FY2022 – 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 (SJRIP): 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 2022 would represent the final year of the 3-year "on" cycle which started in 2019 and delayed a year due to COVID in 2020. 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 SJRIP 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 SJRIP 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 SJRIP'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; SJRIP 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 2022 (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 2019-2022, off 2023-2024). 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 Late August, end late September
- 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 2022 would complete the three year cycle of this monitoring effort. The first two interim reports will incorporated with the third year's analyses in a final report following the completion of data collection.

Following data collection in 2021 and 2022, 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

All data will be submitted to the Program Office by 31 December 2022. A presentation will be given at the 2023 February Biological Committee meeting. A draft final report will be submitted to the Program Office by 31 March 2023 and a final report will be completed by 30 June 2023. A Swimming Upstream report will be generated as well.

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.

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	
	PERSONNEL/LABOR TOTAL	**$43,613.20**

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
	PERMITTING, DATA INPUT, ETC	**$67,738.40**

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
	TRAVEL/PER DIEM TOTAL	**$5,244.00**

Equipment and Supplies

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

		Mileage Rate	TOTAL
Vehicle Mileage			
San Juan fall sampling			
	Grand Jct. to Cortez to Hogback to Sand Island to Grand Jct.	$0.43	$671.42
VEHICLE LEASE		Lease/day	
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
Generator Gasoline		GAS $/GAL	
	San Juan River sampling	$2.51	$350.99
	Vehicle Maint. & Gasoline		**$3,399.10**

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
	6% of Personel, 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 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	**$127,194.39**
USFWS R6 Admin Overhead (3.00%)	**$3,815.83**
USFWS Region 6 Total	**$131,010.22**

FY 2022 Draft Budget

San Juan River Endangered Fish Demographic Monitoring

Utah Division of Wildlife Resources

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2022 Costs for UDWR- Moab

San Juan River Endangered Fish Demographic Monitoring

Task 1. Endangered Fish Monitoring (2 trips X 6 days X 2 people)

Labor: salary + benefits + applicable overtime

	Rate	Hours	Cost
Project Leader	$40.64	20	$813
Biologist	$33.91	300	$10,172
Technician	$17.79	220	$3,915
		subtotal	**$14,900**

Food and Transport

	Rate	Quantity	Cost
Truck Rental (2 trucks)	$500.00	2	$1,000
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
		subtotal	**$3,836**

Equipment

	Rate	Quantity	Cost
Camping gear repair/replacement:	$1,000.00	1	$1,000
Sampling gear repair/replacement:	$1,000.00	1	$1,000
Boating gear repair/replacement:	$1,000.00	1	$1,000
		subtotal	**$3,000**

		Task 1 Subtotal:	**$21,736**

Task 2. Project coordination, meetings, presenting

Labor: salary + benefits + applicable overtime

	Rate	**Hours**	**Cost**
Project Leader	$40.64	40	$1,625
Biologist	$33.91	80	$2,713
Technician	$17.79	0	$0
		subtotal	**$4,338**
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 2 Subtotal:	**$6,036**

Total Expenses	**$27,772**
Administrative Overhead (17% on all personnel services)	**$3,270**
UDWR-Moab Total	**$31,042**

FY22 NMFWCO Demographic monitoring							Page 1	
Labor Cost - Field Work (3 trips x 6 days/trip)								
Position	**Grade/Step**	**Salary w/b**	**Hours/Day**	**Total Days**			**Sub-Total**	
Fish Biologist	GS 11/8	$53.53	8	18			$7,708.32	
Fish Biologist	GS 9/10	$48.22	8	18			$6,943.68	
Remote Biologist	GS 9/4	$40.60	8	18			$0.00	$5,846.40
Biological Tech	GS 5/1	$18.69	8	18			$2,691.36	
Biological Tech	GS 5/1	$18.69	8	12			$1,794.24	
Supervisory Fish Biologist	GS 13/4	$74.78	8	6			$3,589.44	
Overtime Hours (weekend work)		Salary w/b	Hours/Day	Total Days				
Fish Biologist	GS 11/7	$53.53	4.5	18			$4,335.93	
Fish Biologist	GS 9/10	$65.30	4.5	18			$5,289.30	
Remote Biologist	GS 9/4	$54.75	4.5	18			$4,434.75	
Biological Tech	GS 5/1	$27.36	4.5	18			$2,216.16	
Biological Tech	GS 5/1	$27.36	4.5	12			$1,477.44	
Supervisory Fish Biologist	GS 13/4	$74.78	4.5	6			$2,019.06	
Administrative, Reporting, Planning								
Fish Biologist	GS 9/10	$48.22	8	45			$17,359.20	
Remote Biologist	GS 9/4	$40.60	8	20			$0.00	$6,496.00
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	
Biological Tech	GS 5/1	$18.69	8	20			$2,990.40	
Biological Tech	GS 5/1	$18.69	8	20			$2,990.40	
					Total Labor		**$70,724.88**	
Travel and Per Diem	**Days**	**Rate**						
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	
					Total Travel/Per Dier		**$4,227.00**	

FY22 NMFWCO Demographic monitoring							Page 2
Equipment	**Miles/Qty**	**Total Mile**	**Rate**				
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	$0.56				$2,892.96
Generator Fuel	120		$2.85				$342.00
40 gallons/trip x 3 trips							
Maintenance, repair, replace							$3,000.00
(i.e. life jackets, waders, generator repair, dip nets, etc.)							
					Equipment Total		**$8,034.96**
Remote Biologist Savings	$12,342.40						
				Total for 3 trip pop est. - NMFW			**$82,986.84**
							$2,489.61
							$85,476.45

GJFWCO **TOTAL $131,010.22**

UDWR **TOTAL $31,042**

NMFWCO **TOTAL $85,476.45**

GRAND TOTAL **TOTAL $247,528.67**