Facilitated passage of Razorback Sucker over the Piute Farms Waterfall to evaluate the reproductive contribution of translocated individuals

Fiscal Year 2022 Scope of Work

Submitted to
Bureau of Reclamation
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Background

The San Juan River downstream of Navajo Reservoir is roughly 224 river miles (RM) long with the lower 180 river miles designated as Critical Habitat for Razorback Suckers. At the lower end of Razorback Sucker Critical Habitat (about RM -5.0) is the Piute Farms Waterfall (Waterfall), which has been in place since the early 2000s. Long-term regional drought across the San Juan River Basin has reduced lake levels and exposed the Waterfall, and it now acts as barrier for any upstream movement from Lake Powell (Cathcart et al. 2018). Spawning migrations for Razorback Sucker occur between March and June during the ascending or peak spring flows (Tyus and Karp 1990; Farrington et al. 2014). A large number of Razorback Suckers are found immediately below the Waterfall during this time period (Cathcart et al. 2018). This large aggregation of Razorback Suckers suggests that these individuals are trying to move upstream to spawn. While this Waterfall acts as a major barrier to upstream movement, it can be inundated with high lake levels allowing fish passage. The last time the Waterfall was inundated was in 2011 for two weeks during late summer. During this rare event, four Razorback Suckers were documented moving upstream from Lake Powell to the San Juan River (Francis et. al 2013).

Since 2011, several projects have studied the role of the Waterfall on the fish community in the San Juan River both upstream and directly downstream of the Waterfall. While acting as an upstream barrier for nonnative predatory fish including Walleye and Stripped Bass, it also excludes native fish from accessing upstream habitats. The section of the San Juan River downstream of the Waterfall is thought to have historically served as a nursery for endangered Razorback Sucker and Colorado Pikeminnow prior to the construction of Glen Canyon Dam. There is no fish passage structure in place to allow fish to reach the river upstream of the Waterfall. In order to reconnect the Razorback Sucker populations, trap and transport (i.e., translocation) of Razorback Sucker and Colorado Pikeminnow from downstream to upstream of the Waterfall has frequently occurred. Personnel from Kansas State University (KSU) are in the second year (2021) of a two-year collaborative study, using radio telemetry to track translocated Razorback Suckers upstream of the Waterfall. During a two-week period in 2021, 210 Razorback Sucker and 43 Colorado Pikeminnow were moved upstream of the Waterfall (Matt Bogaard per comm.). Genetic parentage analysis of translocated Razorback Sucker and putative offspring (i.e., larval fish) is underway at the Southwestern ARRC for samples collected in 2020 (SOW-41). Consequently, it is currently unknown if this management action is contributing to increased in-river reproduction by individuals moved upstream. Thus, we propose to continue translocating Razorback Sucker upstream of the Waterfall and use parentage assignment to determine the annual contribution of those individuals to larval cohorts.

Study Area

The study area for capturing adult Razorback Suckers will be located within one mile downstream of the Waterfall. Captured Razorback Suckers will be translocated at least 1 mile upstream of the Waterfall and released. American Southwest Ichthyological Researchers (ASIR) will sample larval fish in the San Juan River between Shiprock, NM and Clay Hills, UT (RM 148.0-2.9) as part of their annual larval

endangered fish survey. Additional larval sampling will be required in the San Juan River downstream of the Waterfall to near Great Bend (approximately 15 river miles).

Goal

The goal of this project is to assess the annual contribution of Razorback Suckers captured downstream of and translocated upstream of the Waterfall to larval cohorts in the San Juan River.

Methods

We will collect Razorback Suckers downstream of the Waterfall using an ETS MBS electrofishing unit mounted on a raft (Task 1) and two fish traps (Task 2), a seining corral and a mobile weir. Colorado Pikeminnow will be included in our collections, however, these will not be targeted. Fish will be collected by long dip nets (Task 1 only) and transferred into a salted live well. After a sampling pass (no more than one mile) biological data will be collected on each fish: total length (mm), weight (g), scanned for a Passive Integrated Transponder (PIT) tag, given a PIT tag if one is not present. A fin clip will be collected from each translocated individual and placed in 95% ethanol (EtOH) for parentage assignment. Fish will then be transferred to a boat just upstream of the Waterfall in a 5 gallon bucket where they will be loaded onto a boat containing a large live well and motored upstream at least 1 mile prior to release.

Translocation efforts will occur between the second week of March to the middle of April 2022 (four weeks of sampling), as this is the time when the highest number of PIT tagged fish are detected downstream of the Waterfall (Cathcart et. al 2018). These efforts will be non-consecutive and consist of three person crews sampling for three days. Field crews will electrofish for short periods of time (not more than one hour) in both the morning and in the evening to not over pressure migrating fish and avoid adding unnecessary amounts of electricity to the water. Alternative trapping methods used in 2021, including a seining corral and a mobile weir, will be used without the presence of electrofishing for one week starting the second week of March (Task 2). Low catch rates were observed in 2021 however, additional sampling is required to determine the effectiveness of these sampling techniques. Endangered fish captured in these traps will be translocated above the waterfall in the same method previously stated.

