $25.00 | 270 | $6,750 |
| Out-of-state per diem (3 meetings, 3 days each) | $47.00 | 9 | $423 |
| Hotel- Durango (3 meetings, 3 nights each) | $95.00 | 9 | $855 |
| | | **subtotal** | **$22,410** |

Equipment (current expense)

| | Rate | Quantity | Cost |
|---|---|---|---|
| Camping gear repair/replacement: | | | |
| propane | $3.75 | 20 | $75 |
| tables | $66.00 | 1 | $66 |
| batteries | $10.00 | 9 | $90 |
| tents | $300.00 | 3 | $900 |
| cookware | $150.00 | 1 | $150 |
| chairs | $20.00 | 4 | $80 |
| toilet insert (Riverbank) | $190.00 | 1 | $190 |
| Toilet supplies, and disposal | $100.00 | 1 | $100 |
| charcoal | $10.00 | 9 | $90 |
| first aid supplies | $100.00 | 1 | $100 |
| straps | $4.00 | 42 | $168 |
| dry bags | $80.00 | 3 | $240 |
| satellite phone service | $50.00 | 6 | $300 |
| Pacos | $100.00 | 2 | $200 |
| Sampling gear repair/replacement: | | | |
| dip nets | $300.00 | 2 | $600 |
| foot pedals | $50.00 | 2 | $100 |
| wiring repair/replacement | $50.00 | 2 | $100 |
| anode/cathode repair | $50.00 | 2 | $100 |
| generator maintenance/repair | $200.00 | 2 | $400 |
| ETS repair | $200.00 | 2 | $400 |
| measuring board repair/meter sticks | $25.00 | 4 | $100 |
| scales | $50.00 | 6 | $300 |

| | | | |
|---|---|---|---|
| Rafting gear repair/replacement: | | | |
| shock boat frame repair (welding) | $300.00 | 2 | $600 |
| gear boat frame | $550.00 | 2 | $1,100 |
| life jackets | $100.00 | 6 | $600 |
| oars | $100.00 | 6 | $600 |
| oar hardware | $25.00 | 6 | $150 |
| trailer maintenance | $300.00 | 3 | $900 |
| Fuel for generator (20 gallons/trip, 9 trips) | $4.00 | 180 | $720 |
| Anchor Tags and guns (from Floy) | $0.67 | 1500 | $1,005 |
| | | **subtotal** | **$10,524** |

Training

| | **Rate** | **Quantity** | **Cost** |
|---|---|---|---|
| Swiftwater Rescue (Far Flung Adventures) | $350.00 | 1 | $350 |
| | | **subtotal** | **$350** |

| | |
|---|---|
| Total Expenses | $127,864 |
| Administrative Overhead (20%) | $25,573 |
| **UDWR- Moab Total** | **$153,437** |

Funding for Participating Agencies (see attachments)

| | |
|---|---|
| **USFWS GJ Total** | **$17,305** |
| **NMFG Total** | **$5,720** |
| **Navajo Nation Total** | **$9,124** |

| | |
|---|---|
| **GRAND TOTAL FY-2014** | **$185,585** |

**Under the heading "Funding for Participating Agencies." Costs for participation of the Navajo Nation Department of Fish and Wildlife, in FY-2014. BOR Cooperative Agreement Number with Navajo Nation: R11AP40089**

**Fiscal Year 2014 Budget: Navajo Nation**

| | |
|---|---|
| **Personnel/Labor Costs (Salary+Benefits)** | |
| Fish Biologist-14 days @ 154.16/day | $2,158.24 |
| Bio Tech-14 days @ 84.40/day | $1,181.60 |
| Fringe Benfits=Labor Costs* 42.48% | $1,418.76 |
| Subtotal | $4,758.60 |
| **Travel and Per Diem** | |
| Hotel- 4 nights @ $70.00 | $280.00 |
| Camping Rate-20 nights @ $29/night | $580.00 |
| Vehicle Lease/Maintenance | $454.00 |
| Gasoline-260 miles @ $0.30/mi | $156.00 |
| Subtotal | $1,470.00 |
| **Equipment** | |
| Maintenance, Repair, Replacement | $1,500.00 |

| | |
|---|---|
| Subtotal | $1,500.00 |
| Navajo Nation Total | $7,728.60 |
| Navajo Nation Administration Fees (18.05%) | $1,395.01 |
| **Navajo Nation Total** | **$9,123.62** |

**Under the heading "Funding for Participating Agencies." Costs for participation of the New Mexico Game and Fish in FY-2014. BOR Cooperative Agreement Number with New Mexico Department of Fish and Game: 07FG402630**

**Fiscal Year 2014 Budget: New Mexico Game and Fish**

| | |
|---|---|
| **Personnel/Labor Costs** | |
| Fishery Biologist - 12 days @ $350/day | |
| (1 person x 6 days per trip x 2 trips) | $4,210.00 |
| Subtotal | $4,210.00 |
| **Travel and Per Diem** | |
| ($85 per day per person - 12 days) | $1,020.00 |
| Subtotal | $1,020.00 |
| **Equipment** | |
| Vehicle & Gasoline ($0.35/mile) | |
| (700 miles round trip x 2 trips) | $490.00 |
| Subtotal | $490.00 |
| **NM Game and Fish Total** | $5,720.00 |

**Under the heading "Funding for Participating Agencies." Estimated costs for participation of the U.S. Fish and Wildlife Service, Colorado River Fishery Project in FY 2014-2018. BOR Cooperative Agreement Number with U.S. Fish and Wildlife Service- Grand Junction: R10PG400023**

**Participation in Non-native Species Control in the *Lower* San Juan River**
**Fiscal Year 2014 Project Proposal**
**24 March 2013**

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

Developed by:
Dale Ryden
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Contract or Agreement number(s):
R10 PG 400023 for USFWS – Grand Junction, CO

Reporting Dates: 10/1/2013 through 9/30/2014

**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 2014 Project Proposal**
**Updated: 24 March 2013 (by Dale Ryden)**

Principal Investigator: Brian Hines
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**Fiscal Year 2014 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-2014 costs)

| | |
|---|---|
| **Personnel/Labor Costs (Federal Salary + Benefits)** | |
| Principal Biologist (GS-11) – 80 hours @ $46.53/hr | $ 3,722.00 |
| (1 person X 5 days/trip X 2 trips) | |
| Principal Biologist (GS-7) - 80 hours @ $31.76/hr | $ 3,970.00 |
| (1 people X 5 days/trip X 2 trips) | |
| (+ 30 hours overtime at $47.64/hr = $1,429) | |
| Biological Technician (GS-5) – 80 hours @ $18.39/hr | $ 2,298.00 |
| (1 people X 5 days/trip X 2 trips) | |
| (+ 30 hours overtime each at $27.59/hr = $828) | |
| **Sub Total** | $ 9,990.00 |
| **Administrative Support (Federal Salary + Benefits)** | |
| Administrative Officer (GS-9) – 23 hours @ $42.15/hr | $ 970.00 |
| Project Leader (GS-14) -- 15 hours @ $78.63/hr | $ 1,180.00 |
| **Sub Total** | $ 2,150.00 |
| **Travel and Per Diem (Based on Published FY-2013 Federal Per Diem Rates)** | |
| Hotel Costs – 6 nights | $ 462.00 |
| (6 nights @ $77/night – single occupancy = $420) | |
| Per Diem (Hotel Rate) - 6 days @ $46/day | $ 276.00 |
| Per Diem (Camping Rate) 30 days @ $28/day | $ 840.00 |
| **Sub Total** | $ 1,578.00 |
| **Equipment** | |
| Vehicle Maintenance & Gasoline (GSA lease = $344 + $0.31/mile/truck/trip) | |
| (700 miles round trip from Grand Junction, CO to Clay Hills, UT X 2 trips) | $ 1,122.00 |
| Generator Gasoline for Electrofishing | |
| (20 gallons/trip X 2 trips @ $4.00/gallon) | $ 160.00 |
| Equipment Maintenance, Repair, & Replacement | $ 1,800.00 |

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:

- 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 – 2 pair at $50/pair = $100
- Breathable chest waders - 2 pair @ $125/pair = $250
- 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** | $ 3,082.00 |
| **USFWS-CRFP (Grand Junction, CO) Total** | $ 16,800.00 |
| **USFWS Region 6 Administrative Overhead (3.00%)** | $ 505.00 |
| **USFWS Region 6 Total** | $ 17,305.00 |

# Sub-Adult and Adult Large-Bodied Fish Community Monitoring Fiscal Year 2014 Project Proposal 29 March 2013

Principal Investigators:
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R10 PG 40 020 for USFWS – Albuquerque, NM
08 FG 40 2716 for UDWR – Moab, UT

Reporting Dates: 10/1/2013 through 9/30/2014

**Sub-Adult & Adult Large-Bodied Fish Community Monitoring**
**(a.k.a. Adult Monitoring)**
**Fiscal Year 2014 Project Proposal**
**29 March August 2013**

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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 2012). 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, 2.1.1.3, 2.2.1.4, 2.4.2.2, 3.1.1.1, 3.1.1.3, 3.1.1.4, 3.2.3.1, 3.2.3.5, 4.1.1.1, 4.1.1.2, 4.1.1.3, 4.1.2.3, 4.1.2.5, 4.1.4.1, 4.1.4.2, 4.1.5.1, 4.1.5.2, 4.1.6.1, 4.2.3.2, 4.3.1.1, 4.3.2.2, 4.3.3.1, 4.3.4.1, 4.3.4.2, 4.3.4.4. 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 2014, three additional river sections in NM will be sampled in either August or September. 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. For example:
   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 2014. This trip will sample from RM 180.0 (the Animas River confluence in NM) downstream to RM 77.0 (just upstream of the Sand Island boat launch, near Bluff, UT). 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 70 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 2014 is scheduled to be available by 31 March 2015. The final version of this interim progress report which incorporates comments received, is scheduled to be completed by 1 June 2015. 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 2014. 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 2015.

**Qualifications of Personnel Included in the Budget**

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

Ben has four 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 nonnative removal and endangered species monitoring. He also spent an additional 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, as well as the 2011 and 2012 San Juan River arm of Lake Powel Razorback Sucker Survey reports. Ben will take 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 23 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. Dale represents the USFWS on the Coordination Committee (as of May 2013) for the San Juan River Basin Recovery Implementation Program (for Region 6 of the USFWS) and on the Biology Committee for the Upper Colorado River Endangered Fish Recovery Program (UCREFRP).

