

Nonnative Species Monitoring and Control from Shiprock, New Mexico to Mexican Hat, Utah San Juan River

Fiscal Year 2018 Project Proposal

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Goal

Continue to quantify effects of nonnative fish removal by raft-mounted electrofishing on native and nonnative fishes in the San Juan River and to inform the San Juan River Basin Recovery Implementation Program's Biology Committee on the utility and practicality of the nonnative fish removal program.

Link to Long Rang Plan

Reducing the impacts of nonnative fishes has been identified as a critical Program Element in the San Juan River Basin Recovery Implementation Program's Long Range Plan (2015). Goals, Actions, and Tasks associated with this Element and encompassed within this scope of work include:

Goal 3.1—Control Problematic Nonnative Fishes

Action 3.1.1 Develop, implement, and evaluate the most effective strategies for reducing problematic nonnative fish.

Task 3.1.1.1 Mechanically remove nonnative fish to achieve objectives.

Task 3.1.1.3 Remove nonnative fish during Program research and monitoring activities.

Task 3.1.1.4 Conduct annual review of the success of the nonnative fish control strategy.

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 (*Ptychocheilus lucius*) and Razorback

Sucker (*Xyrauchen texanus*). Additional Long Range Plan Actions and Tasks associated with this task include, but are not limited, to the following:

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

Action 4.1.3 Collect data on the endangered 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.

Overview

Since implementation of annual intensive nonnative fish removal in 2000, the structure of the fish community in the San Juan River has changed substantially (Franssen et al. 2014a). On an annual basis, Colorado Pikeminnow and Razorback Sucker densities (i.e., CPUE) have increased over time, nonnative Common Carp (*Cyprinus carpio*) densities have decreased, and Channel Catfish (*Ictalurus punctatus*) densities have decreased but only in upper reaches of the river (Franssen et al. 2014a, Franssen et al. 2014b). However, the relative contribution of nonnative fish removal via electrofishing, other management actions and environmental factors in driving these changes is unclear. For example, establishing a causal linkage between nonnative fish removal or other management actions (e.g., flow manipulation, habitat restoration) and changes in endangered fish densities is difficult due to the heavily augmented nature of these populations. Conversely, temporal variation (or the lack of) in the densities of nonnative fishes following removal efforts are potentially more directly related, but this variation is also not exempt from other environmental factors (e.g., flow variation and reduced immigration). Given the spatial and temporal inconsistencies of past nonnative fish removal efforts as well as the multiple biotic and abiotic factors contributing to temporal variation in densities of fishes, it is not surprising effects of this management action have been difficult to elucidate.

Based on annual population estimates of Channel Catfish (Duran 2015 and Hines 2015), it is readily apparent the level of nonnative fish removal effort previously put forth will likely not suppress recruitment enough to induce system-wide population decline of this species. Nonetheless, removing individual Channel Catfish from the river by definition lowers their densities, which has the potential to positively impact endangered fishes through reduced competition or predation as well as negatively through deleterious effects of electrofishing on native fishes. Yet, these potential direct (or indirect) effects of the San Juan River's nonnative fish removal program has been difficult to assess due to the complications mentioned above. Therefore, in FY16 we proposed to redesign the nonnative fish removal efforts to evaluate by what factor and for how long Channel Catfish densities were lowered and the responses of native fish densities to electrofishing and nonnative fish removal.

Preliminary data analysis from 2016 showed a general increase in Channel Catfish CPUE over time in the furthest most upstream study reach but decreased CPUE in the lower reaches. Additionally, size structure of Channel Catfish decreased over time in only the three upper removal reaches. Exploitation rates were generally higher in the three upper reaches of the study area. Increased effort in the upper reaches of the study area, much of it focused prior to spring runoff, resulted in a 2.5x increase in hours of electrofishing per river mile compared to previous efforts and a corresponding 2 to 6x increase in juvenile Channel Catfish exploitation rates and a 2 to 3x increase in adult Channel Catfish exploitation rates. In spite of these high exploitation rates, we did not detect riverwide population level declines in Channel Catfish; however, these data were likely confounded by prolonged high spring release flows and higher than average rates of Channel Catfish movement. Continued implementation and evaluation of this more structured nonnative fish removal should provide the San Juan River Basin Recovery and Implementation Program with a clearer scientific evaluation of the effects of the nonnative removal program on native and nonnative fishes in the San Juan River.

To that end, on December 1, 2016 the SJRIP conducted a Nonnative Fish Removal Workshop where results from the 2016 removal efforts were presented and discussed among participants from the Biology Committee and peer reviewers. As a result of these discussions, the Biology Committee developed several options for nonnative removal in 2017 and a ranking system was developed to determine the preferred option. This ranking process resulted in a recommendation by the Biology Committee to move forward with nonnative removal in 2017. Key components to the preferred choice included focusing efforts prior to spring runoff (based on 2016 results), conducting pre and post removal population estimates for Channel Catfish, Razorback Sucker, and Colorado Pikeminnow; and continuing to have both control and treatment reaches. FY18 represents the third year of this revised study design.

Objectives

1. Spatially demarcate removal and control reaches on the San Juan River in order to statistically evaluate responses of fishes to nonnative fish removal via electrofishing.
2. Assess Channel Catfish CPUE and size distributions within removal reaches over time using nonnative fish removal data.
3. Compare Channel Catfish, Razorback Sucker, and Colorado Pikeminnow CPUE between control and treatment reaches using sub-adult and adult fish community monitoring, and nonnative fish removal data.
4. Compare Channel Catfish, Razorback Sucker, and Colorado Pikeminnow population estimates (pre and post removal).
5. Compare Channel Catfish size distributions between control and removal reaches using sub-adult and adult fish community monitoring, and nonnative fish removal data.
6. Quantify movement of tagged Channel Catfish among treatment and control reaches over the summer.