All translocated fish will have PIT tags prior to their release. Movement from these tags will be detected by strategically placing submersible PIT tag antennas in the lower river below Mexican Hat, UT and one antenna spanning the spawning bar at Slickhorn (RM 18.6). The mobile antennas will be deployed below the Waterfall prior to translocation efforts, checked three weeks later to change batteries and download data, and picked up a month later.

Larval fish will be collected monthly (April to August) from the San Juan River upstream of the Waterfall by ASIR during the annual larval fish sampling effort. Additional sampling will be conducted in May and June (period of highest Razorback Sucker larval fish catch in Reach 1 in the San Juan River) downstream of the Waterfall to collect any larvae that may have been produced downstream of or drifted over the waterfall. Sampling efforts for larval fish will be concentrated in low velocity habitats and employ small mesh seines (1 m x 1 m x 0.8 mm) to collect fish. Individual seine hauls will be preserved independently at each site. Habitat designations will also be recorded by seine haul. Retained specimens will be placed

in Whirl-paks containing 95% EtOH and a tag inscribed with unique alphanumeric code that is also recorded on the field data sheet. For each sample site, the lengths (to 0.1 m) of each seine haul and total number of hauls will be measured and recorded. Capture densities for seine samples will be reported as the number of fish per 100 m^2.

Evaluation

Genetic tissue from all translocated fish and morphologically identified larval Razorback Sucker (subsample if greater than 900 are collected) will be sent to the Southwestern Native Aquatic Resources and Recovery Center (Southwestern ARRC) for parentage analysis. Genetic analysis of samples collected in 2022 (i.e., translocated Razorback Sucker and larval Razorback Sucker) will be proposed for fiscal year 2023. Sampling of larval specimens will depend on the number of larval fish contacted in 2022; however, genetic sampling will comprise a larger number of larval fish if available (i.e., up to 900 individuals). Molecular methods will follow similar protocols proposed in the previous translocation scopes of work (SOW-41).

All field data will be submitted to the San Juan River Program Office by December 31, 2022. A presentation of 2022 field efforts will be given at the annual February Biological Committee meeting as well as the annual Biology Committee/Coordination Committee meeting in May 2023. A draft report will be submitted to review by March 31, 2023, with a final report and response to comments submitted by June 30, 2023. Genetic results will not be included in this report. Instead, a proposal to conduct parentage assignment of 2022 collections will be submitted for fiscal year 2023.

Literature Cited

Cathcart, C. N., C. A. Pennock , C. A. Cheek, M. C. McKinstry, P. D. MacKinnon, M. M. Conner, and K. B. Gido. 2018. Waterfall formation at a desert river–reservoir delta isolates endangered fishes. River Research and Appliccations 34(8):948–956. https:// doi.org/10.1002/rra.3341

Farrington, M.A., R.K. Dudley, J.K. Kennedy, S.P. Platania and G.C. White. 2014. Colorado Pikeminnow and Razorback Sucker larval fish survey in the San Juan River. 2014 INTERIM PROGRESS REPORT (FINAL REPORT) submitted to: United States Bureau of Reclamation and the San Juan River Basin Biology Committee

Francis, T. A., D. W. Ryden, and B. J. Schleicher. 2013. San Juan River Arm of Lake Powell Razorback Sucker (*Xyrauchen texanus*) Survey: 2011. 44 pp.

Tyus, H.M. and C.A. Karp. 1990. Spawning and movements of razorback sucker, *Xyrauchen texanus*, in the Green River basin of Colorado and Utah. Southwestern Naturalist 35:427-433.

Budgets

Budget for GJFWCO

Waterfall Sampling

Personnel/Labor Costs (Federal Salary + Benefits)

Task 1: Electrofishing and battery replacement	TOTAL
Principal Biologist (GS-11/7)	$ 3,876.48
(1 person X 5 days/trip X 1 trip – camp)	
(1 person X 4 days/trip X 1 trip – camp)	
Bio. Tech. Crew Leader (GS-7/5)	$ 1,537.20
(1 person X 5 days/trip X 1 trip – camp)	
Biological Technicians (GS-5/1)	$ 984.00
(1 person X 5 days/trip X 1 trip – camp)	
(1 person X 4 days/trip X 1 trip – camp)	
Task 2: Trapping Trip	
Principal Biologist (GS-11/7) (1 person X 7 days - Camp)	$ 3,015.04
(16 hrs overtime)	
Bio. Tech. Crew Leader (GS-7/5) (1 person X 7 days - Camp)	$ 2,459.60
(16 hrs overtime)	
Biological Technicians (GS-5/1) (1 person X 7 days - Camp)	$ 1,574.40
(16 hrs overtime)	
PERSONNEL/LABOR TOTAL	**$ 13,446.72**