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 2014 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-2014 costs)

| | |
|---|---|
| **Personnel/Labor Costs (Federal Salary + Benefits)** | |
| Objectives 1-3: Logistics, Electrofishing, Removal of Nonnative Fish | |
| Principal Biologist (GS-11) – 216 hours @ $46.53/hr | $ 10,050.00 |
| (1 person X 10 days planning & organization) | |
| (1 person X 4 days/trip X 1 trip – work from hotel) | |
| (1 person X 10 days/trip X 1 trip – camping) | |
| (1 person X 3 days/trip X 1 trip – work from hotel) | |
| Bio. Tech. Crew Leader (GS-6) - 112 hours @ $30.88/hr | $ 5,775.00 |
| (1 person X 4 days/trip X 1 trip – work from hotel) | |
| (1 person X 10 days/trip X 1 trip – camping) | |
| (+ 50 hours overtime at $46.32/hr = $2316.00) | |
| Biological Technicians (GS-5) – 408 hours @ $18.39/hr | $ 12,552.00 |
| (3 person X 4 days/trip X 1 trip – work from hotel) | |
| (3 person X 10 days/trip X 1 trip – camping) | |
| (+ 52 hours overtime each at $27.59/hr = $4,304.00) | |
| (3 person X 3 days/trip X 1 trip – work from hotel) | |
| (+ 9 hours overtime each at $27.59/hr = $745.00) | |
| **Sub Total** | $ 28,377.00 |
| **Permitting; Coordination; Data Input, Analysis, Management & Presentation; Report Writing; Office & Administrative Support (Federal Salary + Benefits)** | |
| Administrative Officer (GS-9) – 200 hours @ $42.15/hr | $ 8,430.00 |
| Principal Biologist (GS-11) – 400 hours @ $46.53/hr | $ 18,612.00 |
| Project Leader (GS-14) – 320 hours @ $78.63/hr | $ 25,162.00 |
| **Sub Total** | $ 52,204.00 |
| **Travel and Per Diem (Based on Published FY-2013 Federal Per Diem Rates)** | |
| Hotel Costs | |
| 15 nights @ $77/night (in Farmington, NM) | $ 1,155.00 |
| 5 nights @ $112/night (in Cortez, CO) | $ 560.00 |
| 12 nights @ $77/night (in Farmington, NM) | $ 924.00 |
| 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) | |
| 10 days X 5 people X $28/day | $ 1,400.00 |
| **Sub Total** | $ 5,536.00 |
| **Equipment and Supplies** | |
| Vehicle Maintenance & Gasoline (@ $345/month lease = $11.50 per day based on 30 days in an "average" month + $0.31/mile) | |
| 1 trip from Grand Junction, CO to Farmington, NM X 1 truck X 6 days/trip – work from hotel | $ 431.00 |
| (296 miles one-way = 592 miles round-trip) = $184 | |
| (+ 70 miles shuttling/day X 5 days = 350 miles) = $109 | |
| (2 truck X 6 days/trip X 1 trip X $11.50/day) = $138 | |
| 3 additional days sampling on lower Animas River and San | $ 125.00 |

Juan River upstream of Animas confluence – work from hotel
(30 miles/day X 3 days X 2 trucks = 180 miles) = $56
(2 trucks X 3 days X 11.50/day) = $69

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 — $ 608.00
(610 miles/trip X 1 trip X 2 trucks = 1,220 miles) = $378
(2 trucks X 10 days/trip X 1 trip X $11.50/day) = $230

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:

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** | $ 7,008.00 |
| **USFWS-CRFP (Grand Junction, CO) Total** | $ 93,125.00 |
| **USFWS Region 6 Administrative Overhead (3.00%)** | $ 2,794.00 |
| **USFWS Region 6 Total** | $ 95,919.00 |

**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 | $ 12,069.00 |
| Utah Division of Wildlife Resources - Moab, UT | |
| See Attached Budget for Line Item Breakdowns | $ 4,787.00 |
| | $ 16,856.00 |

| | |
|---|---|
| **FY-2014 WORKPLAN TOTAL** | **$112,775.00** |

**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-2014.**

**Personnel/Labor Costs (Federal Salary + Benefits)**

| | |
|---|---|
| Fish Biologist (GS-9)– 12 days @ $297/day | $ 3,564 |
| (1 person x 11 days x 1 trip; Hogback to Sand Island) | |
| Biological Science Tech (GS-8) – 14 days @ $338/day | $ 4,732 |
| (1 person x 11 days x 1 trip; Hogback to Sand Island) | |

| | |
|---|---|
| (1 person x 3 days x 1 trip; Animas to Hogback Diversion) | |
| Supervisory Fish Biologist (GS-13) – 2 days @ $528/day | |
| (Project participation oversight and contract management) | $ 1,056 |
| Administrative Officer (GS-9) – 1 day @ $305/day | $ 305 |
| **Sub Total** | **$ 9,657** |
| **Travel and Per Diem (Based on Published FY-2012 Federal Per Diem Rates)** | |
| Hotel Costs – 2 nights | $ 172 |
| (1 night x 2 rooms @ $86/night; Cortez, CO) | |
| Per Diem | |
| Camping Rate - 20 days @ $29/day | $ 580 |
| (2 people x 10 days x 1 trip) | |
| Hotel Rate – 2 days @ $46.00/day | $ 92 |
| **Sub Total** | **$ 672** |
| **Equipment** | |
| Vehicle Maintenance & Gasoline (@ $0.51/mile) | |
| (660 miles round trip from Albuquerque, NM to Blanding, UT + 100 miles shuttling) | $ 388 |
| Equipment Maintenance, Repair, & Replacement | |
| (e.g., life jackets, hip boots, generator repair, rubber gloves, dip nets, aluminum welding, raft repair, etc.) | $ 1,000 |
| **Sub Total** | **$ 1,388** |
| **USFWS-NMFWCO (Albuquerque) Total** | **$ 11,717** |
| **USFWS Region 2 Regional Office Administrative Overhead (3%)** | **$ 352** |
| **USFWS Region 2 Total** | **$ 12,069** |

**Under the heading "Funding for participation of other agencies." Cost for participation of the Utah Division of Wildlife Resources, Moab, UT in FY-2014.**

**UDWR Budget FY-2014**

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

| | Salary/day | Days | Cost |
|---|---|---|---|
| Biologist | $265.00 | 6 | $1,590 |
| Technician | $185.00 | 6 | $1,110 |
| | | **subtotal** | **$2,700** |

Food and Transport (current expense)

| | Rate | Quantity | Cost |
|---|---|---|---|
| Mileage (2 trucks, 1 to shiprock, 1 to Bluff) | $0.49 | 750 | $368 |
| Fleet services (1 truck, 2 weeks) | $250.00 | 0.5 | $125 |
| In-state per diem (food for 10 days in field) | $38.00 | 10 | $380 |
| Out-of-state per diem (food for travel day) | $47.00 | 1 | $47 |
| Hotel (Farmington, NM- GSA rate) | $77.00 | 1 | $77 |
| | | **subtotal** | **$996.50** |

Equipment (current expense)

| | Rate | Quantity | Cost |
|---|---|---|---|
| Camping gear repair/replacement: | | | |
| straps | $4.00 | 10 | $40 |
| Sampling gear repair/replacement: | | | |
| anode/cathode repair | $50.00 | 1 | $50 |
| scales | $50.00 | 2 | $100 |
| Rafting gear repair/replacement: | | | |
| oar hardware | $25.00 | 2 | $50 |
| Fuel for generator | $4.00 | 30 | $120 |
| | | **subtotal** | **$360** |
| | | | |
| Total Expenses | | | $4,057 |
| Administrative Overhead (18%) | | | $730 |
| **UDWR- Moab Total** | | | **$4,787** |

**Small-Bodied Fishes Monitoring**
**Fiscal Year 2014 Statement of Work and Project Budget**

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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 River Mile 76.4 (Sand Island, 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; 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) will be sampled every fifth year. Sampling procedures in these lower reaches will be 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**

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

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 Using Block Seining**

In 2011, the SJRIP Biology Committee determined that a methodology called block seining should be experimentally incorporated into the small-bodied monitoring. This method is summarized and described in Golden and Holden (2005) as using two 9 m x 2 m (6 mm mesh) double-weighted seines, where one is held at the bottom of a mesohabitat and the second seine is used to sample down to the first seine. This method was used during the 2011 small-bodied sampling and will be included in the 2012 and 2013 autumn samples. Use of this method will occur at least once within every primary channel sampled. The method will be employed in suitable mesohabitat such as shoals and shoreline runs. Data analysis will include comparisons of species captured, CPUE and fish size structure between block seining and the single 3.0 x 1.2 m (3 mm mesh) seine method. This will be the last year this method will be employed on an experimental basis. The annual report will make a recommendation as to whether this sampling method should be incorporated into the standard monitoring protocol.

**Additional Sampling on the Animas River and/or on the San Juan River above its confluence with the Animas River.**

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, 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. Both of these sites will be monitored in 2014 given water conditions 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 2007 | 81,246 |
| Fiscal Year 2001 | 51,700 | Fiscal Year 2008 | 91,882 |
| Fiscal Year 2002 | 51,700 | Fiscal Year 2009 | 89,479 |
| Fiscal Year 2003 | 49,775 | Fiscal Year 2010 | 89,479 |
| Fiscal Year 2004 | 63,545 | Fiscal Year 2011 | 82,929 |
| Fiscal Year 2005 | 72,645 | Fiscal Year 2012 | 83,417 |
| Fiscal Year 2006 | 72,885 | Fiscal Year 2013 | 92,353 |

**FY 2014 Budget**

**Field**

Personnel

Tasks - Annual monitoring primary channel, secondary channel, and backwater habitats, San Juan River, Farmington, NM to Bluff, UT; RERI and upstream sites; Block net seining. 15 days projected at 12 hours of work per day = 180 hours

| | |
|---|---|
| Project Leader (1) | |
| 92 hrs regular | 92 hrs |
| $32.60/hr (base salary) + $9.78 (benefits) | $42.38/hr |
| 88 hrs overtime | 88 hrs |
| $42.38/hr * 1.5 (time-and-a-half) | $63.57/hr |
| | $9,493.12 |
| Project Biologists (3) | |
| 92 hrs regular | 92 hrs |
| $26.11/hr (base salary) + $7.83 (benefits) | $33.94/hr |
| 88 hrs overtime | 88 hrs |
| $26.11/hr * 1.5 (time-and-a-half) | $50.91/hr |
| | $7,602.56 |
| **TOTAL PERSONNEL** | **$17,095.68** |

Per Diem

| | |
|---|---|
| 12 days/project biologist (in-state rate) for 4 biologists - $85.00/day (standard NM in-state rate) | $4,080.00 |
| 3 days/project biologist (out-of-state rate) for 4 biologists -$115.00/day (standard NM in-state rate) | $1,380.00 |
| **TOTAL PER DIEM** | **$5,460.00** |

Vehicle

| | |
|---|---|
| Round-trip Farmington/Shiprock, NM 2000 miles @ $0.55/mile | $1,110.00 |
| Round-trip to Sand Island, Utah ($0.55/mile) 1280 miles @ $0.55/mile | $ 704.00 |
| **TOTAL VEHICLE** | **$1804.00** |

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** | **$1700.00** |

| | |
|---|---|
| **TOTAL FIELD** | **$26,059.68** |

**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 |
| $26.11/hr (base salary) + $7.83 (benefits) | $33.94/hr |

**TOTAL SPECIMEN MANAGEMENT** **$18,327.60**

**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 |
| $32.60/hr (base salary) + $9.78 (benefits) | $42.38/hr |
| **TOTAL PROJECT LEADER SALARY** | **$5,085.60** |

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 |
| $26.11/hr (base salary) + $7.83 (benefits) | $33.94/hr |
| **TOTAL PROJECT BIOLOGISTS SALARY** | **$13,576.00** |

**TOTAL DATA SYNTHESIS & REPORT PREPARATION** **$18,661.60**

**Reviews and Meetings**

Personnel

Project Leader (1)

Tasks—2 Biology Committee meetings @28 hrs. ea; report review (40)

| | |
|---|---|
| 68 hrs | 46 hrs |
| $32.60/hr (base salary) + $9.78 (benefits) | $42.38/hr |
| **TOTAL PROJECT LEADER SALARY** | **$3,644.68** |

Project Biologists (1)

Tasks—5 Biology Committee @28 hrs. ea(140 hrs); report review (60 hrs)

| | |
|---|---|
| 180 hrs | 180 hrs |
| $26.11/hr (base salary) + $7.83 (benefits) | $33.94/hr |
| **TOTAL PROJECT BIOLOGISTS SALARY** | **$6,788.00** |
| **TOTAL SALARY** | **$10,432.68** |

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** | **$13,457.68** |
| **Administrative** | |
| Personnel | |
| Secretary/Clerk Duties | |
| Tasks—purchasing, travel arrangements. | |
| Project Biologist (1) | 80 hrs |
| $26.11/hr (base salary) + $7.83 (benefits) | $33.94/hr |
| **SECRETARY/CLERK SALARY** | **$2,715.20** |
| Grant and Budgeting | |
| Tasks - administration of agreements, tracking budget expenditures | |
| Project Leader (1) | 120 hrs |
| $32.60/hr (base salary) + $9.78 (benefits) | $42.38/hr |
| **GRANT AND BUDGETING** | **$5085.60** |
| **TOTAL ADMINISTRATIVE** | **$7800.80** |
| **FY 2014 TOTAL** | **$84,307.36** |
| **Field Work** | **$26,059.68** |
| **Specimen Management** | **$18,327.60** |
| **Data Synthesis and Report Preparation** | **$18,661.60** |
| **Reviews and Meetings** | **$13,457.68** |
| **Administrative** | **$ 7,800.80** |

# San Juan River Larval Razorback sucker and Colorado pikeminnow Monitoring Fiscal Year 2014 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

# San Juan River Larval Razorback Sucker and Colorado Pikeminnow Monitoring
# Fiscal Year 2014 Scope of Work

Submitted to the U.S. Bureau of Reclamation

From

American Southwest Ichthyological Researchers, L.L.C. (*ASIR*)
800 Encino Place NE
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505.247.9337 (voice) 505.247.2522 (facsimile)

Contract No. GS10F0249X

1 October 2014 - 30 September 2015

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. Traps were distributed at dusk, retrieved about four hours later, and fish taken in those samples 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 to determine, with a high degree of confidence, if razorback sucker reproduction occurred in the San Juan River during that period. In 1998, two larval razorback sucker were collected providing verification of spawning by the hatchery reared stocked population.

