COLORADO RIVER RECOVERY PROGRAM Project Number: 15
FY 2018-2022 (this the 2018-2019 portion) SCOPE OF WORK for:
Identification and Curation of Larval and Juvenile Fish

Reclamation Agreement number *[if applicable & known]*: R14AP00001
Reclamation Agreement term *[if applicable & known]*: Oct. 1, 2014 – Sep. 30, 2018

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Category:
X Ongoing project
__ Ongoing-revised project
__ Requested new project
__ Unsolicited proposal

Expected Funding Source:
X Annual funds
__ Capital funds
__ Other

I. Title of Proposal:

Identification and Curation of Larval and Juvenile Fish by Colorado State University Larval Fish Laboratory.

II. Relationship to RIPRAP:

General Recovery Program Support Action Plan
V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).
V.A. Measure and document population and habitat parameters to determine status and biological response to recovery actions.
V.B. Conduct research to acquire needed life history information.
V.E. Provide for long-term care, cataloging, and accessibility of preserved specimens.

III. Study Background/Rationale and Hypotheses:

This project supports Larval Fish Laboratory (LFL) taxonomic and analytical services for specific Recovery Program projects (Task 1, Taxonomic Services). Incidental taxonomic services and consultation on larval and juvenile fish taxonomy, sampling techniques, and collection handling are also provided, as needed and time allows, to Upper Colorado River Basin (UCRB) researchers.

The project also provides ongoing curation (maintenance and management) of the growing Upper Colorado River Basin (UCRB) portion of the LFL Collection. LFL currently maintains over 4,300,000 UCRB specimens in about 134,000 taxon-specific lots as voucher for Recovery Program and earlier and related UCRB investigations. These collections are an invaluable, long-term, historical resource for future reference and research. Some collections are over quarter century old, dating back to 1976. New collections are cataloged and added to the LFL Collection as they are received or processed by LFL. As the holdings of the LFL Collection become better known, we expect use of UCRB collections will increase substantially, both within and outside the Recovery Program.

As part of the curatorial effort, we continue to pursue arrangements to help ensure collection permanency. In part through the efforts of the principal investigator, preliminary plans continue to develop for administratively and physically consolidating most of the university's Natural History Research Collections (including the LFL Collection) to provide better long-term recognition, support, and facilities for those collections as a functional unit of Colorado State University.

IV. Study Goals, Objectives, End Product(s):

Goal—

To provide taxonomic, curatorial, and statistical analysis services for various Recovery Program projects.

Objectives—

Support Recovery Program researchers by identifying, processing, cataloging, and curating preserved fish, or analyzing otoliths, in specifically designated sets of collections submitted to LFL under this project (Task 1), currently collections from:

- Project 22F, LFL—samples to assess Yampa and Middle-Green Colorado pikeminnow and razorback sucker larval abundance and samples collected in the White River.
- Project 158, Utah Division of Wildlife Resources and U. S. Fish and Wildlife Service, Vernal, Utah offices—samples associated with middle Green River drift and backwater sampling aimed at understanding factors contributing to the decline of age-0 Colorado pikeminnow (Task 1b) and ISMP samples collected at the same time. **No funding accepted due to study suspension**.
- Project 160, Utah Division of Wildlife Resources, Moab, Utah—samples associated with increased light-trap sampling in the lower Green River for age-0 razorback sucker (Task 1c).
- Project 161, Larval Fish Laboratory—Analyze otoliths of age-0 smallmouth bass from the Colorado River (Task 1d). **Request no funding be sent in 2018**, sample analysis not needed.
- Project 163, USFWS, Grand Junction, Colorado—Samples associated with Gunnison River fish community monitoring. This will include any small chub work from samples collected in Black Rocks.

- Project FR-164, USFWS, Vernal, Utah—Samples associated with Green River Larval Trigger Study Plan monitoring in floodplain wetlands in the Green River Basin.
- Project FR-165, UDWR, Vernal, Utah—Samples associated with Green River Larval Trigger Study Plan monitoring in Stewart Lake floodplain wetland.
- Project 127, 131, and 163 (none in FY 18) statistical analysis.