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

	TOTAL
Administrative Officer (GS-9/8) – 24 hours	$ 1,031.52
Principal Biologist (GS-11/7) – 80 hours	$ 4,307.20
Project Leader (GS-14/6) – 16 hours	$ 1,321.12
PERMITTING, DATA INPUT, ETC	**$ 6,659.84**

Travel and Per Diem (Based on Published FY-2017 Federal Per Diem Rates)

	TOTAL
Camp Rate Task 1	$ 540.00
Camp Rate Task 1	$ 288.00
Camp Rate Task 2	$ 756.00

TRAVEL/PER DIEM TOTAL	**$ 1,584.00**

Equipment and Supplies

Vehicle Maintenance & Gasoline

Vehicle Mileage	TOTAL
San Juan River sampling - spring:	
GJ to waterfall to GJ (Task 1 and Task 2)	$ 975.37
GJ to Mex. Hat to Clay Hills to GJ (Task 1)	$ 242.99
VEHICLE LEASE	
San Juan River sampling - spring:	
Sampling around Waterfall (Task 1)	$ 123.53
Sampling around Waterfall (Task 2)	$ 172.94
Mexican Hat to Clay Hills (Task 1)	$ 49.41
Generator Gasoline	
San Juan River Waterfall - spring: 2 Gallons/day	$ 35.00
Shuttles	
Mexican Hat to Clay Hills (Task 1)	$ 200.00
Vehicle Maint. & Gasoline	**$ 1,799.24**

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 these funds for a “typical” field season for one study COULD include the following:

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 maintenace	
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 2020 Equipment Costs for Task 1
6% of operating budget $ 1,409.39

Other potential uses for these same funds 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), 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 stainless steel electrofishing cathodes, camping kitchen gear (anodized dutch ovens X 2, plates, cups, bowls silverware, pots, pans, griddle), data books, pre-printed Rite-In-The-Rain data sheets, pencils, repair/replace river maps, etc.

USFWS-GJFWCO Total	**$ 24,899.18**
USFWS R6 Admin Overhead (3.00%)	**$ 746.98**
USFWS Region 6 Total	**$ 25,646.16**

	Waterfall Translocation - 1 trips @ Waterfall; 5 days. NMFWCO supplying 3 people per trip.						
TASK 1: Electrofishing							
	Labor Cost - Field Work (1 trip x 5 days)						
	Position	**Grade/Step**	**Salary w/benefits**	**Hours/Day**	**Total Days**	**Sub-Total**	
	Fish Biologist	GS 11/8	$53.53	8	5	$2,141.20	
	Fish Biologist	GS 9/10	$48.22	8	5	$1,928.80	
	Remote Biologist	GS 9/4	$40.60	8	5	$0.00	$1,624.00
	Overtime Hours (weekend or >9 hour work days)	**Grade/Step**	**Salary w/benefits**	**Hours/Day**	**Total Days**		
	Fish Biologist	GS 11/8	$53.53	3	2	$321.18	
	Fish Biologist	GS 9/10	$65.30	3	2	$391.80	
	Remote Biologist	GS 9/4	$54.75	3	2	$328.50	
	Administrative, Reporting, Planning						
	Fish Biologist	GS 9/10	$48.22	8	10	$3,857.60	
	Supervisory Fish Biologist	GS 13/4	$74.78	8	5	$2,991.20	
	Adminstrative Officer	GS 9/9	$47.35	8	5	$1,894.00	
				Total Labor		**$13,525.78**	
	Travel and Per Diem	**Days**	**Rate**				
	Per Diem (Travel Day)	6	$41.25			$247.50	
	Per Diem (Full Day)	9	$29.00			$261.00	
	Concur Fee	3	$14.75			$44.25	
				Total Travel/Per Diem		**$552.75**	
	Equipment	**Miles/Qty**	**Total Miles**	**Rate**			
	Vehicle Fuel						
	2 truck X 1 trip- Albuquerque, NM to Waterfall, UT 800 RT	800 x 2	1,600	$0.56		$896.00	
	Generator Fuel	10		$3.50		$35.00	
	10 gallons/trip x 1 trips						
	Maintenance, repair, replace						
	(i.e. camp gear [tents, coolers], gear repairs (electrofishing boats, scales, PIT tag readers, life jackets), etc.)					$1,000.00	
				Total Equipment		**$1,931.00**	
	Remote Biologist Savings - Task 1	$1,624.00		**NMFWCO Task 1 Subtotal**		**$16,009.53**	
				USFWS R2 Overhead		**$480.29**	
				NMFWCO Task 1 Total		**$16,489.82**	
TASK 2: Trapping							
	Labor Cost - Field Work (1 trip x 7 days)						
	Position	**Grade/Step**	**Salary w/benefits**	**Hours/Day**	**Total Days**	**Sub-Total**	
	Fish Biologist	GS 11/8	$53.53	8	5	$2,141.20	
	Fish Biologist	GS 9/10	$48.22	8	5	$1,928.80	
	Remote Biologist	GS 9/4	$40.60	8	5	$0.00	$1,624.00
	Overtime Hours (weekend or >9 hour work days)	**Grade/Step**	**Salary w/benefits**	**Hours/Day**	**Total Days**		
	Fish Biologist	GS 11/8	$53.53	10	2	$1,070.60	
	Fish Biologist	GS 9/10	$65.30	10	2	$1,306.00	
	Remote Biologist	GS 9/4	$54.75	10	2	$1,095.00	
	Administrative, Reporting, Planning						
	Fish Biologist	GS 9/10	$48.22	8	10	$3,857.60	
				Total Labor		**$11,399.20**	
	Travel and Per Diem	**Days**	**Rate**				
	Per Diem (Travel Day)	6	$41.25			$247.50	
	Per Diem (Full Day)	15	$29.00			$435.00	
	Concur Fee	3	$14.75			$44.25	
				Total Travel/Per Diem		**$726.75**	
	Equipment	**Miles/Qty**	**Total Miles**	**Rate**			
	Vehicle Fuel						
	2 truck X 1 trip- Albuquerque, NM to Waterfall, UT 800 RT	800 x 2	1,600	$0.56		$896.00	
	Maintenance, repair, replace						
	(i.e. camp gear [tents, coolers], gear repairs [scales, PIT tag readers, life jackets], etc.)					$1,000.00	
				Equipment Total		**$1,896.00**	
	Remote Biologist Savings - Task 2	$1,624.00		**NMFWCO Task 2 Subtotal**		**$14,021.95**	
				USFWS R2 Overhead		**$420.66**	
				NMFWCO Task 2 Total		**$14,442.61**	
	Remote Biologist Savings - Total	$3,248.00		**Task 1 & 2 Total**		**$30,932.42**	