Active sampling to determine the reproductive success of razorback sucker has been effective. To date, this investigation has 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 – 2012.

| *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 |

**Colorado pikeminnow project history**

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 in the San Juan River was reflected in the low catch rate of larval Colorado pikeminnow. Numerous adult and sub-adult Colorado pikeminnow have been stocked into the San Juan River in an effort to augment the 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 reproductively mature Colorado pikeminnow in the San Juan River increases, 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 FY 2003. One means of accomplishing this task was to include an additional sampling site 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°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 (1993-2012) and back-calculated dates of spawning.

| *Field Number* | *MSB Catalog Number* | *N=* | *Total Length (mm)* | *Date Collected* | *Calculated Spawn Date* | *River Mile* | *Sample Method* |
|---|---|---|---|---|---|---|---|
| JPS95-205 | 26187 | 1 | 9.2 | 02 Aug 1995 | 15 Jul 1995 | 53.0 | drift netting |
| JPS95-207 | 26191 | 1 | 9.0 | 03 Aug 1995 | 17 Jul 1995 | 53.0 | drift netting |
| WHB96-037 | 29717 | 1 | 8.6 | 02 Aug 1996 | 18 Jul 1996 | 128.0 | drift netting |
| FC01-054 | 50194 | 1 | 8.5 | 01 Aug 2001 | 17 Jul 2001 | 128.0 | drift netting |
| MAF04-046 | 53090 | 1 | 14.2 | 22 Jul 2004 | 24 Jun 2004 | 46.3 | larval seine |
| MAF04-059 | 53130 | 1 | 18.1 | 26 Jul 2004 | 25 Jun 2004 | 17.0 | larval seine |
| MAF07-139 | 70144 | 1 | 14.9 | 25 Jul 2007 | 27 Jun 2007 | 107.7 | larval seine |
| MAF07-157 | 70145 | 1 | 17.5 | 27 Jul 2007 | 27 Jun 2007 | 74.9 | larval seine |
| WHB07-078 | 64032 | 1 | 15.6 | 25 Jul 2007 | 27 Jun 2007 | 33.7 | larval seine |
| MAF09-072 | 74264 | 1 | 25.2 | 27 Jul 2009 | 10 Jun 2009 | 24.7 | larval seine |
| MAF10-140 | 82014 | 1 | 12.6 | 23 Jul 2010 | 27 Jun 2010 | 58.9 | larval seine |
| WHB10-096 | 82040 | 3 | 19.7-21.4 | 20 Jul 2010 | 15-18 Jun 2010 | 41.5 | larval seine |
| WHB10-106 | 82071 | 1 | 16.2 | 22 Jul 2010 | 23 Jun 2010 | 13.0 | larval seine |
| MAF11-114 | 86309 | 3 | 10.6-11.8 | 20 Jul 2011 | 23-25 Jun 2011 | 87.4 | larval seine |
| WHB11-122 | 86501 | 21 | 10.0-12.9 | 21 Jul 2011 | 30 Jun-4 Jul 2011 | 10.8 | larval seine |
| WHB11-124 | 86573 | 3 | 11.8-15.2 | 21 Jul 2011 | 4-6 Jul 2011 | 10.0 | larval seine |
| WHB11-153 | 86656 | 1 | 21.3 | 10 Aug 2011 | 10 Jul 2011 | 92.6 | larval seine |
| MAF11-149 | 86411 | 1 | 17.3 | 11 Aug 2011 | 17 Jul 2011 | 7.0 | larval seine |
| **TOTAL** | | 44 | | | | | |

**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 designated river reaches

and facilitated integration of the larval survey data with that of the other 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.

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 | |

**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 2011 Long Range Plan set forth by the San Juan River Basin Recovery Implementation Program (SJRBRIP).

1 Determine if razorback sucker and Colorado pikeminnow reproduction occurred in the San Juan River and estimate 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 Quantify attributes of habitats important to each life-stage of endangered fish (Task 4.2.2.1).

5 Collect catch rate statistics to estimate relative abundance of endangered fish populations. (Task 4.1.2.5)

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 Document and provide a comparative analysis of the reproductive effort of the entire ichthyofaunal community. (Task 4.1.1.1)

**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. This service was formerly performed by personnel from the USFWS NM Fishery Resources Office stationed in Farmington.

Beginning in 2011, ASIR personnel shuttled vehicles for the upper end crew. There is no cost associated with this effort.

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 2014 must be scheduled by late January 2014 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. 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 seine samples, 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% EtOH (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 SJRBRIP 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).

*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). Corrections to the data will be made directly to individual tables within the main database.

*Analysis:*
The results in our 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. Differences in mean CPUE are determined by species between years using a one-way Analysis of Variance (ANOVA). A Poisson distribution provided the best fit to the raw data. 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 – 2010) were made for each species and significance (i.e., $p<0.05$) was determined using the Tukey-Kramer HSD test. Finally, a nonparametric ANOVA (Kruskal–Wallis test) was used on various data sets to compare results to the parametric analyses. While both ANOVA and Kruskal-Wallis were used to analyze data, data transforms 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 will be 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 (**A**) for larval Colorado pikeminnow are calculated (L= total length mm) using the formulas:

$$\mathbf{A} = -76.7105 + 17.4949(L) - 1.0555(L)^2 + 0.0221(L)^3$$

for larvae <22 mm and

$$\mathbf{A} = -26.6421 + 2.7798(L)$$

for larvae 22 – 47 mm TL

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 °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 August. Daily mean discharge during the study period is acquired from USGS Gage (# 09379500) near Bluff, Utah and Four Corners Bridge (#09371010). Water temperatures (mean, maximum, and minimum) are from temperature loggers and the USGS gage 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 monitoring projects. The two pre-set annual meetings (February and May) require researchers give presentations of the results and that years findings. Meeting duration is about three days (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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**2014 BUDGET: SAN JUAN RIVER LARVAL ENDANGERED FISH MONITORING**
Based on five sampling trips per year

**Personnel (rates adjusted to account for inflation)**

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): ..... $ 19,190

Fisheries Technician (1 staff x 5 trips x 11 days x 8 hrs/day): ..... $ 11,810

*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): ..... $ 17,445

Fisheries Technician (1 staff x 5 trips x 10 days x 8 hrs/day): ..... $ 10,736

Lab Work

*Upper and Lower Reach Samples Combined*

Fisheries Biologist I (120 staff days/sampling year): ..... $ 41,866
Tasks: Laboratory identification, developmental staging, specialized endangered fish processing, data entry, data query and review, database development

Fisheries Technician (120 staff days/sampling year): ..... $ 25,766
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): ..... $ 27,910
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): ..... $ 7,085
Tasks: Project coordination, project and data review, data management, report review

**Personnel (Field, Lab, Office, Oversight): ..... Subtotal $ 161,808**

SJRBRIP Meetings

*Four meetings/year required; 2 days/meeting*

| | | |
|---|---|---|
| Fisheries Biologist I (8 staff days/year): | | $ 2,792 |
| Senior Fisheries Biologist (8 staff days/year): | | $ 4,723 |
| **Personnel (Meetings):** | **Subtotal** | **$ 7,515** |
| **Personnel:** | **Total** | **$ 169,323** |

**Materials and Supplies (rates not adjusted for inflation)**

| | | |
|---|---|---|
| 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 (rates not adjusted for inflation)**

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** |

**2014 Project Totals**

| | | |
|---|---|---|
| **Personnel:** | **Total** | **$ 169,323** |
| **Materials and Supplies:** | **Total** | **$ 4,820** |
| **Project Subtotal Subject to IDC:** | | **$ 174,143** |
| **IDC (13%):** | | **$ 22,639** |
| **New Mexico Gross receipts Tax:** | | **$ 12,190** |
| **Travel and Per Diem** | **Total** | **$ 14,253** |
| **2014 Scope of Work:** | **GRAND TOTAL** | **$ 223,225** |

# DETERMINING THE NATAL ORIGIN OF SAN JUAN RIVER RAZORBACK SUCKER THROUGH ELEMENTAL ANALYSIS OF SCALES
# FISCAL YEAR 2014 SCOPE OF WORK

**SUBMITTED TO THE U.S. BUREAU OF RECLAMATION**

**FROM**

**AMERICAN SOUTHWEST ICHTHYOLOGICAL RESEARCHERS, L.L.C. (*ASIR*)**
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**TO BE FUNDED UNDER CONTRACT NO. GS10F0249X**

**1 OCTOBER 2013- 30 SEPTEMBER 2014**

*DETERMINING THE NATAL ORIGIN OF SAN JUAN RIVER RAZORBACK SUCKER THROUGH MICROCHEMICAL ANALYSIS OF HARD BODY PARTS*
*FISCAL YEAR 2014 PROJECT PROPOSAL*

**Principal Investigators:**
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**Introduction:**

*Xyrauchen texanus,* razorback sucker, 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 spawn and supplement wild populations in the San Juan River are the Dexter National Fish Hatchery & Technology Center (Dexter) and Uvalde National Fish Hatchery (Uvalde). 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 hereafter refer 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). The ability to determine natal origins and thus define whether recruitment to adult stocks (of wild spawned young) is an important step necessary for recovery of razorback sucker.

Task 4.3.1.1 of the SJRBRIP Long-Range Plan is "Document and quantify reproduction, survival, and recruitment" of Colorado pikeminnow and razorback sucker. This task is listed under Goal 4.3: Integrate and synthesize monitoring data and information to evaluate fish community and ecosystem responses to recovery actions. In addition, razorback sucker recovery goals state : For razorback sucker populations to be self-sustaining, adults must reproduce and recruitment of young fish into the adult population must occur at a rate to maintain the population at a minimum of 5,800 adults. When this occurs, the definition of a "self-sustaining" population is met, and the "clock" starts on the downlisting and delisting process." (U.S. Fish and Wildlife Service. 2002). The importance (to recovery of this fish) of documenting recruitment of wild spawned razorback sucker to the adult (reproductive) stage is apparent throughout the SJRBRIP Long Range Plan and Razorback sucker Recovery Plan and can not be overstated. The larval fish monitoring project has documented the presence of wild spawned razorback sucker annually since 1998 and resulted in the collection of over 1,000 larval razorback sucker per year since 2010.

The ability to determine natal origins of adult fish and thus define whether there is recruitment of wild spawned razorback sucker (documented as larval fish) to adult (reproduce stage) stage is a valuable step necessary for recovery of this species.

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.

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 scale microchemistry 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, wild) survival and natal origin composition in the San Juan River. This information will help guide restoration and supplementation efforts to be maximally effective.

There are two overlapping components to this study. The first is to determine the natal origin of San Juan River razorback sucker (Dexter, Uvalde, or wild) and the second is to determine natal origin of razorback sucker collected in the San Juan River arm of Lake Powell. The latter component expands the potential pool of source (=hatchery fish) material to include Upper Colorado Basin hatcheries.

| 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.