Provide, as needed and time allows, incidental taxonomic services and consultation on taxonomy, collecting techniques, and collection handling to other Recovery Program projects and researchers (Task 1).

Catalog and incorporate in the LFL Collection other preserved UCRB specimens deposited by Recovery Program projects and researchers (Task 2).

Continue curation (maintenance and management) of all cataloged UCRB specimens in the LFL Collection (Task 2).

End Products—

Annual project reports.

Collection or analysis data for Project 22F, 160, 163, FR-164, and FR-165 researchers.

Other determinations of specimen identity and data.

Cataloging and incorporation of taxonomic services project collections and other deposited UCRB fish collections in the LFL Collection.

Continued maintenance and management of, and access to, the cataloged collection of preserved fish which serve as voucher for Recovery Program investigations and provide a long-term resource for future Recovery Program and other public reference and research.

V. Study Area:

The Recovery Program collections identified, processed, and curated by LFL were or will be collected from cool to warm-water reaches of the UCRB, generally exclusive of the San Juan River subbasin.

VI. Study Methods/Approach:

Taxonomic Services—We will identify preserved specimens (mostly larvae) or analyze otoliths collected and submitted by other Recovery Program projects specified above and process, catalog, and curate the fish collections as part of the LFL Collection. Limited incidental taxonomic services and related consultation for other Recovery Program projects and researchers also will be provided as needed and time allows.

Ongoing Curation—The LFL Collection will continue to serve as the depository for larval and other small fish from preserved Recovery Program collections. Methods for receiving, accessioning, cataloging, maintaining, and managing use of these preserved specimens are provided in our draft "Larval Fish Laboratory Collection Policies and Procedures Manual" (Appendix II, Snyder 1996), as adapted for our SPECIFY Collection Management System. We will respond to internal and external requests for collection information and use of specimens; Recovery Program approval will be required for any destructive use or transfer of endangered or rare species. We will continue our effort to ensure collection permanency, in

part through planned consolidation of Colorado State University Natural History Research Collections.

VII. Task Description and Schedule:

Task 1: Taxonomic Services—As soon as possible after receipt, collections for Recovery Program projects listed below will be identified and otherwise processed, and as time allows, other incidentally requested taxonomic services and consultations.
1a: Collection identification, processing, and curation for Project 22F, includes final identification of Yampa, middle Green, and White River light trap and drift net samples.
1b: Collection identification, processing, and curation for Project 158, UDWR and USFWS backwater study. Study suspended, no budget requested.
1c: Collection identification, processing, and curation for Project 160, lower Green River light trap and seine samples.
1d: Otolith analyses of age-0 smallmouth bass for Project 161. Study data collection not needed, no budget requested.
1e: Collection identification, processing, and curation for Project 163, Gunnison River monitoring, USFWS, Grand Junction.
1f. Collection identification, processing, and curation for Project FR-164, Larval Trigger Study Plan samples, USFWS, Vernal, Utah.
1g: Collection identification, processing, and curation for Project FR-165, Larval Trigger Study Plan samples, Stewart Lake, UDWR, Vernal, Utah.
1h: Statistical analysis assistance of data collected in the conduct of Projects 127, 131, and 163 (none in FY 18).

Task 2: Ongoing Curation—As needed throughout each fiscal year.

VIII. Deliverables, Due Dates, and Budget by Fiscal Year:

Deliverables and Due Dates:
LFL will record and submit collection data to Project 22F, 160, 163, FR-164, and FR-165 researchers as soon as the collections are processed.
Other taxonomic determinations and related information and suggestions will be conveyed to requesting researchers as time allows.
Annual report—November each year.

Travel: Travel costs for up to two meetings include hotel, per diem, and mileage to travel to meetings. These include costs for two people.

Personnel: Salaries include 24.7% fringe rate, an estimate for 2018-19, plus overhead. Overhead is calculated on all items (including salary plus fringe rate) at 17.5%, per our agreement with BOR.

Supplies: Supplies are used in the conduct of lab analysis of specimens and otoliths. Containers and preservatives are to hold field specimens and to curate specimens in the lab, preservative are formalin and ethanol for preservation of samples. Estimated costs based on current prices procured from various online sources (e.g., Fischer Scientific for

preservatives, sample jars, vials).