Hypotheses

1. **H₀:Nonnative fish removal does not alter the CPUE of Channel Catfish over time.**
2. **H₀:Nonnative fish removal does not change the estimates of population sizes in removal reaches over time.**
3. **H₀:Nonnative fish removal does not alter the size structure of Channel Catfish over time.**
4. **H₀:Nonnative fish removal does not alter the CPUE of Channel Catfish in removal reaches compared to control reaches (after controlling for initial CPUE).**
5. **H₀:Nonnative fish removal does not alter the size structure of Channel Catfish in removal reaches.**
6. **H₀:Nonnative fish removal does not alter the CPUE of Colorado Pikeminnow and Razorback Sucker Catfish in removal reaches.**
7. **H₀:Channel Catfish do not move among reaches.**

Methods

Study design

The proposed nonnative fish removal design will be used to address questions about the ability of electrofishing to affect CPUE and size structures of Channel Catfish, and alter the densities of endangered fishes.

The study design for FY18 will follow a protocol similar to FY 2017. The river between Shiprock, NM and Mexican Hat, UT will be stratified by geomorphic reach to help control for natural longitudinal variation in fish densities (Figure 1). Within each geomorphic reach, the river will be further divided into treatment and control reaches (i.e., geomorphic reach 3 will contain two removal and control reaches). Because of the different agencies involved with nonnative removal, reaches in the upper parts of the river will undergo 18 passes (each pass is two electrofishing rafts on each shore) of removal effort and at least eight passes in the lower reach (i.e., NMFWCO upper section and Utah Department of Wildlife Resources (UDWR) lower section; Figure 1) each year. The disparate removal efforts between the upper and lower reaches will necessitate analyzing these reaches separately. Lengths of treatment and control sub-reaches within each geomorphic reach will be demarcated to maximize the sample size of collections used for comparisons to increase statistical power (mean sample size = 13, range = 7-23). No electrofishing will take place in control reaches (except for the two marking and two recapture passes, see below).

Removal and tagging protocol

All nonnative fish removal efforts will occur between March and September before annual sub-adult and adult fish community monitoring (i.e., fall monitoring) and efforts will be made to limit the amount of electrofishing during spawning periods of Colorado Pikeminnow (Table 1). To generate a pre and post removal population estimate, the first and last passes of the year between Shiprock Bridge, NM and Mexican Hat, UT will be used to tag Channel Catfish and quantify relative abundance (CPUE; fish/hr of electrofishing), and sizes of Channel Catfish, Colorado Pikeminnow, and Razorback Sucker in each river mile. The tagging trip in the spring will take place one week prior to all removal events. The tagging trip will consist of two electrofishing rafts collecting all nonnative fishes, as well as Colorado Pikeminnow and Razorback Sucker at one river mile intervals throughout the entire section of river, both treatment and control sections. All Channel Catfish ≥ 200 mm total length will be tagged with individually numbered floy tags and released back to the river. To generate a pre-removal population estimate, the first removal event post tagging in the spring will sample the entire section of river from Shiprock Bridge, NM to Mexican Hat, UT., including control reaches. All nonnative fishes collected in control reaches during this trip will be released back to the river. All other subsequent trips will collect and remove Channel Catfish in only the treatment reaches at every three river miles and quantify size structure of Channel Catfish in each reach (all fish will be measured from samples until at least 150 individuals are measured in each reach). All endangered fishes will be collected, measured and PIT tagged if untagged. To generate a post-removal population estimate, the last pass of the study period that would take place in September a week prior to fall monitoring will be substituted to a tagging trip with the same tagging protocol as the spring tagging event. The fall monitoring trip, which samples the entire section of river, will serve as the recapture event post-tagging.

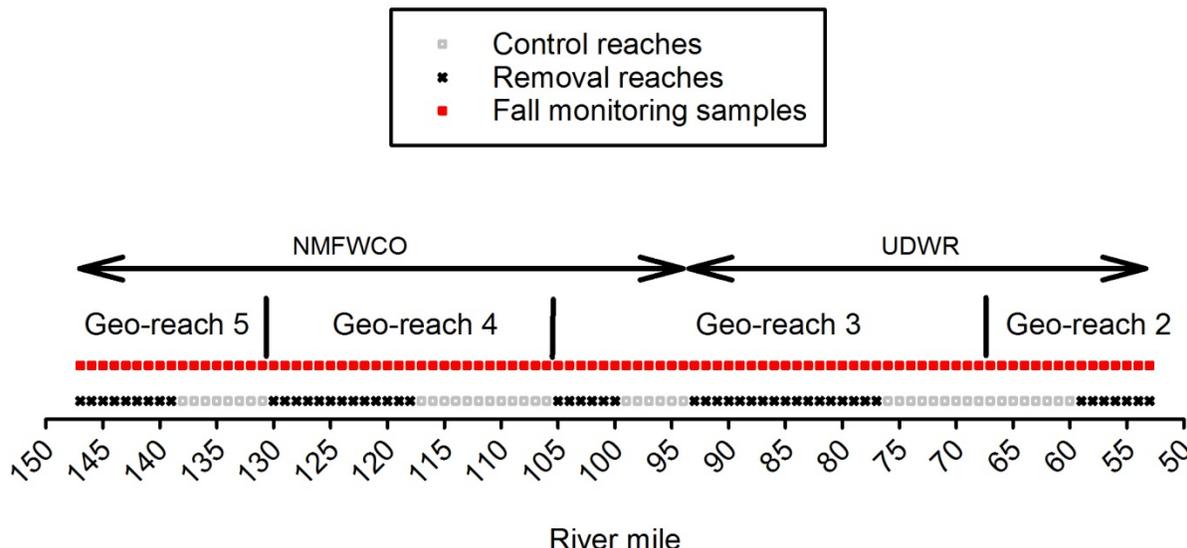


Figure 1. Proposed study area from Shiprock Bridge, NM (RM 147.9) to Mexican Hat, UT (RM 52), detailing treatment (black) and control (grey) sub-reach river miles by geomorphic reach. The red squares identify river miles that will be sampled by large-bodied monitoring in fall 2017 and used in statistical analyses. The proposed spatial effort extended by each agency is denoted.