2022 Costs for UDWR- Moab

San Juan River Waterfall Translocation

Task 1. Waterfall Translocation-Electrofishing (3 people, 5 days)

Labor: salary + benefits + applicable overtime

	Rate	Hours	Cost
Project Leader	$40.64	0	$0
Biologist	$39.13	60	$2,348
Technician	$17.79	120	$2,135
		subtotal	**$4,483**

Food and Transport

	Rate	Quantity	Cost
Truck Rental (2 trucks X 1 month)	$500.00	2	$1,000
Mileage Costs (2 trucks X 350 miles X 1 trip)	$0.40	700	$280
Food (3 people X 5 days X 1 trip)	$35.00	15	$525
		subtotal	**$1,805**

Equipment

	Rate	Quantity	Cost
Camping gear repair/replacement:	$1,000.00	0.5	$500
Sampling gear repair/replacement:	$1,000.00	0.5	$500
Boating gear repair/replacement:	$1,000.00	0.5	$500
		subtotal	**$1,500**
		Task 1 Subtotal:	**$7,788**

Task 2. Waterfall Translocation-Fish trap (3 people, 7 days w/switch out)

Labor: salary + benefits + applicable overtime

	Rate	Hours	Cost
Project Leader	$40.64	50	$2,032
Biologist	$39.13	150	$5,870
Technician	$17.79	100	$1,779
		subtotal	**$9,681**

Food and Transport

	Rate	Quantity	Cost
Truck Rental (2 trucks X 1 month)	$500.00	2	$1,000
Mileage Costs (1 truck X 350 miles X 3 trips)	$0.40	1050	$420
Food (3 people X 4 days X 2 trips)	$35.00	24	$840
		subtotal	**$2,260**

Equipment

	Rate	Quantity	Cost
Camping gear repair/replacement:	$1,000.00	0.5	$500
Sampling gear repair/replacement:	$1,000.00	0.5	$500

Boating gear repair/replacement:	$1,000.00	0.5	$500
		subtotal	**$1,500**
		Task 2 Subtotal:	**$13,441**

Task 3. Lower Canyon Antenna Placement/Retrieval (3 people, 4 days)

Labor: salary + benefits + applicable overtime

	Rate	**Hours**	**Cost**
Project Leader	$40.64	0	$0
Biologist	$39.13	50	$1,957
Technician	$17.79	100	$1,779
		subtotal	**$3,736**

Food and Transport

	Rate	**Quantity**	**Cost**
Truck Rental (2 trucks X 1 month)	$500.00	2	$1,000
Mileage Costs (2 trucks X 350 miles X 1 trip1)	$0.40	700	$280
Food (3 people X 4 days X 1 trip)	$35.00	12	$420
Shuttle (2 trucks)	$180.00	2	$360
		subtotal	**$2,060**

