

# **FY2021 – Demographic Monitoring of Colorado Pikeminnow and Razorback Sucker**

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This SOW proposes the third year of a three-year effort to generate age-specific demographic parameters for Colorado Pikeminnow and Razorback Sucker in the San Juan River. This proposal is aimed at satisfying several data and recovery needs of the San Juan River Basin Recovery Implementation Program (SJ RIP): 1) age-specific capture and survival probabilities of endangered fishes, 2) age-specific abundance estimates of endangered fishes, 3) effects of limited handling on the endangered fishes, and 4) development of a new post-2023 endangered fish monitoring program. Specifically, the proposed work will focus strictly on the two endangered fishes but with increased effort in order to track demographic parameters of both endangered fishes. Similar to the Upper Colorado River Endangered Fish Recovery Program, we propose this demographic-based sampling occur in a 3-year on, 2-year off fashion in order to allow periods of limited handling stress to the recovering populations. Conducting this work in 2021 would represent the final year of the 3-year “on” cycle. Annual sub-adult/adult monitoring could occur during the “off” cycle to maintain long-term monitoring dataset established during previous sampling.

Following the Recruitment Bottleneck Workshop on 22 February 2018, the SJ RIP decided to limit the capture of Colorado Pikeminnow and Razorback Sucker during summer sampling in order to minimize the apparent detrimental effects of the capture event on juvenile Colorado Pikeminnow survival (Clark et al. 2018). At this point the mechanisms contributing to these capture effects are unknown, but stress-related factors such as electrofishing, handling, tagging, live well housing, and other environmental conditions could be negatively affecting survival. Thus, the SJ RIP would likely be unable to evaluate the effects of reduced handling of juvenile Colorado Pikeminnow in the summer without conducting this proposed work.

The negative effect of capture on juvenile Colorado Pikeminnow was documented via analysis of annual survival (Clark et al. 2018). Thus, continued use of the same parameter to measure the response of changing management appears most appropriate (i.e., not capturing juvenile Colorado Pikeminnow during summertime sampling). Clark et al. (2018) reported relatively high capture probabilities for juvenile Colorado Pikeminnow based on the entirety of the SJ RIP’s sampling efforts (annual mean range: 0.31-0.42). However, single-pass Fall Monitoring capture probabilities of juvenile Colorado Pikeminnow are typically lower (annual mean range: 0.0173-0.0483 from 2011-2015; SJ RIP 2017), limiting recaptures needed for precise annual survival estimates. In an effort to increase capture probability for reliable annual survival estimates, we propose conducting three passes in this Demographic Monitoring SOW of four rafts each from Shiprock, NM to Sand Island, Utah in fall 2021 (RM 147.9-77.7). Only endangered fish would be captured during this Demographic Monitoring effort and additional care would be carried out to minimize fish stress (e.g., salting live wells and using aerators). We propose conducting Demographic Monitoring for three of five years (on 2019-2021, off 2022-2023). Three years of Demographic Monitoring will allow for annual, age-specific survival estimates and capture probabilities for both endangered species (and in the future, estimates of wild-spawned versus hatchery-reared fish). Additionally, multiple in-year passes over three years allows for the use

of Pollock's robust design (Kendall et al. 1997) and estimation of age and species-specific annual abundance. The Demographic Monitoring proposal increases sampling effort during the fall; however, because temperatures are cooler in fall compared to summer (when catch rates of endangered fishes were previously highest), physiological stress and mortality should be reduced.