Table 1. Example of how the timing of the proposed tagging and removal trips may be scheduled in the upper study reaches (USFWS – NMFWCO). Single removal passes are denoted with an “X”, multiple pass efforts are denoted with an “XX”, and sub-adult and adult fish community monitoring is denoted with an “*”.

	March	April	May	June	July	August	September
Week							
1		XX	XX				
2	Tagging	XX	XX				Tagging
3	XX	XX					*
4	XX	XX				XX	*

Table 2. Example of how the timing of the proposed tagging and removal trips may be scheduled in the lower study reaches (UDWR Moab). Single removal passes are denoted with an “X”, multiple pass efforts are denoted with an “XX”, and sub-adult and adult fish community monitoring is denoted with an “*”.

	March	April	May	June	July	August	September
Week							
1		XX				X	
2	Tagging	X					Tagging
3	X						*
4	XX					X	*

Due to the disparate removal efforts between the upper and lower sections of the river (i.e., 18 vs 8 passes respectively), we will analyze the two reaches separately. Below we include the primary questions we will address, data sets needed for analyses, and the general structure of statistical analyses that will be applied to the upper and lower reaches. Other potential covariates that may affect sampling efficiency can be included if deemed necessary (e.g., secchi depth, stream discharge at sampling, etc.).

*Data Analysis and Hypothesis Testing***1) Does the CPUE of Channel Catfish vary over time in removal reaches?**

H₀: Nonnative fish removal does not alter the CPUE of Channel Catfish over time.

Prediction: The CPUE of Channel Catfish will decrease over time in removal reaches.

-Calculate the mean CPUE of Channel Catfish in each removal reach (using 1 RM as the sample unit from the first and last pass, and 3 RM for each removal pass) from each trip (n = 11 upper reach, n = 9 lower reach).

-Test for temporal variation in CPUE using nonparametric correlations

2) Do Channel Catfish, Razorback Sucker, and Colorado Pikeminnow population sizes vary over time in removal and control reaches?

H₀: Nonnative fish removal does not change the estimates of population sizes in removal reaches over time.

Prediction: The population size of Channel Catfish will decrease over time in removal reaches

-Assess if 95% CI from Lincoln-Peterson population estimates in each reach overlap between the start and end of the experiment.

3) Does the size structure of Channel Catfish vary over time in removal reaches?

H₀: Nonnative fish removal does not alter the size structure of Channel Catfish over time.

Prediction: Nonnative fish removal will decrease the size structure of Channel Catfish in removal reaches.

-Calculate the median Total Length (TL) of Channel Catfish in each removal reach during each removal period (n = 11 upper reach, n = 8 lower reach).

-Test for temporal variation in size structure using nonparametric correlations between median TL and trip number.

4) Does nonnative fish removal alter the density of Channel Catfish in removal reaches relative to control reaches?

H₀: Nonnative fish removal does not alter the CPUE of Channel Catfish in removal reaches compared to control reaches (after controlling for initial CPUE).

Prediction: The CPUE of Channel Catfish will be lower in removal reaches compared to control reaches (after controlling for initial CPUE).

-Subtract the starting CPUE from the ending CPUE in each RM

-Use ANOVAs to test for variation in Δ CPUE among all reaches for each size class. Significant effects will be assessed with post hoc tests (independent t-tests) between each paired treatment and control reach.

5) Does nonnative fish removal alter the size structure of Channel Catfish in removal reaches relative to control reaches?

H₀: Nonnative fish removal does not alter the size structure of Channel Catfish in removal reaches.

Prediction: The mean length of Channel Catfish will be smaller in removal reaches compared to control reaches.

-Use a nonparametric Kruskal-Wallis test to compare TL from the first pass in each removal reach to the last pass in the removal reach, as well as the first and last passes in the control reaches.

6) Does nonnative fish removal affect the density of endangered fishes (i.e., Colorado Pikeminnow and Razorback Sucker) in removal reaches compared to control reaches?

H₀: Nonnative fish removal does not alter the CPUE of Colorado Pikeminnow and Razorback Sucker Catfish in removal reaches.

Prediction: The CPUE of Colorado Pikeminnow and Razorback Sucker will be higher in removal reaches compared to control reaches (after controlling for initial CPUE).

-Subtract the starting CPUE from the ending CPUE in each RM

-Use ANOVAs to test for variation in Δ CPUE among all reaches for each species (and size class). Significant effects will be assessed with post hoc tests (independent t-tests) between each paired treatment and control reach.

7) What is the rate of Channel Catfish migration into treatment reaches?

H₀: Channel Catfish do not move among reaches.

Prediction: Channel Catfish will move among reaches with more movement upstream compared to downstream.

-Calculate the rate of Channel Catfish movement from recaptured individuals over time.

-Test the calculated rate of movement against a predicted rate of zero using a Wilcoxon sign-rank test.

Summary

Management decisions regarding the nonnative fish removal program on the San Juan River have been hindered by the lack of a rigorous study design that impedes our ability to assess the usefulness of the program. A more structured removal design will allow for a thorough assessment of the level the program can reduce densities of Channel Catfish as well as the potential subsequent response of endangered fishes. While having control reaches may seem counterproductive to reducing densities of nonnative fishes, we think it is necessary to provide a scientifically sound test of the efficacy of the program and provide useful

information on the effects of electrofishing on endangered fishes. However, effort will be increased in removal sub-reaches, the overall numbers of Channel Catfish removed will likely remain similar or be increased relative to previous annual removal efforts.

Although this study design is substantially altered compared to previous nonnative fish removal protocols (i.e., prior to FY16), similar data analyses that have been conducted in previous years will still be available with this design (e.g., Channel Catfish population estimates, exploitation rates).