Equipment

	Rate	**Quantity**	**Cost**
Camping gear repair/replacement:	$1,000.00	0.5	$500
Sampling gear repair/replacement:	$1,000.00	0.5	$500
Boating gear repair/replacement:	$1,000.00	0.5	$500
		subtotal	**$1,500**
		Task 3 Subtotal:	**$7,296**

Task 4. Project coordination, meetings, presenting

Labor: salary + benefits + applicable overtime

	Rate	**Hours**	**Cost**
Project Leader	$40.64	40	$1,625
Biologist	$39.13	160	$6,261
Technician	$17.79	0	$0
		subtotal	**$7,887**

Food and Transport

Truck Rental (1 truck)	$500.00	1	$500
Mileage Costs (1 truck X 350 miles X 1 trip)	$0.40	350	$140
Out-of-State per diem	$46.00	8	$368
Hotel	$115.00	6	$690
		subtotal	**$1,698**

Task 4 Subtotal:	**$9,585**
Total Expenses	**$38,111**
Administrative Overhead (17% on all personnel services)	**$4,672.54**
UDWR-Moab Total	**$42,783**

Project Title: New FY 2022 SOW Translocation of Razorback Sucker over the San Juan River Waterfall to assess Razorback Sucker genetic contribution to in-river reproduction				
Personnel	**Days**	**Hours**	**Rate**	**Total**
Field Sampling (San Juan River Waterfall to Great Bend, Lake Powell)				
Trip 1: May 2022				
Fisheries Biologist I n=1	5	40	$63.27	**$2,530.80**
Field Data Collection –5 days				
Fisheries Technician I n=1	5	40	$38.93	**$1,557.20**
Field Data Collection –5 days				
Trip 2: June 2022				
Fisheries Biologist I n=1	5	40	$63.27	**$2,530.80**
Field Data Collection –5 days				
Fisheries Technician I n=1	5	40	$38.93	**$1,557.20**
Field Data Collection –5 days				
Laboratory Work				
Fisheries Biologist II (n=1)	20	160	$77.85	**$12,456.00**
Larval fish identification –20 days				
Fisheries Technician I n=1	10	80	$38.93	**$3,114.40**
Larval fish processing –10 days				
Office Work				
Fisheries Biologist II (n=1)	5	40	$77.85	**$3,114.00**
Sample prep for SNARRC, Reporting, Presentation				
SJRRIP Meeting attendance (3 mtgs x 2 days)				
Fisheries Biologist II (n=1) covered under larval project	6	48	$77.85	$0.00
Personnel Subtotal				**$26,860.40**
GSA General and Administrative Fee (IFF)				**$201.45**
Personnel Total				**$27,061.85**

Materials and Supplies (Field)	**Quantity**		**Rate**	**Total**
Safety dedicated first aid gear	1		in-kind	$0.00
Carabiners, tie-down straps and boating associated gear	1		in-kind	$0.00
Fish Sampling and associated electronic recording gear	1		in-kind	$0.00
Water quality measuring electronic meters	1		in-kind	$0.00
Material and Supplies Total				**$0.00**

Travel and Per Diem (Field Sampling Effort)	**Quantity**	**Miles**	**Rate**	**Total**
Mileage				
Albuquerque, NM to Farmington, NM	2	945	$0.56	**$1,058.40**
(945 miles per round trip x one 4x4 truck)				
(Albuquerque to Waterfalls=350 miles)				
(Waterfalls to Bullfrog Marina=155 miles)				
(Bullfrog Marina to Albuquerque=440 miles)				
Per Diem (Hotel)				
Per diem– 2 staff x 2 trips x 4 days	16		$55.00	**$880.00**
Field Sampling Travel and Per Diem				**$1,938.40**

Travel and Per Diem (Meeting)	**Quantity**	**Miles**	**Rate**	**Total**
Per Diem (Hotel)				
Lodging – 2 days x 1 staff x 3 trips (travel/room with others)	6		$102.00	with others
Hotel Per diem – 2 day x 1 staff x 3 trips	6		$71.00	in-kind
Meeting Travel and Per Diem				$0.00
Travel and Per Diem Total				**$1,938.40**

Personnel Total	**$27,061.85**
Materials and Supplies Total	**$0.00**
Travel and Per Diem Total	**$1,938.40**
GRAND TOTAL	**$29,000.25**

Budget

GJFWCO	**TOTAL $25,646.16**
NMFWCO	**TOTAL $ 30,932.42**
UDWR	**TOTAL $42,783**
ASIR	**TOTAL $29,000.25**
GRAND TOTAL	**TOTAL $128,361.83**

Response to Comments

41a Translocation of Razorback Sucker over the San Juan River waterfall to assess genetic contribution to in-river reproduction.