**Background - A 2011 Pilot Study using Scales and LA-ICP-MS**

As this process (determining natal origin using elemental analysis of scales) had not been tested on San Juan River fish, we conducted an unfunded pilot study of the proposed technique in 2011. The process involved laser ablation (LA) of scales and analysis of the elemental composition using an inductively coupled plasma mass spectrometry machine (ICP-MS). Scales were collected from adult and sub-adult razorback sucker captured in the San Juan River during the July 2011 and September 2011 non-native removal trips. Scales were removed from a total of seven razorback sucker, six of which contained PIT tags when captured. In December 2011, we went to Dexter National Fish Hatchery and Technology Center (Dexter, NM) and Uvalde National Fish Hatchery (Uvalde, TX) and obtained scale samples from hatchery reared razorback sucker and water samples from each facility. Scales were obtained from five Dexter and eight Uvalde razorback sucker. Scales from all razorback sucker were processed (cleaned and mounted) in December 2011 and elemental analysis of scales and water samples performed at Woods Hole Oceanographic Institute (WHOI) in January 2012. Data generated from the WHOI elemental analysis were processed and interpreted during January-February 2012 and presented to the San Juan River Basin Recovery Implementation Program Biology Committee (February 2012) and Coordination Committee (May 2012).

**Results of the Pilot Study**

Elemental analysis showed distinct differences between the water chemistry at Dexter and Uvalde. The Mg:Ca ratio of the water at Dexter was 2.7 times that of Uvalde's water while the Dexter Sr:Ca ratio was over 3.2 times that of Uvalde. There were little between site differences in either the Mn:Ca or the Ba:Ca ratios. Otolith and scale Sr:Ca ratios are know to be linearly related and a good microchemical analysis marker to use in freshwater systems (Wells et al. 2003). For purposes of this preliminary study,

determination of the natal origin of the seven San Juan River fish was based exclusively on analysis of their Sr:Ca ratio.

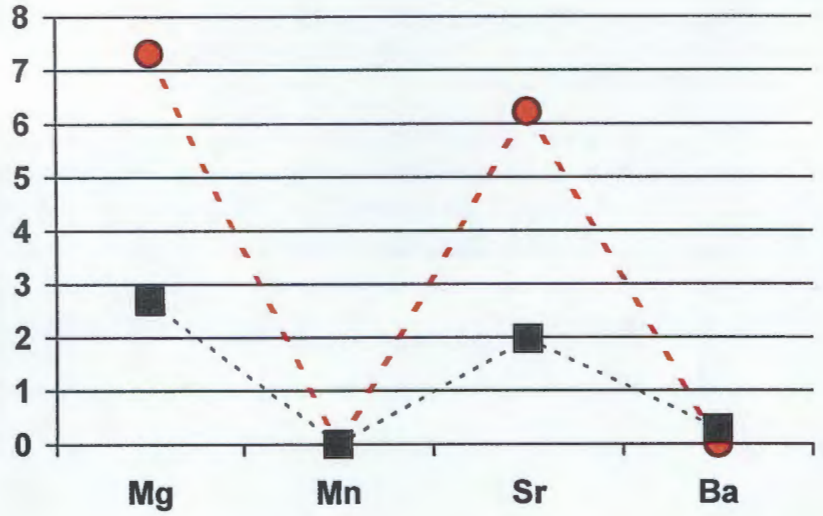


Figure 1. Elemental analysis of the water in which stocked San Juan River razorback sucker are reared at Dexter (circles) and Uvalde (squares).

Transverse elemental scale signatures (Sr:Ca ratio) from each of the seven San Juan River fish were plotted so that natal signature could be differentiated from recent signatures (Figure 2). Each of the seven San Juan River fish were assigned to one of four natal origin categories: Dexter, Uvalde, wild (i.e., had been spawned in the San Juan River), or unknown. The information associated with the six PIT tagged specimens was not revealed until after all specimens had been assigned to a natal origin category.

All six PIT tagged specimens were correctly assigned to their proper natal origin category (all from Dexter) and the one untagged specimen was also determined to have originated at Dexter. In addition to being able to detect the natal signatures of each of the seven specimens, we were able to detect the elemental signatures of the San Juan River and NAPI (Navajo Agricultural Products Industry) Ponds.

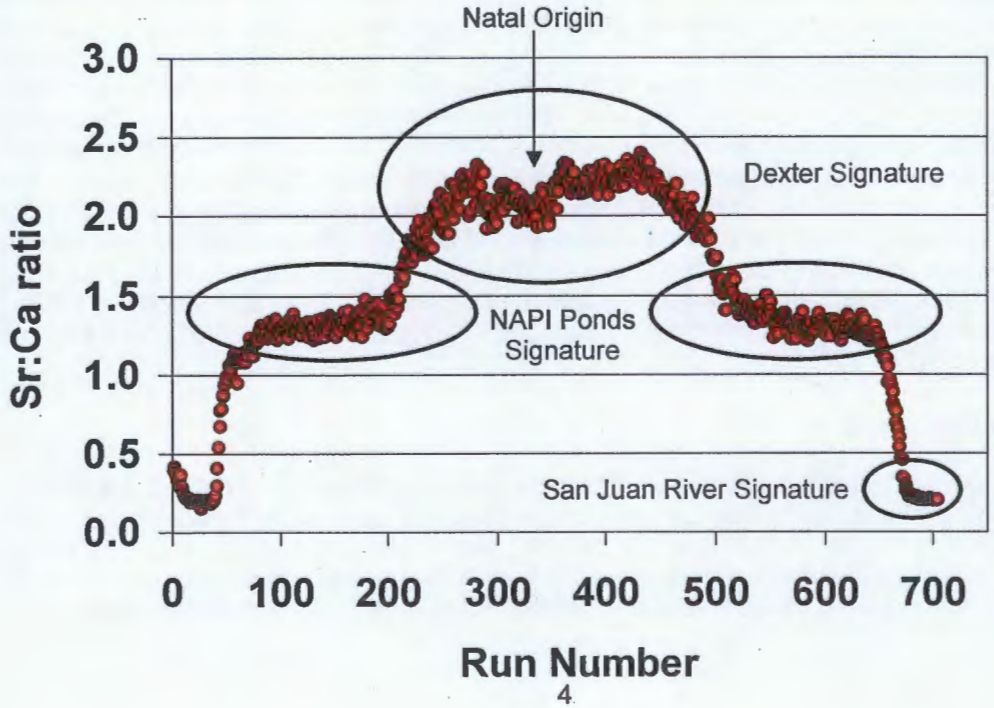

Figure 2. Elemental analysis (Sr:Ca ratio) from a scale of a PIT tagged San Juan River razorback sucker showing the elemental signatures of three water sources. This individual was assigned (correctly), based on the data in the oval labeled "natal origin" to Dexter.

**Project Objectives:**

1. Using 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 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 scales (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* — Scales will be removed from study specimens using antiseptic techniques. Field crews have been provided a water-proof scale sampling kit containing sampling instructions (Figure 3), a pen-knife, water-proof pens and pencils, isopropyl wipes, and pre-labeled sample envelopes. A knife will be used to remove scales from the right dorsal region above the lateral line of each fish. After scales are removed from an individual fish, the scales 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 knife blade will be cleaned with an isopropyl wipe each time scales have been removed from a specimen.

Instructions for Scale Collection from razorback sucker

Remove scales from the right side of the fish (fish facing forward) from one to three rows above the lateral line on the posterior half of the body (below the dorsal fin). Avoid areas that appeared scarred or deformed. Clean your knife by using an alcohol wipe before and after removing scales and between each fish.

Gently remove mucus from scale area to be sampled using the back of the knife. Wipe the knife clean again and remove a few scales at a time using the knife tip moving it toward the head of the fish (against the scales). Collect from 10 to 20 scales from each fish. Insert knife blade containing scales into the envelope and wipe knife blade clean while inside envelope.

Scales should be spread across the inside of the envelope to prevent clumping which can lead to fungal growth and scale degradation. Filled scale envelopes should be stored in dry conditions (plastic sample box) to ensure that the scales remain viable for analyses. Scale samples or filled envelopes should not be stored in sealed plastic bags because the scales will rot.

Rubbing mucus with your finger from the surrounding skin of the fish to the sampling area will restore mucus protection to the area where scales were removed. Record information requested on the labeled scale packet.

DATE:_____
Pit Tag #:_____
Length TL/SL:_____
Weight:_____
Location (RM):_____
Were scales removed from the recommended area? ☐ Yes ☐ No
If "No", scales from:_____

A small plastic sample box that includes knife, alcohol wipes, scale envelopes, and adhesive address labels is provided. Place the scale envelopes in a large envelope at the end of each trip and mail them back to us so the samples can be processed before they begin degrading.

Figure 3. Instruction sheet for collection of razorback sucker scales by San Juan River field crews.

*Hatchery Specimens/Water Samples* – Additional scales (ca. 5-10 per specimen; ca. 10 individuals per hatchery or unique water source) will be obtained from fish at Dexter National Fish Hatchery and Uvalde National Fish Hatchery. Scales from razorback sucker reared at Grand Junction Fish Hatcheries, (Horsethief Canyon Native Fish Facility, 24-Road Fish Hatchery, Grand Valley Propagation Facility), and

Ouray National Fish Hatchery will also need to be included to address natal origin of razorback sucker collected in the San Juan River arm of Lake Powell. In addition, we will add NAPI water signatures to the analytical pool as all potential sources and their range of variation must be included and understood.

*Laboratory processing of scales* – Scales can be damaged or lost and subsequently regenerated (Figure 5) making them unsuitable for analysis to determine natal origin. All scales will be viewed under magnification for suitability for analysis. All suitable scales will be cleaned using aseptic techniques, sonified to remove any remaining tissue or contaminants, rinsed in Milli-Q water, and dried under a laminar flow hood. After processing, all useable scales will be mounted to glass slides using double-sided tape.

*Laboratory* – (Woods Hole Oceanographic Institution) – Water samples will be analyzed using inductively coupled plasma mass spectrometry for 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.

Scales will be analyzed at WHOI via laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) for elemental concentrations of Barium, Calcium, Magnesium, Manganese, and Strontium. Scales obtained from both Dexter and Uvalde hatcheries will serve as reference scales and create a reference data set of elemental measurements for known origin fish. Scales from non-tagged razorback suckers will be compared to the data set of known origin fish (Dexter or Uvalde) to determine natal origin. To determine natal origin of individual fish, the laser ablation path will be set to travel through the focus of each scale (Figure 4). Because the focus is the first part to grow in the scale, it is likely that this area of the scale will reveal elemental concentrations at the time of scale formation.