Budget notes: Costs were formerly reduced to accommodate Program needs. This was accomplished by eliminating Colorado River smallmouth bass otolith analysis, eliminating funding for sample analysis under Project 158 (Green River backwater studies), building in only minimal raises for salary between 2016-2019, and decreasing costs for sample identification and other analyses. Increases in other years needed to support mandated raises for personnel; increased sample costs or new project additions may change budget.

Budget reduced during the FY 2018-2019 period by $35,702 by reducing Principal Investigator time on this project. FY 2019 Budget modified to include tuition costs for a graduate student involved in this project, for $25,800. No additional funds are required for tuition; all tasks will be fully completed, and costs for tuition are covered by eliminating Principal Investigator costs in Task 1a. Student will be expected to accomplish that level of work doing sample identification, so costs will be converted to salary if a student is not recruited that year.

FY-2018	Task 1a, project 22f sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	45	545		$24,525
Senior technician (d)	40	247		$9,878
Technician (d)	35	158		$5,546
			subtotal	$39,949
Supplies				
jars and vials	4	100		$400
preservative	12	11		$132
			subtotal	$532
Travel				
meetings	2	900		$1,800
			subtotal	$1,800
			Total	$42,281

FY-2018	Task 1c, project 160 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	35	545		$19,075
Senior technician (d)	45	247		$11,113
Technician (d)	35	158		$5,546
			subtotal	$35,734
Supplies				
jars and vials	3	100		$300
preservative	8	11		$88
			subtotal	$388
			Total	$36,122

FY-2018	Task 1e, project 163 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	40	545		$21,800
Senior technician (d)	130	247		$32,104
Technician (d)	150	158		$23,767
			subtotal	$77,671
Supplies				
jars and vials	16	100		$1,600
preservative	18	11		$198
			subtotal	$1,798
			Total	$79,469

FY-2018	Task 1f, project FR 164 sample identification and curation
Item	Cost

Labor	Units	Cost/unit		
Principal investigator (d)	25	545		$13,625
Senior technician (d)	30	247		$7,409
Technician (d)	25	158		$3,961
			subtotal	$24,995
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$25,261

FY-2018	Task 1g, project FR 165 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	25	545		$13,625
Senior technician (d)	35	247		$8,643
Technician (d)	25	158		$3,961
			subtotal	$26,230
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$26,496

FY-2018	Task 1h, project 127 ($2,160), 131 ($7,500), 163 ($0) statistical analysis			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	14	545		$7,630

Technician (d)	12.81	158		$2,030
			subtotal	$9,660
			Total	$9,660

FY-2018	Task 2, ongoing curation and collection maintenance			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	20	545		$10,900
Senior technician (d)	25	247		$6,174
Technician (d)	25	158		$3,961
			subtotal	$21,035
Supplies				
jars and vials	3	100		$300
preservative	9	11		$99
			subtotal	$399
			Total	$21,434
			FY-2018 total	$240,722

FY-2019	Task 1a, project 22f sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Tuition, grad student credits	30	860		$25,800
Senior technician (d)	40	252		$10,076
Technician (d)	35	162		$5,657
			subtotal	$41,532
Supplies				
jars and vials	4	100		$400
preservative	12	11		$132

			subtotal	$532
Travel				
meetings	2	950		$1,900
			subtotal	$1,900
			Total	$43,964

FY-2019	Task 1c, project 160 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator				
(d)	35	556		$19,457
Senior technician (d)	45	252		$11,335
Technician (d)	35	162		$5,657
			subtotal	$36,448
Supplies				
jars and vials	3	100		$300
preservative	8	11		$88
			subtotal	$388
			Total	$36,836

FY-2019	Task 1e, project 163 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator				
(d)	40	556		$22,236
Senior technician (d)	130	252		$32,746
Technician (d)	150	162		$24,242
			subtotal	$79,225

Supplies				
jars and vials	16	100		$1,600
preservative	18	11		$198
			subtotal	$1,798
			Total	$81,023