Deliverables

Data will be entered, analyzed, and presented to the SJRIP Biology Committee at a workshop following the 2018 field season. A draft report will be submitted to the Program Office by 31 March 2019 and a final report will be completed by 1 June 2019. All data will be submitted to the Program Office by 31 December 2018.

Outyear Budgets:

FY 18 \$549,520.64 ** Funding included for nonnative removal across all Agencies and Agreement Numbers

Appendix 1. Shiprock to Montezuma Creek (18 passes; two tagging trips)

USFWS – NMFWCO	\$179,305.97
USFWS – GJFWCO	\$91,419.05
ASIR – Albuquerque	\$49,368.00
UDWR – Moab	\$15,271.00
NMDGF	\$12,814.00
NNDFW	\$6,643.03
Sub-Total for Upper Section	\$354,821.05

Appendix 2. Montezuma Creek to Mexican Hat (8 passes, 2 tagging trips)

UDWR – Moab	\$159,718.00
USFWS- GJFWCO	\$18,894.48
NMDGF	\$6,604.00
NNDFW	\$9,480.10
Sub-Total for Lower Section	\$194,699.59

**** The following budget reflects the cost associated with all FY 2018 tagging and nonnative fish removal efforts from Shiprock, New Mexico downstream to Mexican Hat, Utah. Two budgets submitted by Utah Department of Wildlife Resources include 1) assisting FWS-NMFWCO with removal from Shiprock, NM to Montezuma Creek, UT (Appendix 1) and 2) UDWR-Moab's led efforts from Montezuma Creek to Mexican Hat, UT (Appendix 2). Disbursement of funds will be under agency specific agreements with the Bureau of Reclamation – Salt Lake City, UT.**

Literature Cited

Duran, B.R. 2015. Endangered fish monitoring and nonnative species monitoring and control in the upper/middle San Juan River: 2014. Final report to the San Juan River Basin Recovery Implementation Program. Albuquerque, New Mexico.

- Franssen, N.R., S.L. Durst, K.B. Gido, D.W. Ryden, V. Lamarra, and D.L. Propst. 2014a. Long-term dynamics of large-bodied fishes assessed from spatially intensive monitoring of a managed desert river. *River Research and Applications* doi: 10.1002/rra.2855
- Franssen, N.R., J.E. Davis, D. Ryden and K.B. Gido. 2014b. Fish community responses to mechanical removal of nonnative fishes in a large southwestern river. *Fisheries* 39:352–363.
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APPENDIX 1

PARTICIPATING AGENCIES BUDGETS FOR FY 18 NONNATIVE SPECIES MONITORING AND CONTROL FROM SHIPROCK, NM TO MONTEZUMA CREEK, UT

U.S. Fish and Wildlife Service - New Mexico Fish and Wildlife Conservation Office							
FY 2018							
Endangered Fish Monitoring and Nonnative Fish Removal and Control							
Labor Cost - Removal							
Position	Grade/Step	Hourly Rate	Fringe	Salary w/ Benefits	Hours/Day	Total Days	Sub-total
Fish Biologist	GS 9/7	\$29.41	26.41%	\$37.17	9	80	\$26,765.07
Fish Biologist	GS 7/1	\$19.89	28.00%	\$25.45	9	24	\$5,497.80
Fish Biologist	GS 11/7	\$35.58	25.54%	\$44.66	9	30	\$12,059.36
Supervisory Fish Biologist	GS 13/6	\$49.30	28.28%	\$63.24	9	30	\$17,075.35
Bio. Science Techs (2 people)**	GS 5/1	\$16.17	20.00%	\$19.41	9	160	\$27,949.54
Labor Cost - Tagging							
Fish Biologist	GS 9/7	\$29.41	26.41%	\$37.17	9	8	\$2,676.51
Supervisory Fish Biologist	GS 14/9	\$63.25	26.93%	\$80.29	9	6	\$4,335.48
Fish Biologist	GS 11/7	\$35.58	25.54%	\$44.66	9	6	\$2,411.87
Bio. Science Techs (2 people)**	GS 5/1	\$16.17	20.00%	\$19.41	9	16	\$2,794.95
Administrative and Reporting							
Fish Biologist	GS 9/7	\$29.41	26.41%	\$37.17	9	55	\$18,400.98
Bio. Science Techs (2 people)**	GS 5/1	\$16.17	20.00%	\$19.41	9	40	\$6,987.38
Supervisory Fish Biologist	GS 13/6	\$49.30	28.28%	\$63.24	9	5	\$2,845.89
Administrative Officer	GS 9/8	\$30.23	26.12%	\$38.12	9	5	\$1,715.52
						Total Labor	\$131,515.71
Travel and Per Diem							
	Days	Rate					Sub-total
Hotel Costs	45	\$91.00					\$4,095.00
Per Diem (Hotel Rate/Travel Day)	95	\$38.25					\$3,633.75
Per Diem (Camping Rate)	200	\$29.00					\$5,800.00
						Total Travel/Per Diem	\$13,528.75
Equipment							
	Miles/Qty	Total Miles	Rate				Sub-total
Shuttle Costs	55		\$200.00				\$11,000
5 trucks x 11 trips							
Vehicle Fuel							
3 trucks x 8 trips - ABQ to Montezuma Creek, UT - 545mi RT	545	13,080	\$0.54				\$7,063.20
2 trucks x 3 trips - ABQ to Montezuma Creek, UT - 545mi RT	545	3,270	\$0.54				\$1,765.80
Generator Fuel							
60 gallons x 11 trips - based on ave. price for premium fuel 2/8/17	660		\$2.50				\$1,650.00
Maintenance, repair, replace							
(i.e. life jackets, waders, generator repair/replacement, dip nets, etc.)							\$5,000.00
Tagging Equipment							
3,000 Floy t-Bar Anchor Tags (FD)	3000		\$0.74				\$2,220.00
Ten (10) Replacement Needles	10		\$10.00				\$100.00
Pistol Grip Tagging Gun	4		\$60.00				\$240.00
						Equipment	\$29,039.00
						Sub-total for Nonnative Fish Removal - NMFWCO only	\$174,083.46
						Administrative Overhead (3%)	\$5,222.50
						Total of FWS - NMFWCO	\$179,305.97