The following is an outline for the proposed work:

- Three passes (4 rafts each pass) separated by one week
- Each river mile will be a sample unit
- Sampled reach is between Shiprock and Sand Island (RM 147.9-77.7)
- Start mid-September, end early October
- Capture only endangered fishes
- All previous PIT tagging protocols will be in place
  - o All captured fish will be checked for a PIT tag
  - o All fish lacking a PIT tag and >130mm will be implanted with a new PIT tag
- Analysis will be mark-recapture robust design (same analysis used by Upper Basin)
  - o Estimate age-specific capture probability (per pass)
  - o Estimate age-specific survival (annual)
  - o Estimate age-specific abundance (annual)

## Data Analysis

Data collected during the proposed Demographic Monitoring effort in 2021 would complete the three year cycle of this monitoring effort. The first two interim reports will be incorporated with the third year's analyses in a final report following the completion of data collection.

Following data collection in 2020 and 2021, we will use Pollock's robust design (Kendall et al. 1997) implemented in Program MARK (White and Burnham 1999) to estimate demographic parameters of interest. The use of this model is particularly advantageous because it integrates both closed and open population models to estimate several demographic parameters. For example, within year sampling occasions will take place at closely spaced temporal intervals (3 passes over 6 weeks) to estimate *within year age-specific abundance* with closed models. This level of within-year sampling across consecutive years will then allow for the estimation of *between year age-specific survival* using open population models. Additionally, the robust design allows for the estimation of *capture/recapture probability by pass*. A suite of competing models including the effects of variation in factors such as fish size (TL), year, pass-specific capture/recapture probability, temporary emigration, and reach will be evaluated with AICC (Burnham and Anderson 1998) for Colorado Pikeminnow and Razorback Sucker.

**Deliverables**

A draft final report will be submitted to the Program Office by 31 March 2022 and a final report will be completed by 30 June 2022. All data will be submitted to the Program Office by 31 December 2021.

**References**

- Burnham, K.P., and D.R. Anderson. 1998. Model selection and inference: a practical information-theoretic approach. Springer-Verlag, New York.
- Clark, S.R., M.M. Conner, S.L. Durst, and N.R. Franssen. 2018. Age-specific estimates indicate deleterious capture effects and low survival of stocked juvenile Colorado Pikeminnow (*Ptychocheilus lucius*). North American Journal of Fisheries Management. doi/pdf/10.1002/nafm.10214.
- Kendall, W.L., J.D. Nichols, and J.E. Hines. 1997. Estimating temporary emigration using capture-recapture data with Pollock's robust design. Ecology 78(2):563-578.
- San Juan River Basin Recovery Implementation Program (SJRIP). 2017. Population abundance estimates for Colorado Pikeminnow and Razorback Sucker in the San Juan River. San Juan River Basin Recovery Implementation Program, U.S. Fish & Wildlife Service, Albuquerque, NM.
- White, G.C., and K.P. Burnham. 1999. Program MARK: survival estimation from populations of marked animals. Bird Study 46 (supplement):120-138.

Disclaimer: There was a transposing error between MS Excel and MS Word where labor costs of around \$22,600 were dropped from FY2020 Demographic Monitoring. These labor costs were included in the FY2021 Demographic Monitoring SOW which resulted in a large increase from FY2020.

**Task 1: Demographic Monitoring – total budget: \$239,516**

Personnel/Labor Costs (Federal Salary + Benefits)

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

Description	Rate/HR	TOTAL
Principal Biologist (GS-11/7) – 320 hours		\$17,228.80
(1 person X 10 days planning & organization)	\$53.84	
San Juan River sampling - fall:		
(1 person X 8 days/trip X 1 trip – camping)	\$53.84	
(+ 16 extra hours)	\$53.84	
Bio. Tech. Crew Leader (GS-7/4) - 120 hours		\$9,738.00
San Juan River sampling - fall:		
(1 person X 10 days/trip X 1 trip – camping)	\$32.46	
(+ 40 hours overtime)	\$48.69	
Bio. Tech. Crew Leader (GS-6/3) - 120 hours		\$16,646.40
San Juan River sampling - fall:		
(1 person X 10 days/trip X 1 trip – camping)	\$27.74	
(+ 40 hours overtime)	\$41.62	
	<b>PERSONNEL/LABOR</b>	
	<b>TOTAL</b>	<b>\$43,613.20</b>