How can the technical aspects of this SOW be improved?

Keith (TNC): Describe why the Piute Falls barrier was chosen for this study, rather than other potential barriers to RBS spawning migration. Describe the likelihood that the number, location, and frequency of larval RBS seine surveys will be sufficient to provide meaningful results. Provide information on the known or hypothesized distance covered by adult RBS during spawning migrations and the location of larval seine surveys relative to the release location of captured adults and their likely pre-spawn movements (i.e., how likely is it that their progeny would be detected?). We think this is an excellent question given the number of barriers identified in the San Juan River. We chose the Piute Farms Waterfall for this study because it has been shown to be a major barrier to seasonal migration for Razorback Sucker. In addition, unlike PNM, passage for Razorback Sucker is nonexistent. We think this scope of work will contribute to additional years of data collection evaluating the efficacy of this management action. We are basing our larval sampling efforts using previous years of data. For example, results from recent effective number of breeder estimates (N_b) identified full siblings found both upstream and downstream of the Waterfall. While these efforts may not be sufficient for answering our question, they do suggest that larval sampling was sufficient for capturing fish that exit the river because of drift. We think this information is supportive of the larval sampling efforts we proposed.

Larrick (UMUT): No suggestions.

Mazzone (Jicarilla Apache Nation): Will Colorado Pikeminnow be translocated above the waterfall if captured below even if they are not considered the target species of this scope? Incorporating Pikeminnow in some fashion would be encouraged. Any Colorado Pikeminnow captured below the waterfall will be moved upstream of the waterfall after biological data is collected. Any Colorado Pikeminnow >130mm total length that does not have a PIT tag will receive one prior to translocation.

McKinstry (BOR): It might be nice to see a few more of Pennock's research referenced since he did spend three years there (which is an error in the proposal since so far it has been 5 years that we have been moving fish down there). I'm not quite sure we are ready to turn this project into a "management action" yet, although this proposal is enough of a description of what needs to be done to just move fish. I am certainly all in favor of moving as many fish as we can, but spending that many weeks down there is not what I think we need at this point. For example, if all of the fish that are moved spawn at Slickhorn and the larvae just go down past the waterfall and into the lake, AND re not recruited to yoy and juveniles, I think we would say "so what". If the fish do spawn at Slickhorn and the larvae recruit then we need to move as many as we can. Personally, I think the work needs to start the second week of March after the fish have for sure shown up and water temps are good. No need going in late February—not many fish there yet. Then do 3 weeks of continuous work to move as many fish as possible. I also think that the work needs to be integrated with continued monitoring of the radio-tagged fish since many/most of the currently-tagged fish will come back and their radio tags will still be working. I recommend we move the radio antenna currently upstream of the spawning bar near Slickhorn to the actual suspected spawning site at the bend near Slickhorn. The placement of a PIT tag antenna at this location should also be investigated. I didn't see level of effort, but in the past 3 people have been enough to do the work at a god pace and provide enough help. This is a great example of a SOW where we should see the proposed budget The time period that sampling was proposed has been reduced to one week utilizing two trapping techniques and three noncontinuous five-day electrofishing trips starting the second week of March. We are foregoing the use of radio tags and relying on PIT tag antennas to collect movement data. Several mobile antennas will be placed in the lower canyon and one river wide antenna will be installed at Slickhorn.

I think we need to consider the construction of some type of hoist or "ski-lift" mechanism where we carry fish around the waterfall. The sandstone ramp has degraded to the point where it is very difficult to carry fish up the ramp so it now takes several transfers of buckets with fish. Perhaps the installation of three posts, one at the bottom, one at the top of the ramp, and one near where the boat is tied off, along with pulleys and cable could be used to move the fish? At a minimum we need something to at least cover the ramp portion. We like the idea, however, we also think this idea warrants a separate SOW because anything that would be permanently installed would likely need to be approved by the NPS and require an Engineer to design and oversee the construction. If trap and transport is going to continue then for safety reasons this would absolutely need to be considered.

Might consider using the trap again. What do we have to lose? An attempt to capture fish in these traps was made in 2021 during low flows with little to no debris in the river. These traps failed to capture any Razorback Suckers, and potentially failed to capture any Colorado Pikeminnow (several were captured in the seining corral however there were believed to be present prior to the corral being set up). Traps will be placed below the Waterfall again in 2022 during the second week of March. These traps will be fished for five days with no electrofishing performed, to reduce any possibility of effecting the efficiency of these trapping techniques.