U.S. Fish Wildlife Service, Colorado River Fishery Project (USFWS-CRFP)
Budget for Participation in
Non-native Species Control in the *Upper* San Juan River
Fiscal Year 2018 Project Proposal
(Shiprock, NM to Montezuma Creek, UT)

Personnel/Labor Costs (Federal Salary + Benefits)										
Description	Rate/HR	PEOPLE	DAYS	Trips	HRS	OT HRS	SUB TOTAL	OT SUB TOTAL	TOTAL	
Principal Biologist (GS-11/7) – 144 hours (1 person X 6 days/trip X 3 camping trips)	\$53.24	1	6	3	144		\$7,666.09		\$7,666.09	
Bio. Tech. Crew Leader (GS-7/4) – 144 hours (1 person X 6 days/trip X 3 camping trips (+ 20 hours overtime/trip X 3 trips)	\$35.91 \$53.87	1	6	3	144 20	60	\$5,171.14	\$3,231.96	\$8,403.10	
Bio. Tech. Crew Leader (GS-6/3) – 144 hours (1 person X 6 days/trip X 3 camping trips (+ 20 hours overtime/trip X 3 trips)	\$28.45 \$42.68	1	6	3	144 20	60	\$4,096.86	\$2,560.85	\$6,657.71	
Biological Technicians (GS-5/1) – 960 hours @ \$23.02/hr (2 people X 6 days/trip X 3 camping trips (2 people X 6 days/trip X 7 camping trips (+ 20 hours OT/trip X 10 trips X 2 people)	\$23.37 \$23.37 \$35.05	2	6	3	288 672 20	400	\$6,729.21 \$15,701.48	\$14,019.18	\$36,449.87	
Personnel and Labor									\$59,176.77	
Administrative Support (Federal Salary + Benefits)										
Description	Rate/HR	PEOPLE	DAYS	HRS						TOTAL
Administrative Officer (GS-9/8) – 60 hours @ \$42.14/hr	\$42.77	1		60						\$2,566.33
Project Leader (GS-14/6) – 60 hours @ \$80.95/hr	\$82.16	1		60						\$4,929.86
Admin Support Total									\$7,496.18	
Travel and Per Diem (Based on Published FY-2017 Federal Per Diem Rates)										
Description	RATE	PEOPLE	NIGHTS	Trips	Sub Total					TOTAL
Hotel – 1 night in Cortez, CO @ 4 people/trip X 3 trips	\$114.00	4	1	3	\$1,368.00					\$1,368.00
Hotel – 1 night in Cortez, CO @ 2 people/trip X 7 trips	\$114.00	2	1	7	\$1,596.00					\$1,596.00
Per Diem (Hotel Rate) – 1 day in Cortez, CO X 4 people	\$59.00	4	1	3	\$708.00					\$708.00
Per Diem (Hotel Rate) – 1 day in Cortez, CO X 2 people	\$59.00	2	1	7	\$826.00					\$826.00
Per Diem (Camp Rate) – 5 days X 4 people/trip X 3 trips	\$59.00	4	5	3	\$3,540.00					\$3,540.00
Per Diem (Camp Rate) – 5 days X 2 people/trip X 7 trips	\$59.00	2	5	7	\$4,130.00					\$4,130.00
Travel & Per Diem Total									\$12,168.00	
Equipment & Supplies										
Vehicle Maintenance & Gasoline (@ \$365/month lease = \$12.17 per day based on 30 days in an "average" month + \$0.42/mile)										
Vehicle Mileage	TRUCKS	DAYS	Trips	MILEAGE	GAS/MILE					TOTAL
GJ to Cortez to Shiprock to Montezuma Creek, to GJ	2		3	600	\$0.43					\$1,534.68
GJ to Cortez to Shiprock to Montezuma Creek, to GJ	1		7	600	\$0.43					\$1,790.46
Vehicle Lease										
GJ to Cortez to Shiprock to Montezuma Creek, to GJ	2	6	3		\$12.35					\$444.69
GJ to Cortez to Shiprock to Montezuma Creek, to GJ	1	6	7		\$12.35					\$518.81
Generator Gas	BOATS	DAYS	Gal/day	Trips	GAS \$/GAL					TOTAL
San Juan River Shiprock to Montezuma Creek	1	5	5	10	\$2.51					\$626.76
Vehicle Maint. & Gas Total									\$4,915.40	
Equipment Maintenance, Repair, & Replacement										
Equipment Maintenance, Repair, & Replacement	Exact use of the money in this section of the budget will vary from year to year depending on what equipment needs to be maintained, repaired, or replaced, but use of									

Under the heading "Funding for participation of other agencies." Cost for participation of American Southwest Ichthyological Researchers, LLC – Albuquerque, NM in FY-2018 nonnative removal activities

2018 BUDGET: SAN JUAN RIVER NON-NATIVE FISH REMOVAL
 Based on eight sampling trips per year: Shiprock to Mexican Hat

Personnel

Field Data Collection

Shiprock to Mexican Hat - RM 148.0 - 53.3

Fisheries Biologist I (2 staff x 8 trips x 5 days x 8 hrs/day at \$ 57.18/hr):..... \$ 36,595

Project Oversight

Senior Fisheries Biologist (1 staff x 4 days x 8 hrs/day at \$ 96.77/hr):..... \$ 3,097

Tasks: Project coordination and management.