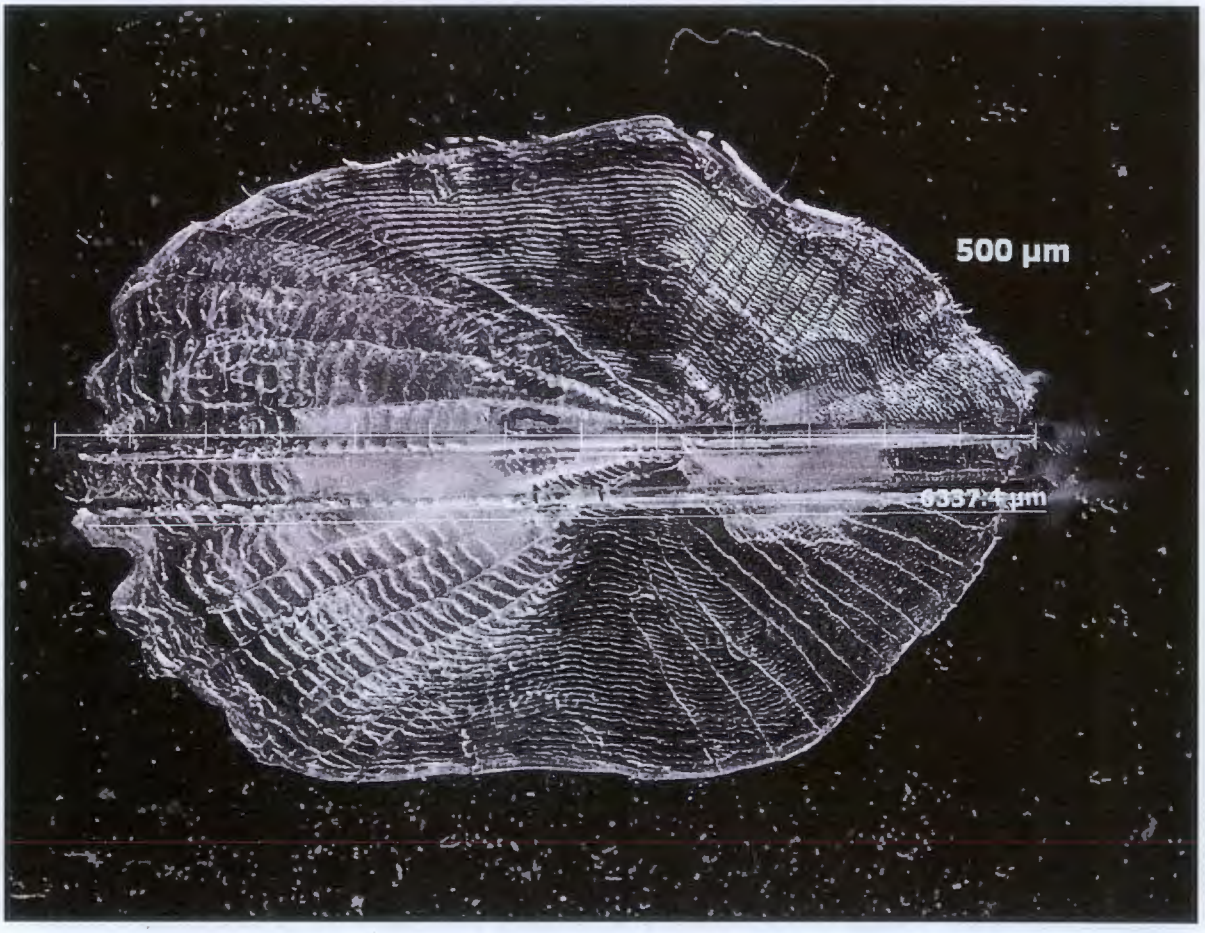

Figure 4. Image of a razorback sucker scale used in pilot LA ICP-MS study. This scale was ablated twice during microchemistry analysis. The upper ablation line follows the ideal path for performing the microchemistry analysis because it passes through the center of the scale. The distance between consecutive vertical bars on the upper ablation line is 500 µm.

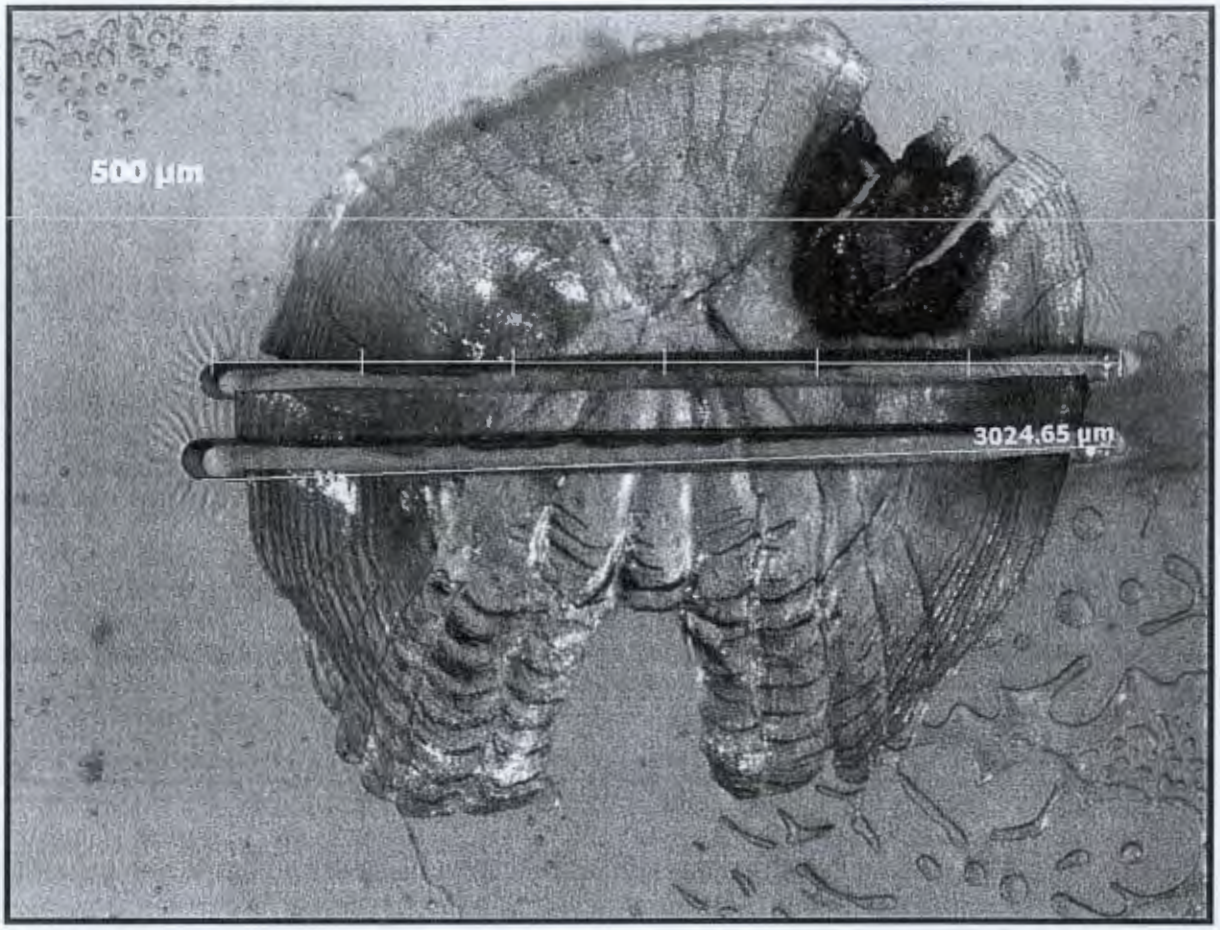


Figure 5. Image of a regenerated razorback sucker scale used in pilot LA ICP-MS study. This scale was ablated twice during microchemistry analysis. The distance between consecutive vertical bars on the upper ablation line is 500 µm.

*Laboratory* – (General Information on Data Generated by LA-ICP-MS) – Each ablation generates the same series of data with the only difference being the cumulative amount of data produced. The amount of data generated is proportional to the length of the ablation. Elemental analyses of five elements, Barium, Strontium, Manganese, Calcium, and Magnesium are recorded and within each element, data are recorded for the most common 10 isotopes of that element. A single reading is comprised of 50 data points (10 isotopes for each of the five elements). Single readings are generated at approximately one-second intervals with 70 individual readings (of 50 data points) generated across a 400 micron ablation (total of 3,500 data points for one 400 micron ablation on a scale). The first step in synthesis of the datasets is to average isotopic signatures of each element. This generates individual values along the length of the ablation at approximately 5 micron intervals for each element. These data-points are than used to track changes in the elemental composition of the scale across time.

Obviously, the longer the ablation, the larger the total data-set per individual scale. Ablation lengths for the seven unknown fish from the pilot study ranged from 2,700 to 6,300 microns and generated from 35,500 to 65,500 individual data points.

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 scale has been sampled. Elemental analysis of the blanks and standards is the same as performed on the scales (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 (generating 70 separate individual readings each containing 50 data points. 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 scales.

**Analysis:**

*Data Analysis* — Because of the complicated nature of the data generated, the experienced scientists and staff at WHOI strongly advised us 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 scales are those with elemental concentration 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 elemental concentrations, a predictive model will be created and tested for classification accuracy. A data set (or library) of known natal origin fish scales will be created to determine if fish scales 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 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 data will be transferred to the San Juan River database manager. Fish scales 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.

**Goals for Future Application of this Technique**:

1) Reduce scale processing time
   a) explore the use of diluted SupraPur Hydrogen Peroxide Solution for cleaning of scales.
2) Increase number of scales processed per day at WHOI.
   a) reduce LA-ICP-MS time per scale by:
      1. determining optimal ablation location.
      2. determining optimal amount of ablation necessary for a useable elemental signature.
3) Reduce data processing analysis time.
   a) develop a program or code to convert the raw data to a form that is suitable for analysis.

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Caveats for the early (experimental/developmental) stages of this project

The first few sample runs for this project will help us refine techniques and determine the level of

resolution required to determine the natal origin of razorback sucker. The scale analysis sampling effort described herein was estimated using up to five scales per fish and 50 total specimens (n= 250 scales). Throughout this effort we will track the time required to process the scale in the laboratory (deemed considerable at the moment) and also have a more precise understanding of the number of scales that can be analyzed per day at WHOI. In addition, we will acquire information on length of the ablation necessary to acquire unambiguous information from each scale, the variation present (based on five scales per fish) in individual fish, and axis along the scales that maximize the information acquired. This information will be incorporated into subsequent proposals to employ this technique on razorback sucker.

Terminology

**WHOI** Woods Hole Oceanographic Institution; Plasma Mass Spectrometry Facility = laboratory in the Marine Chemistry and Geochemistry Department where trace element and isotope ratio measurements of scales will be obtained. Their instruments include argon plasma source magnetic sector mass spectrometers equipped with a variety of sample introduction devices for gaseous, liquid and solid samples. (http://www.whoi.edu/page.do?pid=31615)

**ICP-MS** Inductively Coupled Plasma (refers to attachment of an instrument that allows samples to be analyzed to be "transported" to the Mass Spectrometer). The three argon plasma mass spectrometers at the WHOI facility are manufactured by Thermo Electron Corporation in Bremen, Germany.

**Ablation** Often referred to as "burns", ablation is the removal of material from the surface of an object by a controlled, slow burn, or vaporization. Solid materials (fish scales or otoliths) can be directly sampled and introduced into the core of inductively coupled argon plasma (ICP) which generates ions that are then introduced to either the Neptune or Element 2 mass spectrometer. This is achieved by the New Wave Research UP 213 LASER ablation (LA) sampling device.

**Processing** Scales and otoliths must be "prepared" (cleaned) prior to being ablated and analyzed. As the objective is to determine the elemental signature of the study material, it must be free of contamination. The processing of this material (scales) is done by the researcher (at their home institution) in a clean room or laboratory. Material to be analyzed is examined, cleaned, subjected to sonification, dried in fume hoods with laminar flow, and ultimately mounted on a glass slide and maintained under clean-room conditions.

1) Time required to perform ablation (LA)
   a) Based on 400 micron burns (=length of ablation) with duration of 1 minute
   b) Actual burns for scales of unknown origin will be about 3000 microns with 10 minute duration
   c) This will allow for burn across the entire length (or width) of scale
      1. This is necessary to capture entire history of fish (important for initial samples)
   d) We will experiment with burns through only half the scale (natal region to edge)
      1. This will allow us to determine if this technique can be used for future samples
      2. If the shorter burn works it would allow more samples to be run during future events

2) Instrument (LA-ICP-MS) breaks down
   a) We were told (from initial 2010 inquiry regarding technique) to allow one day in the event of problems with any of the instruments
   b) Each trip to WHOI will take a minimum of four days (two travel days and one LA-ICP-MS day plus one backup LA-ICP-MS day; even if we do not need the instruments the second day, we would not have used that day for travel as we would have worked a 24 hour shift.