Minor point, but I would use PIUTE FARMS WATERFALL as the correct name. That is the name of the draw that comes in at that location on USGS maps and Google maps. I realize we have called it many

things, but Piute Farms Waterfall should be used from here on out. I also realize it is a misspelling of Paiute, but that is the name that is on the various maps, at least until it is changed. Spelling and name has been changed

Miller (Southern Ute Indian Tribe): The SOW does not include detail on which other SOW in the annual work plan will complete the genetic tissue analysis (page 145, lines 99-102). The SOW completing the analysis should be referenced. Thank you. We have included a brief description of how this work will be completed and approximately when. We have discussed this need with the Southwestern ARRC who has agreed to solicit funding to conduct the genetic work (i.e., parentage assignment) in fiscal year 2023. This timeline was discussed between PIs because 2022 larval collections would not be available for genetic sampling until early spring of 2023. This will provide Southwestern ARRC the opportunity to base their scope of work on available samples for both content and budgetary reasons. For example, if 100 larval Razorback Sucker are collected, then genetic sampling would likely cover all individuals and their budget would reflect 100 samples. However, if 2,000 larval fish are collected, then a subsample of several hundred (e.g., up to 900) would likely be included in genetic analyses along with a budget that reflects that effort. This sample size, however, will ultimately be decided by the Southwestern ARRC in their fiscal year 2023 proposal.

This is a separate capture and translocation effort in addition to the Trap and Transport being currently completed using traps. How do the two projects relate to one another? The trap and transport project that was conducted in the spring on 2021 was an add-on to the KSU translocation study. The KSU study is scheduled to be finished in FY 2021. There is currently no proposed trap and transport study/work for FY 2022 below the Waterfall. We will be using PIT tag antennas to monitor movement of fish vs radio tags.

Will the fish captured in the Trap and Transport also have genetic samples taken to determine contribution to larval fish? More detail on the two projects should be included in the SOW. Thank you. Yes, all Razorback Sucker moved upstream of the Waterfall will be fin clipped for parentage analysis. We have clarified this in our methods.

Warren (Peer Reviewer): What entity will analyze the samples for the parental analysis? I assume SNARCC? I suggest you mention that in your SOW. This has been added. Southwestern ARRC will conduct the parentage assignment.

Are all captured razorback larvae going to be subjected to parental analysis (or a large subsample)? Great question. This will depend on the number of samples collected in the field and is part of our rationale for Southwestern ARRC soliciting funds to conduct the genetic work in fiscal year 2023. Please see our response to Miller for more details (above).

The probability of capturing AND genetically analyzing larvae from translocated adults seems low unless all larvae are analyzed genetically (or a sizeable subsample are analyzed). It's further complicated by not knowing how far up the river the translocated fishes might go before spawning. Perhaps consider conducting parental analysis on larvae well upstream of the falls to help insure you capture them if they are there. We agree with this comment and agree that considering a large portion of larval fish

captured upstream is important. We can estimate upstream movement using PIT tag antennas to determine how far fish moved; however, we also recognize that PIT tag antennas may not detect all individuals. While we can use this as an indicator for upstream range for larval sampling, we agree that we need to consider a larger upstream sample of larval fish. Thus, we will work with Southwestern ARRC to discuss the range and sample size to include for parentage assignment. This analysis will likely include a large subsample or up to all larvae collected from ASIR's sampling efforts (SOW 41a and SOW21). Please see comments above as this final sample size will be determined by the Southwestern ARRC for fiscal year 2023.

Zeigler (NMDGF): Line 68: Why will additional sampling be required downstream of Paiute Waterfall to near Great Bend? Is this larval sampling? Yes, added.

Line 71-73: The goal of this project should be changed to simply translocating fish above the waterfall to increase connectivity between the two populations and that translocating these fish above the waterfall may allow them to successfully spawn. The study by KSU is already assessing the annual reproductive contribution of Razorback Sucker translocated above the waterfall. Why does that study need to continue? This collaborative study with KSU includes parentage assignment conducted by the Southwestern ARRC. While two years of sampling were proposed, COVID-19 restrictions prohibited sampling efforts during 2020, which will likely affect genetic results. For example, translocation of Razorback Sucker was planned to occur at both PNM and the Waterfall; however, translocation of fish at PNM was limited. Similarly, larval collections were also modified because of travel restrictions and sampling did not reflect ASIR's historical river-wide efforts and were primarily focused upstream. Thus, it is likely that these limitations will affect the ability to assign parents because of a more restricted sampling.

Line 75-76: Why is only electrofishing being considered as a collection method? Is there a reason that none of the new trapping methods would be employed here? The Program just invested in two different traps to try an increase the efficiency of trapping Razorback Suckers and to decrease exposure to electrofishing. An attempt to capture fish in these traps was made in 2021 during low flows with little to no debris in the river. These traps failed to capture any Razorback Suckers, and potentially failed to capture any Colorado Pikeminnow (several were captured in the seining corral however there were believed to be present prior to the corral being set up). Traps will be placed below the Waterfall again in 2022 during the second week of March. These traps will be fished for five days with no electrofishing performed, to reduce any possibility of effecting the efficiency of these trapping techniques.