Personnel: Total \$ 39,692

Materials and Supplies

Rafts and associated sampling gear supplied by USFWS
 Personal camping gear (*In kind contribution*)

Materials and Supplies: Total \$ 0

Travel and Per Diem

Travel

Travel - (1 vehicle x 8 trips x 625 miles x \$ 0.54/mile):\$ 2,700
 (roundtrip Albuquerque to Montezuma Creek, shuttle to Mexican Hat and return) ¹

Travel - (1 vehicle x 8 commercial shuttles x 180/per shuttle):\$ 1,440

Per Diem

Per Diem - 1 hotel day per trip x 8 trips x 2 staff (\$ 91/night GSA lodging rate):\$ 1,456

Per Diem - 5 field days per trip x 8 trips x 2 staff (\$ 51/day GSA M&IE rate):\$ 4,080

Travel and Per Diem: Total \$ 9,676

2018 Project Totals

Personnel: Total \$ 39,692

Materials and Supplies: Total \$ 0

Travel and Per Diem: Total \$ 9,676

2018 Scope of Work: GRAND TOTAL \$ 49,368

FY 2018 Costs for UDWR- Moab
Participation in Middle San Juan River (Shiprock to Montezuma Creek) Nonnative Control (6 people X 5 days)
Labor: salary + benefits + applicable overtime (personnel services)

	Rate	Hours	Cost
Project Leader	\$35.31	20	\$706
Biologist	\$32.57	80	\$2,606
Technician	\$17.11	340	\$5,817
		subtotal	\$9,129

Food and Transport (current expense)

	Rate	Quantity	Cost
Fleet Costs (2 trucks for 5% of total fleet costs)	\$40,800.00	0.050	\$2,040
In-state per-diem (6 people X 5 days)	\$41.00	30	\$1,230
Hotel in Bluff, UT	\$100.00	3	\$300
		subtotal	\$3,570

Equipment (current expense)

	Rate	Quantity	Cost
Camping gear repair/replacement:			\$300
Sampling gear repair/replacement:			\$300
Boating gear repair/replacement:			\$300
Fuel for generators	\$4.00	30	\$120
		subtotal	\$1,020

Total Expenses **\$13,719**

Administrative Overhead (17% on all personnel services) **\$1,552**

UDWR-Moab Total FY 2018 **\$15,271**

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

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

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

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

Under the heading "Funding for participation of other agencies." Cost for participation of New Mexico Department of Game and Fish in FY-2018 Endangered Fish Monitoring and Nonnative Fish Control activities (Shiprock, NM to Montezuma Creek, UT).

Sampling

Personnel

Tasks - Assist USFWS New Mexico Fish and Wildlife Conservation Office with Endangered Fish Monitoring and Nonnative Fish Control from Shiprock, NM to Montezuma Creek, UT; 1 project biologist for 4 trips at 5 days per trip (20 total days), field days projected at 10 hours of work per day = 160 regular hours and 40 overtime hours (200 hours total).

Project Biologist (1)

160 hrs regular @ \$37.13/hr (\$26.99/hr (base salary) + \$10.14 (benefits))	\$ 5,941
40 hrs overtime @ \$55.69/hr (\$37.13/hr * 1.5 (time-and-a-half))	\$ 2,228

Sub-total	\$ 8,169
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Per Diem

12 days @ \$85/day (standard NM in-state rate)	\$ 1,020
8 days @ 115/day (standard NM out-of-state rate)	\$ 920

Sub-total	\$ 1,940
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Vehicles

Round-trip Farmington/Shiprock, NM – 700 miles @ \$0.55/mile x 4 trips	\$ 1,540
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Sub-total	\$ 1,540
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FY 2018 Total

NMDGF - Santa Fe	\$ 11,649
Administrative Overhead (10%)	\$ 1,165

Total	\$ 12,814
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Under the heading "Funding for participation of other agencies." Cost for participation of the Navajo Nation Department of Fish and Wildlife in FY-2018 nonnative removal activities (Shiprock, NM to Montezuma Creek, UT).

Personnel/Labor Costs (Salary + Benefits)	
Fish Biologist – 10 days @ \$169.44/day (1 person x 5 days x 2 trips)	\$ 1,694.40
Biological Technician – 10 days @ \$92.80/day (1 person x 5 days x 2 trips)	\$ 928.00
	Sub-Total <u>\$2,622.40</u>
Fringe Benefits X 48.7%	\$ 1,277.11

Total Personnel/Labor \$ 3,899.51

Sub-total with 3% added for inflation \$4,016.49

Travel (Vehicle shuttling)	
Vehicle Lease/Maintenance & Gasoline \$15.33/day X 12 days = \$183.96 + 2 X 36miles X .28/mile=\$20.16 (36 miles round trip from Fruitland, NM to Shiprock x 6 trips)	\$ 204.12
Per Diem Meals 10 days X \$51.00/day	\$ 510.00

Total Travel \$ 714.12

Sub-total with 3% added for inflation \$ 735.54

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	\$5,782.03
Navajo Fish and Wildlife Administrative Overhead (17.5%)	\$ 861.00
Navajo Nation Total	\$6,643.03