FY-2019 Task 1f, project FR 164 sample identification and curation

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	25	556		$13,898
Senior technician (d)	30	252		$7,557
Technician (d)	25	162		$4,040
			subtotal	$25,495
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$25,761

FY-2019 Task 1g, project FR 165 sample identification and curation

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	25	556		$13,898
Senior technician (d)	35	252		$8,816
Technician (d)	25	162		$4,040
			subtotal	$26,754
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66

			subtotal	$266
			Total	$27,020

FY-2019	Task 1h, project 127 ($2,203), 131 ($0), 163 ($0) statistical analysis			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	3	556		$1,668
Technician (d)	3.31	162		$535
			subtotal	$2,203
			Total	$2,203

FY-2019	Task 2, ongoing curation and collection maintenance			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	20	556		$11,118
Senior technician (d)	25	252		$6,297
Technician (d)	25	162		$4,040
			subtotal	$21,456
Supplies				
jars and vials	3	100		$300
preservative	9	11		$99
			subtotal	$399
			Total	$21,855

FY-2019 total	$238,661

FY-2020	Task 1a, project 22f sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	45	567		$25,520
Senior technician (d)	40	257		$10,282
Technician (d)	35	165		$5,783
			subtotal	$41,585
Supplies				
jars and vials	4	100		$400
preservative	12	11		$132
			subtotal	$532
Travel				
meetings	2	1000		$2,000
			subtotal	$2,000
			Total	$44,117

FY-2020	Task 1c, project 160 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	35	567		$19,849
Senior technician (d)	45	257		$11,567
Technician (d)	35	165		$5,783
			subtotal	$37,199
Supplies				
jars and vials	3	100		$300
preservative	8	11		$88
			subtotal	$388
			Total	$37,587

FY-2020	Task 1e, project 163 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	40	567		$22,685
Senior technician (d)	130	257		$33,415
Technician (d)	150	165		$24,786
			subtotal	$80,886
Supplies				
jars and vials	16	100		$1,600
preservative	18	11		$198
			subtotal	$1,798
			Total	$82,684

FY-2020	Task 1f, project FR 164 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	25	567		$14,178
Senior technician (d)	30	257		$7,711
Technician (d)	25	165		$4,131
			subtotal	$26,020
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$26,286

FY-2020	Task 1g, project FR 165 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	25	567		$14,178
Senior technician (d)	35	257		$8,996
Technician (d)	25	165		$4,131
			subtotal	$27,305
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$27,571

FY-2020	Task 1h, project 127 ($2247), 131 ($7,500), 163 ($0) statistical analysis, 9747			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	15	567		$8,507
Technician (d)	7.506	165		$1,240
			subtotal	$9,747
			Total	$9,747

FY-2020	Task 2, ongoing curation and collection maintenance			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	20	567		$11,342
Senior technician (d)	25	257		$6,426
Technician (d)	25	165		$4,131

			subtotal	$21,899
Supplies				
jars and vials	3	100		$300
preservative	9	11		$99
			subtotal	$399
			Total	$22,298
			FY-2020 total	$250,292

FY-2021 Task 1a, project 22f sample identification and curation

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	45	578		$26,025
Senior technician (d)	40	262		$10,486
Technician (d)	35	168		$5,891
			subtotal	$42,401
Supplies				
jars and vials	4	100		$400
preservative	12	11		$132
			subtotal	$532
Travel				
meetings	2	1000		$2,000
			subtotal	$2,000
			Total	$44,933

FY-2021 Task 1c, project 160 sample identification and curation

Item	Cost

Labor	Units	Cost/unit		
Principal investigator (d)	35	578		$20,242
Senior technician (d)	45	262		$11,796
Technician (d)	35	168		$5,891
			subtotal	$37,929
Supplies				
jars and vials	3	100		$300
preservative	8	11		$88
			subtotal	$388
			Total	$38,317

FY-2021 Task 1e, project 163 sample identification and curation

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	40	578		$23,134
Senior technician (d)	130	262		$34,078
Technician (d)	150	168		$25,245
			subtotal	$82,457
Supplies				
jars and vials	16	100		$1,600
preservative	18	11		$198
			subtotal	$1,798
			Total	$84,255