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

	Rate/HR	TOTAL
Administrative Officer (GS-9/8) – 360 hours	\$42.98	\$15,472.80
Principal Biologist (GS-11/7) – 480 hours	\$53.84	\$25,843.20
Project Leader (GS-14/6) – 320 hours	\$82.57	\$26,422.40
	<b>PERMITTING, DATA</b>	
	<b>INPUT, ETC</b>	<b>\$67,738.40</b>

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

Hotel Costs	RATE	TOTAL
5 nights (in Cortez, CO)	\$124.00	\$1,488.00
Per Diem (Hotel Rate)		
1 days X 5 people (in Cortez, CO)	\$61.00	\$732.00

Per Diem (Camping Rate)

10 days X 4 people

	\$36.00	\$3,024.00
<b>TRAVEL/PER DIEM</b>		
<b>TOTAL</b>		<b>\$5,244.00</b>

Equipment and Supplies

Vehicle Maintenance & Gasoline (@ \$365/month lease = \$12.17 per day based on 30 days in an "average" month + \$0.42/mile)

Vehicle Mileage	Mileage Rate	TOTAL
San Juan fall sampling		
Grand Jct. to Cortez to Hogback to Sand Island to Grand Jct.	\$0.43	\$671.42
<b>VEHICLE LEASE</b>	<b>Lease/day</b>	
San Juan fall sampling		
Grand Jct. to Cortez to Hogback to Sand Island to Grand Jct.	\$12.35	\$296.46
Shuttle Service	\$253.75	\$2,030.00
<b>Generator Gasoline</b>	<b>GAS \$/GAL</b>	
San Juan River sampling	\$2.51	\$350.99
	<b>Vehicle Maint. &amp; Gasoline</b>	<b>\$3,399.10</b>

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 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**

**6% of Personnel, Permitting, Travel, and Vehicle Maint. \$7,199.68**

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 pigtales, 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.

<b>USFWS-GJFWCO Total</b>	<b>\$127,194.39</b>
<b>USFWS R6 Admin Overhead (3.00%)</b>	<b>\$3,815.83</b>
<b>USFWS Region 6 Total</b>	<b>\$131,010.22</b>