APPENDIX 2

PARTICIPATING AGENCIES BUDGETS FOR FY 18 NONNATIVE MONITORING AND CONTROL FROM MONTEZUMA CREEK TO MEXICAN HAT, UT

FY 2018 Costs for UDWR- Moab			
San Juan River Nonnative Removal (Montezuma Creek to Mexican Hat: 9 passes)			
<u>Labor: salary + benefits + applicable overtime (personnel services)</u>			
	Rate	Hours	Cost
Project Leader	\$35.31	225	\$7,945
Biologist	\$32.57	1400	\$45,604
Technician	\$17.11	2800	\$47,903
		subtotal	\$101,452
<u>Food and Transport (current expense)</u>			
	Rate	Quantity	Cost
Fleet Costs ^a (3 trucks for 25% of total fleet costs)	\$40,800.00	0.25	\$10,200
Food (6 people, 5 days, 9 passes)	\$30.00	270	\$8,100
Shuttle (3 trucks, 9 passes plus 4 others)	\$105.00	31	\$3,255
Out-of-state per diem (Biologist and Project Leader)	\$46.00	12	\$552
Hotel- Durango (Biologist and Project Leader)	\$95.00	8	\$760
		subtotal	\$22,867
<u>Equipment (current expense)</u>			
	Rate	Quantity	Cost
Camping gear repair/replacement ^b :			\$5,625
Sampling gear repair/replacement ^c :			\$4,557
Boating gear repair/replacement ^d :			\$3,950
Fuel for generators (20 gallons/pass)	\$4.00	180	\$720
		subtotal	\$14,852
<u>Other</u>			
	Rate	Quantity	Cost
Swiftwater Rescue Training	\$350.00	2	\$700
Juniper System Data Logger	\$2,600.00	1	\$2,600
		subtotal	\$3,300
Total Expenses			\$142,471
Administrative Overhead (17% on all personnel services)			\$17,247
UDWR-Moab Total			\$159,718

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 2018 Project Proposal
(Montezuma Creek to Mexican Hat, UT)

Personnel/Labor Costs (Federal Salary + Benefits)										
Description	Rate/HR	PEOPLE	DAYS	Trips	HRS	OT HRS	SUB TOTAL	OT SUB TOTAL	TOTAL	
Principal Biologist (GS-11/7) – 80 hours (1 person X 5 days/trip X 2 trips)	\$53.24	1	5	2	80		\$4,258.94		\$4,258.94	
Bio. Tech. Crew Leader (GS-7/4) - 80 hours (1 person X 5 days/trip X 2 trips (+ 15 hours OT/trip X 2 trips X 1 person)	\$35.91 \$53.87	1	5	2	80 15	30	\$2,872.86	\$1,615.98	\$4,488.84	
Bio. Tech. Crew Leader (GS-6/3) – 80 hours (1 person X 5 days/trip X 2 trips (+ 15 hours OT/trip X 2 trips X 1 person)	\$28.45 \$42.68	1	5	2	80 15	30	\$2,276.04	\$1,280.42	\$3,556.46	
Personnel & Labor Costs									\$12,304.24	
Administrative Support (Federal Salary + Benefits)										
Description	Rate/HR	PEOPLE	DAYS	HRS						TOTAL
Administrative Officer (GS-9) – 23 hours	\$42.77	1		23						\$983.76
Project Leader (GS-14) -- 15 hours	\$82.16	1		15						\$1,232.46
Admin Support Costs									\$2,216.22	
Travel and Per Diem (Based on Published FY-2017 Federal Per Diem Rates)										
Description	RATE	PEOPLE	NIGHTS	Trips						TOTAL
Hotel Costs 2 nights X 3 people	\$114.00	3	1	2						\$684.00
Per Diem (Hotel Rate) 2 days X 3 people	\$59.00	3	1	2						\$354.00
Per Diem (Camping Rate) 10 days X 3 people	\$28.00	3	5	2						\$840.00
Travel & Per Diem Total									\$1,878.00	
Equipment & Supplies										
Vehicle Maintenance & Gasoline (GSA lease @ \$365 = \$12.17 per day based on 30 days in an "average" month + \$0.42/mile)										
Vehicle Mileage	TRUCKS	DAYS	Trips	MILEAGE	GAS/MILE	SUBTOTAL		TOTAL		
Grand Jct. to Cortez to Montezuma Creek to Grand Jct.	1		2	700	\$0.43	\$596.82	\$596.82			
Vehicle Lease										
Grand Jct. to Cortez to Montezuma Creek to Grand Jct.	1	5	2		\$12.35	\$123.53	\$123.53			
Generator Gas	BOATS	DAYS	Gal/day	Trips	GAS \$/GAL	SUBTOTAL				
(20 gallons/trip X 2 trips)	1	5	5	2	\$2.51	\$125.35	\$125.35			
Vehicle Maint. & Gas Total									\$845.70	
Equipment Maintenance, Repair, & Replacement										
Equipment Maintenance, Repair, & Replacement										
Exact use of the money in this section of the budget will vary from year to year depending on what equipment needs to be maintained, repaired, or replaced, but use of f										