**2014 BUDGET: DETERMINING THE NATAL ORIGIN OF SAN JUAN RIVER RAZORBACK SUCKER THROUGH ELEMENTAL ANALYSIS OF SCALES**

Based on scale samples from 100 fish and elemental analysis performed on five scales per fish (unless otherwise noted *)

**Personnel (rates adjusted to account for inflation)**

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 |

Scale Preparation (100 Fish and 500 Scales)

Fisheries Technician (50 days x 8 hrs/day): $ 10,609
Tasks: Class 100 clean room processing of scales: selection, examination, sonification, preparation, mounting, and accounting of sample materials

WHOI Analytical Runs of Scales (100 Fish and 500 Scales)

Fisheries Technician (2 staff x 5 days x 8 hrs/day x 2 trips): $ 4,244
(Two individuals needed for 24 hr runs)
Tasks: Perform analytical runs of scales

Fisheries Biologist I (5 days x 8hrs/day x 2 trips): $ 3,448
Tasks: Perform analytical runs of scales

Office Work (Analysis of Data & Report Production)

Fisheries Biologist I (50 days x 8 hrs/day): $ 17,242
Tasks: Post-ablation scale processing (photography, review, lengths), data analysis, draft report preparation, review redraft and submission, development of presentation of study for annual meetings

Project Expert Assistance

Mass Spectrometry Research Associate (5 days x 8 hrs/day): $ 5,305
(Cost per project year *)
Tasks: Expert assistance with analysis, review, and interpretation of the data and consultation

Project Oversight And Review

Senior Fisheries Biologist (12 days x 8 hrs/day): $ 7,002
(Cost per project year *)
Tasks: Project oversight, data review, reporting duties, meeting presentation, updates of progress

**Personnel (Lab, Office, and Oversight): Total $ 47,850**

**Materials and Supplies (rates not adjusted for inflation)**

Scale Preparation (Class 100 clean room facility)

Slides and mounting media
Washing/cleaning (sonicator, hydrogen peroxide, HCl, etc.)
Non-metallic (ceramic) cleaning and mounting tools

| | | |
|---|---|---|
| **Materials and Supplies (Scale Preparation):** | **Subtotal** | **$ 500** |

Elemental Analysis at WHOI (Published rate) for two 3 day trips

| | | |
|---|---|---|
| Element 2 argon plasma mass spectrometer ($1,240/day x 6 days): | | $ 7,440 |
| 193 nm LASER ($ 110/day x 6 days): | | $ 660 |
| "Night" argon for long analytical sessions ($ 110/day x 6 days): | | $ 660 |
| **Materials and Supplies (WHOI):** | **Subtotal** | **$ 8,760** |
| **Materials and Supplies:** | **Total** | **$ 9,260** |

**Travel and Per Diem (rates not adjusted for inflation)**

Elemental Analysis at WHOI

| | | |
|---|---|---|
| Travel - Airlines; Albuquerque, NM to Providence, RI (Round-trip (r.t.) tickets x 3 staff x 2 trips): | | $ 4,800 |
| Travel - Car rental and fuel (5 days/trip x 2 trips): | | $ 900 |
| Per Diem (5 days/trip x 3 staff x 2 trips): | | $ 1,500 |
| Hotel - Falmouth/Cape Cod (4 days/ trip x 3 staff x 2 trips): | | $ 3,600 |
| **Travel and Per Diem (WHOI):** | **Total** | **$ 10,800** |

**2014 Project Totals**

| | | |
|---|---|---|
| **Personnel:** | **Subtotal** | **$ 47,850** |
| **Materials and Supplies:** | **Total** | **$ 9,260** |
| **Project Subtotal Subject to IDC:** | **Subtotal** | **$ 57,110** |
| **IDC (13%):** | | **$ 7,424** |
| **New Mexico Gross Receipts Tax:** | | **$ 3,998** |
| **Travel and Per Diem:** | **Total** | **$ 10,800** |
| **2014 Scope of Work:** | **GRAND TOTAL** | **$ 79,332** |

**San Juan River Specimen Curation by the Museum of Southwestern Biology**

**Fiscal Year 2014 Scope of Work**

Principle Investigators: Alexandra M. Snyder, Thomas F. Turner, David L. Propst
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and

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**Award R13SS40013**
1 October 2013 to 30 September 2014

## 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, 35,165 lots or 1,330,362 fish specimens collected (1987-2012) 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 18,460 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 24,587 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.

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 to SJRIP researchers in that format.

**Methods**

The primary task to be completed under the curatorial 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 collection 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 2012 San Juan River specimen curation and larval fish identification activities will be prepared and distributed by 31 March 2015 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 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 in the process of being completely incorporated (specimens and data) with the MSB fish collections.

# Budget Fiscal Year 2014
# 1 July 2013 to 30 June 2014 for Specimen Curation

| 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. | | | | | | |
| Professional Staff | $12.00/ HR | 0.50 | | | $11,520.00 | $11,520.00 |
| Student Assistant | 10.38/HR | 0.30 | | | $6,480.00 | $6,480.00 |
| **FRINGE BENEFITS** – Explain the type of fringe benefits and how applied to various categories of personnel. | | | | | | |
| Professional Staff | 35.2% | 1 | | | $4,055.00 | $4,055 |
| Student Assistant | 1% | 1 | | | $65.00 | $65.00 |
| **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 | $1104 | 12 MO | | | $1,104.00 | $1,104.00 |
| Specimen containers | $803 | 12 MO | | | $803.00 | $803.00 |
| Specimen labels | $290 | 12 MO | | | $290.00 | $290.00 |
| Lab supplies | $420 | 12 MO | | | $420.00 | $420.00 |
| | | | | | | |
| **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--** | | | | | $24,694.00 | $24,694.00 |
| INDIRECT COSTS – 17.5% | | | | | | |
| | | | | | $5,238.00 | $5,238.00 |
| **TOTAL PROJ./ACTIVITY COSTS** | | | | | $29,932.00 | **$29,932.00** |

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**San Juan River Basin Recovery Implementation Program**
**Data Integration and Synthesis**
**Museum of Southwestern Biology**

**Fiscal Year 2014 Scope Of Work**

**Award R13SS40013**
1 October 2013 to 30 September 2014

## Principal Investigators

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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) for a two-year period 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**

Dr. 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(14), Dr. 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 2014 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 are near completion and their progress to date has been noted. In FY(14), 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 gone through one round of peer review and is currently being revised for 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.

**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 accepted for publication at *Ecology of Freshwater Fish* and was authored by Nathan Franssen and Scott Durst. This manuscript has been distributed to the Biology Committee.

**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, Colorado, New Mexico, and Utah*" is currently in review at *Transactions of the American Fisheries Society*. Scott Durst and Nathan Franssen authored this paper. This manuscript has been distributed to the Biology Committee.

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

This project is ongoing and its progress will be presented to the Biology Committee during the fall meeting in 2013 and will likely be completed in 2014.

**5) How has flow manipulation, nonnative fish removal, and endangered fish augmentation influenced the fish community of the San Juan River?**

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

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

Proposed projects 4) through 7) will be completed in FY(14) 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. A minimum of 5 manuscripts will be prepared. Three manuscripts will likely be published in FY(13) while at least two more will be completed in FY(14).

**Schedule**

This project is proposed for 2 years, beginning 1 October 2012, with the option for a 3$^{rd}$ year.

## Budget Fiscal Year 2014
## 1 July 2013 to 30 June 2014 for Data Analysis and Synthesis

| 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 | $21.35/ HR | 1.00FTE | | | $41,000.00 | $41,000.00 |
| UNM Faculty Summer | $57.40/ HR | 0.04FTE | | | $9,178.00 | $9,178.00 |
| **FRINGE BENEFITS** – Explain the type of fringe benefits and how applied to various categories of personnel. | | | | | | |
| UNM Post-doctoral | 28.3% | 1 | | | $11,603.00 | $$11,603.00 |
| UNM Faculty Summer | 221.1% | 1 | | | $1,937.00 | $1,937.00 |
| **TRAVEL**—dates; location of travel; method of travel x estimated cost; who will travel | | | | | | |
| Franssen, Propst, Turner, Gido | $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--** | | | | | $73,262.00 | $73,262.00 |
| INDIRECT COSTS – 17.5% | | | | | | |
| | | | | | $15,540.00 | $15,540.00 |
| **TOTAL PROJ./ACTIVITY COSTS** | | | | | **$88,802.00** | **$88,802.00** |

# SJRIP Videography
# 2014 Project Proposal

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## 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. Often the video is flown in connection with another trip to control costs.

## 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.

## Tasks – 2014

1. Fly San Juan River with vertically oriented camera and take HD video and high res. digital stills.
2. Periodically provide specific images that are rectified for detailed mapping.
3. Archive video/still frames and provide to researchers as requested.

**FY 2014 BUDGET**

| **Funding source** | **Expenditure in FY2014** |
|---|---|
| | |
| FY2014 Annual funding | $22,000 |
| | |
| **Total** | **$22,000** |

**Projected funding:**
**FY-2015** $22,000.00
**FY-2016** $24,000.00

# San Juan River Population Model Update, Maintenance, Population Model runs Project Scope of Work

Principle Investigators:
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And
Vince Lamarra
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## Background

A modeling effort to construct a conceptual framework for the fish community and endangered fishes in the San Juan River began in 1998. This effort relates to relevant sections of the San Juan River Long Range Plan. These models 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 during a two day workshop in April 2007. The Biology Committee requested that a scope of work be developed to continue model maintenance and conduct model runs. The scope of work was developed but not funded due to fiscal constraints. In Biology Committee meetings in 2009 and 2010, it has been noted that much of the analysis regarding management actions and endangered species recovery in the San Juan River could be evaluated using the Population Model. The intent of this update is to continue to refine the structural and functional components of the mechanistic model, present an updated version of the model to the Biology Committee members, and make additional model runs with updated input data from the monitoring in the San Juan River.

## Tasks

1. Update the Stella® model software for the San Juan population model from Version 8 to the newest version
2. Update the model parameters with new physical and biological data from the San Juan River Recovery and Implementation Program.
3. Update the user interface and run-time version of the model.
4. Create an internet accessible model using Stella NetSim software.
5. Complete the model documentation for the updated Population Model.
6. Make additional model runs that incorporate the information from the monitoring data to evaluate SJRIP Program objectives.

**Benefits to the Tribe and surrounding communities**

The San Juan River Recovery Implementation Program (SJRIP) is the reasonable and prudent alternative developed for the ALP Project. The San Juan population model provides a means to quantitatively evaluate the management activities of the SJRIP for recovery of the federally listed Colorado pikeminnow and razorback sucker. An efficient and scientifically informed basis for management actions, such as using the model, would continue progress toward recovery for the endangered fish and allow current and future water development projects, in a timely manner. The completion of the model will allow the SJRIP to quickly evaluate ongoing and proposed management actions for recovery of the listed species using a rigorous scientifically based tool. In addition, the SJRIP is at a point where data integration of the past 5 years of monitoring is needed. The data integration is an integral component of the evaluation of progress toward recovery for the Program. This integration includes determination of population responses to management actions such as non-native fish removal, augmentation of endangered fishes, and flow manipulations. It has been pointed out by several members of the SJRIP Peer Review panel that the model, if updated could provide the means for integration. Because the model is a broad ecosystem based mechanistic model, all of the major ecosystem components that can be manipulated to benefit the endangered fish are included. The model can evaluate how current and future water development affects fish populations, in particular Colorado pikeminnow and razorback sucker.

**Methods**

The current version of the model is in Stella Version 8. Newer Stella versions have substantial changes that would significantly improve model function. This update will include planning sessions to reconfigure the model to take advantage of new data handling capabilities in Version 9 and to update the user interface. The planning sessions will include discussion with the Biology Committee from San Juan River Recovery Program.

The model will be reconfigured to Stella Version 9 to improve its function. The reconfiguration will require conversion of the existing Stella 8 model code to Stella 9.

The user interface is critical to allow other participants in the Program to run simulations through a Web enabled simulation site. The user interface will allow Program participants to vary management parameters for model simulations. This interface will include the construction of a web enabled simulation site using web software available from Stella. The Web access will provide a secure means to control the model code while allowing a variety of users to run simulations.

The biological and physical model data only contain information through 2002. The San Juan Program has collected additional data on fish populations and habitat through 2009 including preliminary population estimates for endangered Colorado pikeminnow and razorback sucker. Data up through 2009 will be used to update species distributions, abundance and population estimates. The model parameters will be updated, as needed, with the new biological and physical data.

Documentation will be completed that includes instructions for model use, description of changes to model parameters, and full description of model components. A model report was completed in 2006, which described the model components and parameters. The original model report will be updated and included in the model documentation.

After completion of the model updates, model simulations will be made to test the model operation and evaluate the change in population dynamics. The main focus of the simulations is likely to be the expected endangered fish populations as a result of stocking Colorado pikeminnow and razorback sucker. Initial results will be presented to the Program. Any Program participant can conduct additional model

simulations after the Web based access feature is complete.