<b>Demographic monitoring. New Mexico Fish and Wildlife Conservation Office</b>						
<b>Labor Cost - Field Work (3 trips x 6 days/trip) 5 people per trip</b>						
<b>Position</b>	<b>Grade/Step</b>	<b>Salary w/be</b>	<b>Hours/Day</b>	<b>Total Days</b>		<b>Sub-Total</b>
Fish Biologist	GS 11/7	\$52.04	8	18		\$7,493.76
Fish Biologist	GS 9/7	\$47.16	8	18		\$6,791.04
Remote Biologist	GS 9/4	\$41.72	8	18		\$0.00
Biological Tech	GS 5/1	\$18.67	8	18		\$2,688.48
Biological Tech	GS 5/1	\$18.67	8	12		\$1,792.32
Supervisory Fish Biologist	GS 13/4	\$71.12	8	6		\$3,413.76
<b>6 days. 67.25 hours per trip</b>						
<b>Overtime Hours (weekend work)</b>		<b>Salary w/be</b>	<b>Hours/Day</b>	<b>Total Days</b>		
Fish Biologist	GS 11/7	\$52.04	4.5	18		\$4,215.24
Fish Biologist	GS 9/7	\$62.93	4.5	18		\$5,097.33
Remote Biologist	GS 9/4	\$56.18	4.5	18		\$4,550.58
Biological Tech	GS 5/1	\$27.34	4.5	18		\$2,214.54
Biological Tech	GS 5/1	\$27.34	4.5	12		\$1,476.36
Supervisory Fish Biologist	GS 13/4	\$71.12	4.5	6		\$1,920.24
<b>Administrative, Reporting, Planning</b>						
Fish Biologist	GS 9/7	\$47.16	8	45		\$16,977.60
Remote Biologist	GS 9/4	\$41.72	8	20		\$0.00
Supervisory Fish Biologist	GS 13/4	\$71.12	8	5		\$2,844.80
Administrative Officer	GS 9/9	\$46.93	8	5		\$1,877.20
Biological Tech	GS 5/1	\$18.67	8	20		\$2,987.20
Biological Tech	GS 5/1	\$18.67	8	20		\$2,987.20
<b>Total Labor</b>						<b>\$69,327.65</b>
<b>Travel and Per Diem</b>						
	<b>Days</b>	<b>Rate</b>				
Hotel Costs	12	\$96.00				\$1,152.00
Hotel tax	12	\$12.00				\$144.00
Per Diem (Travel Day)	27	\$41.25				\$1,113.75
Per Diem (Full Day)	60	\$29.00				\$1,740.00
Concur Fee	15	\$14.75				\$221.25
<b>Total Travel/Per Die</b>						<b>\$4,227.00</b>
<b>Equipment</b>						
	<b>Miles/Qty</b>	<b>Total Miles</b>	<b>Rate</b>			
Shuttle Costs	9		\$200.00			\$1,800.00
3 trucks x 3 trips						
Vehicle Fuel						
3 trucks X 3 trips - ABQ to						
Sand Island, UT 574 mi RT	574	5,166	\$0.58			\$2,996.28
Generator Fuel						
40 gallons/trip x 3 trips	120		\$2.85			\$342.00
Maintenance, repair, replace (i.e. life jackets, waders, generator repair, dip nets, etc.)						\$3,000.00
<b>Equipment Total</b>						<b>\$8,138.28</b>
<b>Total for 3 trip pop est. - NMFW</b>						<b>\$81,692.93</b>
<b>Overhead 3%</b>						<b>\$2,450.79</b>
<b>Grand Total</b>						<b>\$84,143.72</b>

**FY 2021 Draft Budget**  
**San Juan River Endangered Fish Demographic Monitoring**  
**Utah Division of Wildlife Resources**

Submitted by Katie Creighton and Brian Hines  
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<b>FY 2021 Costs for UDWR- Moab</b>
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**San Juan River Endangered Fish Demographic Monitoring**

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**Task 1. Endangered Fish Monitoring: Shiprock to Sand Island (2 people X 6 days X 2 trips)**

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

	<b>Rate</b>	<b>Hours</b>	<b>Cost</b>
Project Leader	\$38.10	20	\$762
Biologist	\$33.91	320	\$10,850
Technician	\$17.08	220	\$3,758
		<b>subtotal</b>	<b>\$15,370</b>

Food and Transport (current expense)

	<b>Rate</b>	<b>Quantity</b>	<b>Cost</b>
Truck Rental (2 trucks)	\$199.37	4	\$797
Mileage Costs (2 trucks X 350 miles X 2 trips)	\$0.40	1500	\$600
In-state per diem (during trip)	\$43.00	24	\$1,032
Out-of-State per diem (before trip)	\$46.00	4	\$184
Hotel (before trip)	\$105.00	4	\$420
Shuttle (2 trucks X 2 trips)	\$150.00	4	\$600
		<b>subtotal</b>	<b>\$3,633</b>

Equipment (current expense)

	<b>Rate</b>	<b>Quantity</b>	<b>Cost</b>
Camping gear repair/replacement:			\$500
Sampling gear repair/replacement:			\$1,000
Boating gear repair/replacement:			\$1,000
Fuel for generators (50 gallons/pass)	\$4.00	100	\$400
		<b>subtotal</b>	<b>\$2,900</b>

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<b>Total Expenses</b>	<b>\$21,903</b>
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<b>Administrative Overhead (16% on all personnel services)</b>	<b>\$2,459</b>
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<b>FY 2021 Total</b>	<b>\$24,362</b>
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