FY-2021 Task 1f, project FR 164 sample identification and curation

Item			Cost
Labor	Units	Cost/unit	
Principal investigator (d)	25	578	$14,459

Senior technician (d)	30	262		$7,864
Technician (d)	25	168		$4,208
			subtotal	$26,530
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$26,796

FY-2021	Task 1g, project FR 165 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	25	578		$14,459
Senior technician (d)	35	262		$9,175
Technician (d)	25	168		$4,208
			subtotal	$27,841
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$28,107

FY-2021	Task 1h, project 127 ($5730), 131 ($7,500), 163 ($9066) statistical analysis, 22296			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	35	578		$20,242
Technician (d)	12.205	168		$2,054
			subtotal	$22,296

			Total	$22,296

FY-2021	Task 2, ongoing curation and collection maintenance			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	20	578		$11,567
Senior technician (d)	25	262		$6,554
Technician (d)	25	168		$4,208
			subtotal	$22,328
Supplies				
jars and vials	3	100		$300
preservative	9	11		$99
			subtotal	$399
			Total	$22,727
			FY-2021 total	$267,431

FY-2022	Task 1a, project 22f sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	45	590		$26,530
Senior technician (d)	40	267		$10,690
Technician (d)	35	171		$5,998
			subtotal	$43,217
Supplies				
jars and vials	4	100		$400
preservative	12	11		$132
			subtotal	$532

Travel				
meetings	2	1000		$2,000
			subtotal	$2,000
			Total	$45,749

FY-2022	Task 1c, project 160 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator				
(d)	35	590		$20,635
Senior technician (d)	45	267		$12,026
Technician (d)	35	171		$5,998
			subtotal	$38,658
Supplies				
jars and vials	3	100		$300
preservative	8	11		$88
			subtotal	$388
			Total	$39,046

FY-2022	Task 1e, project 163 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator				
(d)	40	590		$23,582
Senior technician (d)	130	267		$34,741
Technician (d)	150	171		$25,704
			subtotal	$84,028
Supplies				
jars and vials	16	100		$1,600
preservative	18	11		$198

			subtotal	$1,798
			Total	$85,826

FY-2022	Task 1f, project FR 164 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	25	590		$14,739
Senior technician (d)	30	267		$8,017
Technician (d)	25	171		$4,284
			subtotal	$27,040
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$27,306

FY-2022	Task 1g, project FR 165 sample identification and curation			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	25	590		$14,739
Senior technician (d)	35	267		$9,353
Technician (d)	25	171		$4,284
			subtotal	$28,376
Supplies				
jars and vials	2	100		$200
preservative	6	11		$66
			subtotal	$266
			Total	$28,642

FY-2022	Task 1h, project 127 ($0), 131 ($7,500), 163 ($0) statistical analysis, 7500			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	12	578		$6,940
Technician (d)	3.325	168		$560
			subtotal	$7,500
			Total	$7,500

FY-2022	Task 2, ongoing curation and collection maintenance			
Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	20	590		$11,791
Senior technician (d)	25	267		$6,681
Technician (d)	25	171		$4,284
			subtotal	$22,756
Supplies				
jars and vials	3	100		$300
preservative	9	11		$99
			subtotal	$399
			Total	$23,155
			FY-2022 total	$257,224

IX. Budget Summary

Summary table for FY 2018-2019 and five year budget.

FY 2018-19 budget

Year	LFL
FY2018	$240,722
FY2019	$238,661
	$479,383

FY2018-2022 budget

Year	LFL
FY2018	$240,722
FY2019	$238,661
FY2020	$250,292
FY2021	$267,431
FY2022	$257,224
	$1,254,330

X. Reviewers: (Not applicable–ongoing project)

XI. References:

Snyder, D. E. 1996. Preserved larval and small-fish collections of the Upper Colorado River Basin: maintenance and cataloging of a valuable historical database. Final Report of the Larval Fish Laboratory, Colorado State University, to the Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin, U.S. Fish and Wildlife Service, Denver, Colorado. (24 April 1996).