**Schedule**

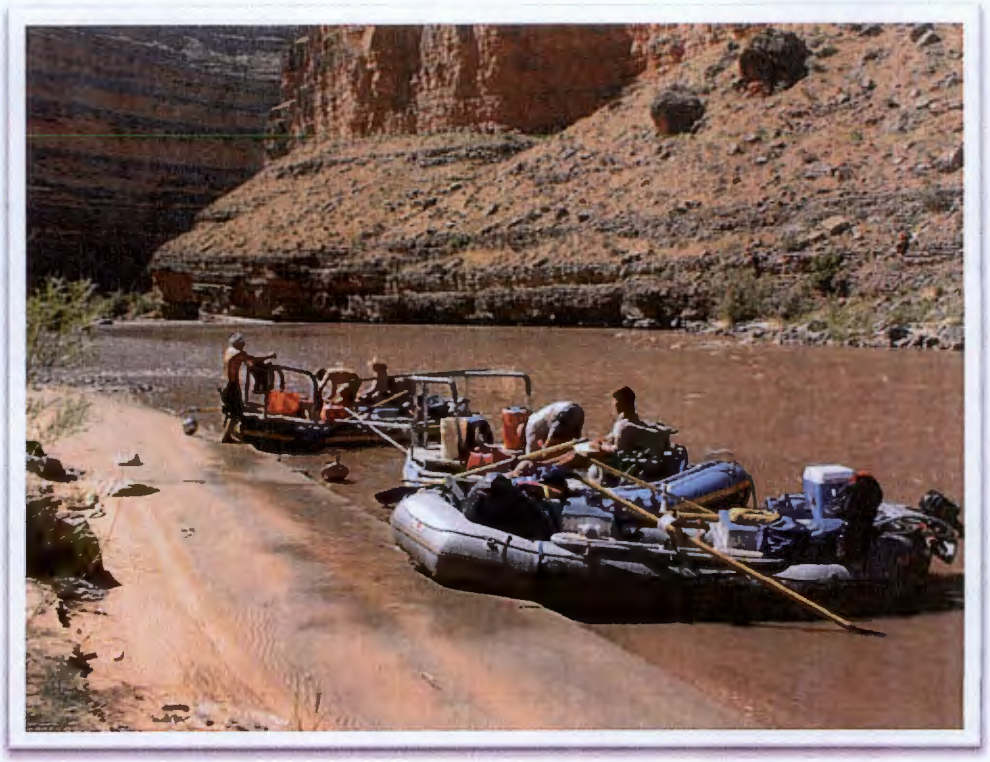
Model code conversion from Stella 8 to the newest version of Stella, including planning, conversion and testing, will take 6-12 months.
Model documentation will be concurrent with model code conversion. The documentation will be complete two-three months after the code conversion is completed.
Model simulations will be completed as the final part of model conversion and testing. Simulation results will be available one-two months after model conversion.
Total time required for the model update with documentation is estimated at 6-12 months.

Model maintenance is an ongoing task that consists of updating the model with new model parameters based on new information and updating the model software as needed. Once the model is converted to the newest version of Stella, only minor revisions would be needed on an annual basis. These revisions include incorporating new data from the monitoring program and adjusting the model parameters with new values as they become available. The Stella software would not be updated unless a new version is released and only after review of the changes between versions shows a substantial advantage to the upgrade.

**Products**

A revised model in the most recent Stella Version will be produced for the Tribe. A report will be prepared that documents the model update, software use, web access use, and basic model function. Summary tables of model simulations will be produced for each model run. A summary of model maintenance activities will be completed annually.

Ecosystems Research Institute, Inc.
Miller Ecological Consultants, Inc.



# San Juan River Basin Recovery Implementation Program Habitat Monitoring Plan: 2014

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## INTRODUCTION

In 2011, the San Juan Recovery and Implementation Program (SJRIP) developed water temperature and habitat monitoring protocols, which form the basis for this Statement of Work (SOW). 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 the initial work being conducted by the U.S. Bureau of Reclamation (Reclamation). 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, while developing the current river-wide mapping methodologies and habitat types. Between 1992 and 2007, baseflow river-wide habitat was mapped by ERI 18 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 (Rm 180). Flow recommendations were heavily based upon river channel and habitat response to flows, which were determined from a 7-year research study of channel morphology and habitat. In 1999, long-term monitoring was established to track channel and habitat response to flows. The protocols were continuations of those established during the 7-year research period and continued through 2004.

The data integration analysis in 2005 indicated that complex channel reaches (those with high habitat diversity, islands, multi-threaded channels and complex channel margins) correlated to native fish abundance. Furthermore, captures of young-of-year (YOY) endangered fish also appeared to be correlated with channel complexity. Finally, backwater and low velocity habitats were 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 has been closely coordinated and integrated with fish community monitoring to allow assessment of changing habitat availability and fish use in response to management actions towards 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 other monitoring activities to assess the effectiveness of management actions, such as flow management, habitat modifications or nonnative fish removal. A focused habitat monitoring workshop was completed in January 2012. Its purpose was to evaluate, refine, and improve the habitat monitoring and mapping work on the San Juan River to insure the program implemented methodologies were conducive to answering outstanding questions and provide the data necessary to evaluate and revise the SJRIP's flow recommendations.

## 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 RELATIVE TO LONG RANGE PLAN

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) Periodically (2014), 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.

Objective 3) 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) Develop relationships between habitat availability and antecedent flow conditions. Use key habitats for this analysis.

Objective 5) Track long-term trends of habitat availability.

## PROPOSED STUDY DESIGN

There are three major tasks included in this proposed study which address the previously stated objectives. They include:

Task 1. Annual habitat mapping and data analysis,

Task 2. Field habitat mapping (river-wide survey scheduled in 2014) and monitor River Ecosystem Restoration Initiative (RERI) Sites,

Task 3. Water temperature monitoring

These tasks are described in detail in the following sections, including methods, data analysis, schedule and deliverables.

## TASK 1. FIELD HABITAT MAPPING (RIVER-WIDE SURVEY IN 2014)

### GENERAL METHODS

1) Using nine general habitat categories (Table 1), map aquatic habitat at a scale of 1" = 200', using digital video files provided to the contractor by Reclamation; and,

2) Examine the relationships between hydrology (especially recent antecedent hydrology conditions) and habitat conditions throughout the river, especially backwater habitats and habitat complexity including island count, surface area and island perimeters.

### SPECIFIC METHODS FOR RIVER-WIDE HABITAT MAPPING SURVEY IN 2014

In 2014, base photography maps will be prepared at a scale of approximately 1 inch = 200 feet for river-wide mapping from the videography described above. The frames will be printed on 8.5 x 11 inch pages with river mile marks and placed in sheet protectors for field mapping.

Eight aquatic habitat types and one associated terrestrial type (Table 1) will be delineated on the base photographs (1 inch = 200 ft scale) by visual inspection in the field when floating the river. Each polygon delineated will be marked with its corresponding habitat as noted in Table 1. The date of mapping and the mapper's name will be recorded on the first map sheet for each day's mapping. All mappers used by ERI have direct experience in mapping the San Juan River using the proposed methodology. In as much as the mapping process is interpretive, annual reviews will be conducted among the mapping crews prior to mapping to assure the best possible reproducibility in interpretation among mappers. Following field mapping, the field sheets will be reviewed and missing codes or non-closed polygons corrected prior to processing.

**Table 1. Categories of habitat types to be used in the river-wide mapping effort on the San Juan River.**

| | |
|---|---|
| Backwater Types | Irrigation Returns and Tributaries |
| Low Velocity Types | Inundated Vegetation |
| Run Types | Slackwater Types |
| Riffle Types | Islands |
| Shoal Types | |

Once the field mapping sheets are reviewed and edited, they will be scanned at a resolution of 300 dpi and then rectified to the 2011 geo-referenced National Agricultural Imagery Program (NAIP) county mosaics to remove distortion. After rectification, the habitat polygons will be digitized and coded in ArcGIS to produce a shape file and database with habitat perimeter and area by type and river mile. The data will then be extracted and summarized by count and area per river mile for analysis. Average flow at mapping for each detailed reach will also be extracted from the nearest USGS gage data, using the gage or gages most representative of the reach.

## DATA ANALYSIS FOR EVERY FIFTH YEAR HABITAT MAPPING (2014)

Data analysis will be the same whether photo-interpreted or field mapped, except that the number of habitat types 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. In 2014/2015, all data will be integrated to examine the relationship between habitat abundance and antecedent spring flow conditions for individual and multiple years.

## RIVER-WIDE MAPPING SCHEDULE

The river-wide mapping will occur in the summer of 2014 with July/August 2014 videography. In 2014 when river-wide mapping is completed, there will be a one-year lag in interpretation due to the lateness of the data collection and the time required to scan and digitize the field maps.

## DELIVERABLES

1) Rectified habitat map

2) Polygon area, perimeter and geo-referenced location of 9 habitat types

3) Date of mapping for each daily segment

4) Flow at mapping for each geomorphic reach

5) Antecedent runoff hydrograph conditions for all years between mappings

6) Data summarized by river mile, geomorphic reach, and entire mapped river

7) Distribution and abundance of other habitat categories (long-term trend analysis)

8) Track long term trends of habitat availability, and temperature, and provide

- A draft report prepared and submitted by February 28, 2015
- A final report submitted by June 1, 2015
- Attendance at the annual report meeting and one additional Biology Committee meeting

## TASK 2. MONITOR RERI SITES

### GENERAL METHODS

1) Using nine general habitat categories (Table 1), map aquatic habitat at a scale of 1" = 300' using the available imagery provided to the contractor and which is being used for the river wide mapping.

2) Determine the amount of flow entering and leaving the reclaimed channels and controls.

3) Using pre-established bench marks, survey across stream transects after spring runoff 2014 at the entrance of each secondary channel as well as the control channels.

4) Examine the relationships between hydrology (especially recent antecedent hydrology conditions) and habitat conditions throughout the six recently modified RERI secondary channels, especially low velocity habitats and habitat complexity.

5) Utilize several natural and flowing secondary channels within the immediate area as control reaches.

### SPECIFIC METHODS FOR RERI SECONDARY CHANNEL MONITORING

In 2014, the summer video flight used in the river wide mapping will be used at a scale of approximately 1 inch = 300 feet for the RERI secondary channel mapping. The photos will be printed on 11 x 17 inch pages with the river-mile marks and provided in sheet protectors for field mapping.

Eight aquatic habitat types and one associated terrestrial type (Table 1) will be delineated on the base photographs (1 inch = 300 ft scale) by visual inspection in the field by walking the entire reconstruction sites and controls. Each polygon delineated will be marked with its corresponding code as noted in Table 1. The date of mapping and the mapper's name will be recorded on the first map sheet for each day's mapping. All mappers used by ERI have direct experience in mapping the San Juan River using the proposed methodology. In as much as the mapping process is interpretive, annual reviews will be conducted among the mapping crews prior to mapping to assure the best possible reproducibility in interpretation among mappers. Following field mapping, the field sheets will be reviewed and missing codes or non-closed polygons corrected prior to processing.

Once the field mapping sheets are reviewed and edited, they will be scanned at a resolution of 300 dpi and then rectified to the 2011 geo-referenced NIAP county mosaics to remove distortion. After rectification, the habitat polygons will be digitized and coded in ArcGIS to produce a shape file and database with habitat perimeter and area by type and river mile. The data will then be extracted and summarized by count and area per site for analysis. Average flow at mapping for each detailed reach will also be extracted from USGS gauge data from Shiprock.

In addition, across stream transects will be resurveyed from the established benchmarks from 2013 at the inflow area of each modified RERI secondary channels and transects in the newly constructed channel. Each set of transects will be field surveyed using the permanent benchmarks such that a year to year variations can be determined. Surveys will occur at the time as the river wide mapping (post runoff).

Flows will be determined in the field for each inflow and outlet channel.

## DATA ANALYSIS

Data analysis will be the same whether photo-interpreted (river wide) or field mapped RERI sites). 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. Impacts of 2014 spring runoff will be determined by comparing late summer 2013 data from the same locations.

## RERI MAPPING SCHEDULE

The RERI mapping will occur in the late summer 2014. This will allow a comparison of the effects of two separate spring runoff events on the RERI sites.