Raft trailer maintenance								
	Annual trailer maintenance & safety inspection	\$788.20						
	Replace/repair trailer suspension, trailer lights, winch handle/straps/gears, trailer jack stand, wheel bearings							
	Replace trailer tires – 2 per year @ \$77 each	\$154.00						
	Signal light pigtail adapters – 2 @ \$15 each	\$30.00						
Generator maintenance								
	Spark plugs for generators – 5 at \$2.20 each	\$11.00						
	Synthetic oil for generators - 5 quarts at \$6.30 each	\$31.50						
	Generator repair/tune-up - 9 hrs @ \$70/hr = parts	\$703.79						
Sampling gear (needs to be regularly replaced)								
	Hip boots – 2 pair at \$75/pair	\$150.00						
	Breathable chest waders - 2 pair @ \$120/pair	\$240.00						
	NRS Type IV life jackets – 2 @ \$130 each	\$260.00						
	Electrical Gloves - 3 pairs @ \$75/pair	\$225.00						
	Dura-Frame electrofishing dip nets – 1 @ \$630 each + freight	\$630.00						
Raft frame &/or boat hull repair								
	Aluminum welding – 7 hours @ \$95/hr	\$665.00						
Raft repair kits								
	Raft glue (urethane/hypalon) – Four 4-oz. cans @ \$24.95/can	\$100.00						
	NRS raft patch material – 5 feet @ \$37/ft	\$185.00						
	Toluene – 1 qt @ \$17.95/qt	\$18.00						
Equipment tie-downs - NRS HD-brand tie-down straps, each boat needs:								
	Ten 2-ft straps - 10 @ \$4.20 each	\$42.00						
	Five 3-ft straps - 5 @ \$4.30 each	\$21.50						
	Ten 4-ft straps - 10 @ \$4.70 each	\$47.00						
	Five 6-ft straps 5 @ \$5.05 each	\$25.25						
	Five 9-ft straps 5 @ \$5.70 each	\$28.50						
	Five 12-ft straps 5 @ \$6.15 each	\$30.75						
Raft rigging materials, each boat needs:								
	D-style carabiners - 10 @ \$8.25 each	\$82.50						
	Mesh rig bag – 1 @ \$50 each	\$50.00						
	Yeti 125-quart coolers – 1 @ \$500 each	\$550.00						
	5-gallon plastic gasoline jerry cans – 5 @ \$40 each	\$200.00						
	20 lb. propane tanks – 1 @ \$55 each	\$55.00						
	Eddy Out Aluminum Dry Box (36L x 16H x 16D) - 1 at \$375.00	\$375.00						
	Cans for 1st aid & tool kits, raft repair kits, etc. - 20 @ \$19 ea.	\$380.00						
Rafting oars, oar blades, and oar rowing sleeves								
	Carlisle 10-foot oar shafts – 2 @ \$100 each	\$200.00						
	Carlisle Oars blades – 4 @ \$65 each	\$260.00						
	Oar sleeves – 4 @ \$18 each	\$72.00						
Camping Gear								
	NRS Canyon Dry Box (kitchen cook kit storage) - 1 at \$165.00	\$165.00						
	NRS campsite counter (18"W X 68" L X 40" H) - 1 at \$299.95	\$299.95						
	Roll-A-Table (32" X 32" table, 27" legs) - 2 at \$99.95 each	\$199.90						
	2-man tent (1/person), ~ 1 year life-span - 6 at \$99.99 each	\$599.94						
	Partner Steel 16" 4-burner camp stove - 1 at \$359.00	\$359.00						
River bags								
	NRS 3.8 heavy-duty Bill's Bag 110L – 1 @ \$160 each	\$160.00						
	NRS Tuff Sacks 25L - 5 @ \$35 each	\$175.00						
Pesola brand spring scales								
	# 20010 Micro-Line 10 gram – 1 @ \$68.75	\$68.75						
	# 20030 Micro-Line 30 gram – 1 @ \$61.60	\$61.60						
	# 20100 Micro-Line 100 gram – 1 @ \$61.60	\$61.60						
	# 40300 Medio-Line 300 gram – 1 @ \$73.15	\$73.15						
	# 40600 Medio-Line 600 gram – 1 @ \$73.15	\$73.15						
	# 42500 Medio-Line 2,500 gram – 1 @ \$71.45	\$71.45						
	# 41002 Medio-Line 1,000 gram – 1 @ \$73.15	\$73.15						
	# 80005 Macro-Line 5 kg – 1 @ \$150.15	\$150.15						
	# 80010 Macro-Line 10 kg – 1 @ \$155.65	\$155.65						
	NRS E-160 Self-Bailing Raft - 1 at \$6,125.00	\$6,125.00						
Equipment Maintenance, Repair, & Replacement Subtotal		\$15,483.43						
							Requested 2017 Equipment	
							Costs for Task 3	\$1,100.00
							USFWS-GJFWCO Total	\$18,344.16
							USFWS R6 Admin Overhead (3.00%)	\$550.32
							USFWS Region 6 Total	\$18,894.48

Under the heading "Funding for participation of other agencies." Cost for participation of New Mexico Department of Game and Fish in FY-2018 Endangered Fish Monitoring and Nonnative Fish Control activities (Montezuma Creek, UT to Mexican Hat, UT).

Sampling

Personnel

Tasks - Assist Utah Department of Wildlife Resources with Endangered Fish Monitoring and Nonnative Fish Control from Montezuma Creek, UT to Mexican Hat, UT; 1 project biologist for 2 trips at 5 days per trip (10 total days), field days projected at 10 hours of work per day = 80 regular hours and 20 overtime hours (100 hours total).

Project Biologist (1)

80 hrs regular @ \$37.13/hr (\$26.99/hr (base salary) + \$10.14 (benefits))	\$ 2,970
20 hrs overtime @ \$55.69/hr (\$37.13/hr * 1.5 (time-and-a-half))	\$ 1,114

Sub-total \$ 4,084

Per Diem

10 days @ 115/day (standard NM out-of-state rate)	\$ 1,150
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Sub-total \$ 1,150

Vehicles

Round-trip Bluff, UT – 700 miles @ \$0.55/mile x 2 trips	\$ 770
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Sub-total \$ 770

FY 2018 Total

NMDGF - Santa Fe	\$ 6,004
Administrative Overhead (10%)	\$ 600

Total \$ 6,604

Under the heading “Funding for Participating Agencies.” Estimated costs for participation of the Navajo Nation Department of Fish and Wildlife, in FY-2018 (Montezuma Creek to Mexican Hat, UT). BOR Cooperative Agreement Number with Navajo Nation: R11AP40089

FY 2017 Costs for Navajo Nation			
<u>Personnel/Labor Costs (Salary+Benefits)</u>	Rate	Quantity	
Fish Biologist	\$169.44	14	\$2,372.16
Bio Tech	\$92.80	14	\$1,299.20
Fringe Benefits (Labor Costs* 48.70%)	\$127.71		\$1,787.94
Subtotal			\$5,459.30
<u>Travel and Per Diem</u>			
Per Diem Meals	\$51.00	14	\$714.00
Vehicle Lease/Maintenance	\$460.00	1	\$460.00
Mileage	\$0.28	260	\$72.80
Subtotal			\$1,246.80
<u>Equipment</u>			
Maintenance, Repair, Replacement	\$1,545.00	1	\$1,545
Subtotal			\$1,545
Total Expenses			\$8,251.10
Navajo Nation Administration Fees (17.5%)			\$1,229.00
Navajo Nation FY16 Total			\$9,480.10