Line 79: You plan to carry all large adult Razorback Sucker a ½ mile upstream in 5 gallon buckets to release them? Clarification on transportation of Razorback Sucker has been added

Line 81: Is the plan to sample everyday for 9 weeks? This seems unnecessarily long time to be out collecting fish. The data from Cathcart et al. (2018) indicates that the number of Razorback Sucker detected at the waterfall drops off significantly after March 31. Is it really necessary to sample in April? Sampling period has been shortened

Line 87-97: Given that larval sampling has occurred below the waterfall it would be informative to include how many Razorback Sucker larvae have been captured in past sampling efforts. I would also recommend specifying how many larval sampling trips would be conducted beyond what is proposed in the larval monitoring FY2022 SOW. As it is currently written there is not much information as to what will actually be done. Also, how will larval fish captured below the waterfall be determined if they were produced below the waterfall (no genetic data to relate them back to) or drifted over the waterfall (very little genetic data to relate them back to). This is a valid point. Linking genetic data back to where larval fish were collected and where parents spawned may be difficult. While this concern cannot be fully addressed without sampling all potential parents in the San Juan River and all potential parents below the Waterfall (i.e., Lake Powell), we can potentially link fish through sibship assignment. For example, if two larval fish are identified as full-siblings with one full sibling collected above the Waterfall and one collected below the Waterfall and both individuals can be assigned to a parent that was translocated, then we could infer that a translocated adult contributed offspring and drift distributed at least one offspring downstream of the Waterfall. In contrast, if we find a pair of full siblings below the Waterfall and they cannot be assigned to any translocated Razorback Sucker, then we cannot conclude if spawning occurred below or above the Waterfall.

Line 98-102: There are likely many other things that would be informative to investigate / evaluate. The distribution of larvae produced from fish moved above the waterfall is an example of something that would be very informative. Also, the number of hybrid larvae produced from fish moved above the waterfall vs. other larvae produced by fish within the river. You may intend to present or evaluate these things already but you should specify them here. Including these things would make this a stronger proposal. We agree with Zeigler; there are often a variety of additional questions that can be evaluated using genetic data. However, the purpose of this proposal is to move fish and collect samples for genetic analysis. Southwestern ARRC has agreed to submit a proposal for fiscal year 2023. We will work with them to include any additional analyses they think will be suitable. We have worked to clarify that this scope will not be conducting any genetic analyses, but, instead, collect tissues for a future scope that can address parental contribution of translocated fish.

Line 99: Who is completing the parental pairing analysis? Additional information needs to be provided about this analysis. Southwestern ARRC will be conducting the parentage analysis. This has been added to our scope of work.

Overall, I am not sure why this study is needed. The Program funded KSU to complete a project that will answer this question. The PIs provided no rationale for why the study needs to continue or what the benefits to recovery for continuing this project are. I suggest the PIs provide this information and also explore different methods to utilize the traps the Program recently had constructed for use at the waterfall. Thank you. At this point in time, we do not think this question has been answered. Given sampling restrictions caused by COVID-19 in 2020 we think another year of data are necessary to determine if translocated Razorback Sucker contribute to larval cohorts. If this management strategy

(i.e., translocation) proves to be an effective action, then we will continue efforts and seek new methods for improving our efficacy.

PO: There is a larger temporal effort proposed in this SOW than what has been conducted previously. It would be helpful if the PIs articulate why the increased effort is necessary. We decreased this effort to three weeks with non-continuous efforts starting the 2nd week of March.

The Program purchased traps to assess different methods to increase efficiency below the waterfall. Inclusion of other capture techniques other than electrofishing would be beneficial. An attempt to capture fish in these traps was made in 2021 during low flows with little to no debris in the river. These traps failed to capture any Razorback Suckers, and potentially failed to capture any Colorado Pikeminnow (several were captured in the seining corral however there were believed to be present prior to the corral being set up). Traps will be placed below the Waterfall again in 2022 during the second week of March. These traps will be fished for five days with no electrofishing performed, to reduce any possibility of effecting the efficiency of these trapping techniques.

Since it is expected that these fish will be close to reproducing addressing whether there are any concerns that electrofishing could be counterproductive to this management action would be useful for assessment of the SOW. Electrofishing has been proven to be the most effective and efficient means for collecting these fish below the Waterfall. Reasoning for electrofishing has been added

The SOW includes genetic analyses to assess the overall evaluation of the project. It is not clear who or what level or when this assessment will be made. Southwestern ARRC has agreed to submit a proposal in fiscal year 2023 to conduct parentage testing of Razorback Sucker and larval fish collected by ASIR. This has been added to the scope of work.

Line 69: The larval sampling frequency below the waterfall states samples will be in May and June. How many passes will this entail? This will include three passes below the Waterfall.