## DELIVERABLES

1) Rectified habitat maps of RERI sites and controls
2) Polygon area, perimeter and geo-referenced location of nine habitat types
3) Date of mapping for each daily segment
4) Flow at mapping for each site
5) Antecedent runoff hydrograph for both years between mappings
6) Data summarized by site
7) Distance and elevation for each across stream transect. Map showing location of each transect
8) Inflow and outflow of each RERI channel

## TASK 3. WATER 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.

## WATER TEMPERATURE MONITORING

HOBO Water Temp Tidbit2 loggers have been deployed since fall of 2011 in the San Juan River and selected tributary streams (Table 2). The HOBO Water Temp Tidibit2 logger is accurate to ±0.2 C. These loggers can be quickly read by either the HOBO Optic Shuttle or OPTIC base station. The HOBOware Pro software is used to deploy and download the data from the logger. This software has built in capability to summarize data into daily values from the individual fifteen minute measurements. The following objectives are proposed for the project.

It was recommended that the water temperature monitoring in the San Juan River and the Animas River at Farmington, New Mexico be transferred to the USGS. During this transition we will keep the loggers in place to maintain the water temperature records. These loggers will be removed when USGS has the real time water temperature monitoring on line.

**Table 2.** Water temperature monitoring locations in the San Juan River.

| Location | Rivermile |
|---|---|
| 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 |

It was recommended that the water temperature monitoring in the San Juan River and the Animas River at Farmington, New Mexico be transferred to the USGS. During this transition we will keep the loggers in place to maintain the water temperature records. These loggers will be removed when USGS has the real time water temperature monitoring on line.

## DATABASE AND DATA ANALYSIS

After the fall logger 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.

There will be an additional analysis in FY2014 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.

**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 |

## PROPOSED METHODS

### Data Collection

The data collection will continue at the current locations with the HOBO Water Temp Tidbit2 loggers until USGS water temperature monitoring is online in the fall of 2013.

The final reading for FY2013 will be made at the end of September, 2013. At that time, we will redeploy the loggers and read them when they are removed later in the fall or winter of 2013.

The data from each logger will be checked at the deployment location to verify data download prior to proceeding to the next download location. The data will be transferred to computer at MEC's office after each field visit. Following each download, data will be quality checked and bad data removed. Vandalism, natural causes or equipment malfunction can cause loss of data that are beyond our control. Every attempt will be made to assure quality data within the scope described, but some missing data is likely inevitable. Data integrity similar to that in the existing database will be provided.

**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 eight 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.

**Table 5.** Temperature station description database table.

| ID | Location | Notes | Latitude | Longitude | Datum |
|---|---|---|---|---|---|
| 4C | Four Corners | Located at the Four Corners USGS gage | 37.00195 | -109.031 | NAD83 |
| AF | Animas at Farmington | Located at the Animas at Farmington USGS gage | 36.72154 | -108.202 | NAD83 |
| AR | Archuleta | Located at the Archuleta USGS gage | 36.80278 | -107.699 | NAD83 |
| FM | Farmington | Located at the Farmington USGS gage | 36.72221 | -108.225 | NAD83 |
| MH | Mexican Hat | Located right bank near the USGS mini-monitor enclosure upstream of Mex Hat bridge | 37.15059 | -109.867 | NAD83 |

**Data Analysis and Reporting**

After the fall logger 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

Annual

1) Daily 15-minute, maximum, minimum, and average water temperature
2) Daily mean flow at each USGS gage
3) An annual draft report prepared and submitted by March 31st of each year
   - A final report submitted by June 1 of each year
   - An updated temperature database with all data collected to date, updated through September 2014 by June 1, 2015.
   - Attendance at the annual report meeting and one additional Biology Committee meeting
   - Retrospective review of water temperature data for year data is available.
   - Comparision of larval capture rates, sizes and timing of capture with water temperatures.
   - Report summarizing the analysis
   - October 1, 2013 – September 30, 2014 data set from USGS gages for Recovery Program files

**Revised water temperature costs**

It is assumed that water temperature monitoring would be conducted by USGS as per the FY2013 report recommendations. The tasks for FY2014 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.

## 2014 BUDGET

| TASK | Labor | Direct Costs | Total by Task |
|---|---|---|---|
| **Task 1 River Habitat Mapping** | | | |
| Videography Clipping | $2,263.00 | | $2,263.00 |
| Image rectification | $21,400.00 | | $21,400.00 |
| Trip Preparation Printing/Sleeving Maps | $8,712.00 | $392.00 | $9,104.00 |
| Field Work | $22,320.00 | $3,150.00 | $25,470.00 |
| Digitizing Mapped River | $52,675.00 | | $52,675.00 |
| Back Water/ Embayment Identification | $2,905.50 | | $2,905.50 |
| Data Analysis | $5,793.00 | | $5,793.00 |
| Reporting | $6,168.25 | $178.50 | $6,346.75 |
| Meetings | $1,248.00 | $734.40 | $1,982.40 |
| | | | |
| **Task 2 RERI Monitoring** | | | |
| Field Mapping | $2,210.00 | $2,300.00 | $4,510.00 |
| Data Analysis | $6,533.00 | | $6,533.00 |
| Reporting | $4,837.25 | $170.00 | $5,007.25 |
| | | | |
| **Task 3 Water Temperature Monitoring** | | | |
| Logger Deployment | $0.00 | $0.00 | $0.00 |
| Quarterly monitoring | $0.00 | $0.00 | $0.00 |
| Data analysis | $9,600.00 | | $9,600.00 |
| Draft report | $4,200.00 | | $4,200.00 |
| Final report | $1,500.00 | | $1,500.00 |
| Meetings | $600.00 | | $600.00 |
| Final report data delivery | $600.00 | | $600.00 |
| **Total Cost Estimate** | **$153,565.00** | **$6,924.90** | **$160,489.90** |

**Peer Review for 2014**
**Fiscal Year 2013 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 2014. It is anticipated that the Panel will meet with the Biology Committee at three meetings during the year; the December 2013 Planning meeting, the February/March, 2014 Researcher's meeting, and a May, 2014 BC meeting (combined with the Coordination Committee) to draft 2015 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 FY2014 three to four times to review monitoring and research progress and to discuss scopes of work for 2015. 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-14:**
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 2014.

The total budget is distributed among the four peer reviewers through individual Services Contracts with Reclamation.

| | |
|---|---|
| Salaries: | $40,000 |
| Travel: | $15,000 |
| **Total** | **$55,000** |

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:**

| | |
|---|---|
| **2015** | **$55,000** |

**Program Coordinator's Office**
**Fiscal Year 2014 Draft Proposal**

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**Cooperative Agreement #:** R13PG40015
**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 and the 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 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 recommendation 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 responsibility for maintaining the database and produced and distributed CDs containing the updated Program database to the researchers 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 maintaining the 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 the Program database; maintained, performed quality control, annually updated, and distributed GIS researcher database using appropriate format as necessary; 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 Continue to develop a Standardized Database for all stocked and recaptured Colorado pikeminnow and razorback sucker in order to determine the fate of stocked fish.

Task 4.3.2.1 Continue to 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 various Program projects.

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 San Juan River Recovery Implementation Program's Database.
2. Maintain, perform Quality Control, annually update, and distribute current San Juan River Recovery Implementation 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 Office, Albuquerque, New Mexico).
4. Maintain and update SJRRIP 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 San Juan River Recovery Implementation Program's Database. Data will be checked for Quality Controlled and updated as necessary.
2. Contact and coordinate with appropriate personnel in the Upper Colorado River Basin 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 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 San Juan River Program works jointly with the Upper Colorado River Recovery Program (UCRRP) 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. Geographic reach of some of these audiences differ by Recovery Program.

Education and Outreach Mission

To support the SJR 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 UCRRP.

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 SJR Program activities with the Upper Basin Recovery Implementation Program.
2. Coordinate outreach activities with the Upper Basin Recovery Implementation Program; disseminate information on Program activities to the public through brochures, newsletters and/or the website.
3. Coordinate outreach activities with Water Users Student Fairs and local schools fairs.

| **Fiscal Year 2014 Budget** | **USFWS Funding** | **Program Base Funding** |
|---|---|---|
| **Personnel/Labor Costs (Federal Salary + Benefits):** | | |
| Program Coordinator (GS-13) 1248/832 hours@ 59.47/hr | $74,219 | $49,479 |
| Assistant Program Coordinator (GS-13) 1040/1040 hours@ 63.78/hr | 66,331 | 66,331 |
| Program Biologist (GS-11) 2080 hours @ 39.45/hr | -- | 82,056 |
| Program Assistant (GS-7) 832/832 hours @ 30.91/hr | 12,859 | 12,859 |
| USFWS IT-Support | 14,000 | -- |
| USFWS Budget Analyst | 15,000 | -- |
| | | |
| **Personnel Sub-total** | **$182,409** | **$ 210,725** |
| **Travel/Lodging & Per Diem (based on published FY-2013 Federal Per Diem Rates):** | | |
| Hotel – 40 days in Farmington, NM @ $77/night | | 3,080 |
| Hotel – 20 days in Durango, CO @ $95/night | | 1,900 |
| Hotel – 12 days in Denver, CO @ $149/night | | 1,788 |
| Hotel – 8 days in Las Vegas, NV @ $99 | | 792 |
| Per Diem – 40 days in Farmington, NM @ $46 | | 1,840 |
| Per Diem – 20 days in Durango, CO @ $61 | | 1,220 |
| Per Diem – 12 days in Denver, CO @ $66 | | 792 |
| Per Diem – 8 days in Las Vegas, NV @ $71 | | 568 |
| Per Diem – 20 days camping @ $29 night | | 580 |
| Registration Fee CRWUA $250 *2 | | 500 |
| Regional Office Travel To SJRIP | 12,000 | -- |
| | | |
| **Travel/Lodging & Pier Diem Subtotal** | **12,000** | **$ 13,060** |
| **Travel/Airfare & Mileage:** | | |
| Airfare to Denver, CO - $300 trip/4 trips | | 1,200 |
| Airfare to Las Vegas, NV - $600 trip/2 trips | | 1,200 |
| Mileage to Farmington - 20 trips@190mi/trip*18 MPG = 10.5gpt*4.00pg = $42.20)<br>Mileage to Durango - 12 trips@220mi/trip*18 MPG = 12.5gpt*4.00pg = $48.80) | | 844<br>586 |
| Rental Car @ $120/day*8 days | | 960 |
| | | |
| **Travel/ Airfare & Mileage Sub-Total** | -- | **$ 4,790** |

| | | |
|---|---|---|
| **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 |
| | | |
| **Equipment and Supplies Sub-total** | **$5,700** | **$ 15,910** |
| **Facilities Rental Costs for Meetings:** | | |
| Farmington@ $100/day *35 | | 3,500 |
| Durango @$300/day *15 | | 4,500 |
| | | |
| **Facilities Rental Sub-Total** | **--** | **$ 8,000** |
| | | |
| **Budget Subtotal** | **$200,109** | **$252,484** |
| **Administrative charge (3%)** | | **$7,575** |
| **FY2014 Total** | **$200,109** | **$260,059** |
| **Carry-Over** | | **$50,000** |
| | | |
| **Grand Total** | **$200,109** | **$210,059** |

# FY 2014 Reclamation San Juan River Basin Recovery Program Base Funds and Contract 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 30—40 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 FY14

### 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 | 600 | $54,000.00 |
| Lead Contract Officer | $120.00 | 1 | 40 | $4,800.00 |
| Contract Specialist | $70.00 | 1 | 600 | $42,000.00 |
| Contract and agreement Auditor | $120.00 | 1 | 100 | $12,000.00 |
| Agreement specialist | $55.00 | 2 | 800 | $44,000.00 |
| Total | | | | $160,400.00 |

** 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 officer | Farmington, Durango | CC/BC mtg., or contract admin | 1 trips @ 2 days | $100/$200 | $50/$200 | $100 | $2,000 | $1,500.00 |
| 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-2014**

| | |
|---|---|
| Total labor | $160,400.00 |
| Total travel | $11,255.00$11,255.00 |
| **Grand total** | **$171,655.00**[1] |

[1] **This total budget represents a 6.8% increase over the FY2013 budget due to higher contracting costs from oversight in Denver.**