I. Project Title: Identification and Curation of Larval and Juvenile Fish by Colorado State University Larval Fish Laboratory.

II. Bureau of Reclamation Agreement Number(s): R14AP00001

Project/Grant Period: Start date (Mo/Day/Yr): 10/01/14
End date: (Mo/Day/Yr): 09/30/18
Reporting period end date: 09/30/15
Is this the final report? Yes _____ No __X__

III. Principal Investigator(s): Kevin R. Bestgen (Project Manager), Darrel E. Snyder, and Sean C. Seal
Larval Fish Laboratory, Colorado State University, 1474 Campus Delivery, Fort Collins, CO 80523-1474
Kevin.Bestgen@ColoState.edu, Darrel.Snyder@ColoState.edu, and Sean.Seal@ColoState.edu
Phone (970) 491-1848 (KRB), 491-5295 (DES), and 491-6412 (SCS)
Fax (970) 491-5091

IV. Abstract: This ongoing project supports Larval Fish Laboratory (LFL) taxonomic, analytical, and curatorial services for specific Recovery Program projects, and as time allows, other incidentally requested taxonomic services and consultation (Task 1). It also provides for ongoing curation (maintenance and management) of the LFL Collection, including controlled access to and use of collection holdings and data by UCRB and other researchers (Task 2).

V. Study Schedule: Ongoing project since 1995. Collections from the following projects are identified, processed, and curated annually with the resultant data provided to the principal investigator as soon as logistically possible after the collections are received: Project 22F, LFL—preliminarily identified drift-net and light-trap samples from the lower Yampa, Middle-Green, and White Rivers to assess the larval abundance of Colorado Pikeminnow and Razorback Sucker (Task 1a); Project 138, Utah Division of Wildlife resources, Vernal and Moab offices—Interagency Standardized Monitoring Program sample identification/verification as needed (none in 2015); Project 158, Utah Division of Wildlife Resources (UDWR) and U. S. Fish and Wildlife Service (USFWS), Vernal offices—drift and backwater samples from the Middle-Green River to help assess factors contributing to the decline of age-0 Colorado Pikeminnow and simultaneously collected ISMP samples (Task 1b—backlog, study suspended in 2013); Project 160, UDWR, Moab—light-trap samples for age-0 razorback sucker and seine samples from the lower Green River (Task 1c); Project 163, USFWS, Grand Junction—samples associated with Gunnison River fish community monitoring (Task 1e); Project FR-164, USFWS, Vernal—samples associated with Green River Larval Trigger Study Plan

monitoring in floodplain wetlands (Task 1f); and Project FR-165, UDWR, Vernal—samples associated with Green River Larval Trigger Study Plan monitoring in Stewart Lake floodplain (Task 1g). This project also supports work for Project 161, LFL—analysis of otoliths from age-0 smallmouth bass taken in the Colorado River (Task 1d), but no analysis was needed or funded for 2014 or 2015. Incidental taxonomic services and consultation on early life-stage taxonomy, sampling techniques, and collection handling are addressed as needed and time allows (also Task 1). General collection maintenance activities (e.g., fluid level and container checks) are conducted annually; other maintenance and management concerns, including National Park Service inventory checks of cross-catalogued holdings are addressed as needed and newly deposited and backlog collections are cataloged as time permits (Task 2). Responses to requests for loans, collection use, or information on collection holdings are provided as needed (also Task 2).

VI. Relationship to RIPRAP: This project is related to General Recovery Program Support Action Plan V (monitor populations and habitat and conduct research to support recovery actions—research, monitoring, and data management). Identification and processing of collections for Projects 22F, 138, 158, 160, 163, FR-164, and FR-165 and otolith analyses for Project 161 contribute to Tasks V.A (measure and document population and habitat parameters to determine status and biological response to recovery actions) and V.B (conduct research to acquire needed life history information). The remainder of this project specifically addresses Task V.E (provide for long-term care, cataloging, and accessibility of preserved specimens) and, in that preserved specimens are the ultimate natural history database, contributes to Task V.A.1 (conduct interagency data management program to compile, manage, and maintain all research and monitoring data collected by the Recovery Program).

VII. Accomplishments of FY 2015 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1, Taxonomic Services—We processed the following preserved collections for Task 1a (Project 22F): in 2013, 218 Yampa River drift net samples (548 lots-5,475 specimens), 14 seine samples (64 lots-4,889 specimens) and 35 Green River drift net samples (46 lots-47 specimens), 7 seine samples (26 lots-683 specimens). In 2014, 206 Yampa River drift net samples (755 lots-6,602 specimens) were collected. Also in 2014, 152 razorback sucker light-trap collections (400 lots-6,441 specimens) were taken from the Green River. For Task 1b (Project 158), no samples were received. For Task 1c (Project 160), 74 light-trap (128 lots-3,242 specimens)[a] and 20 seine (79 lots-4,363 specimens) collections taken 2013 in the lower Green River. In 2014, 82 lower Green River light-trap (155 lots-5561 specimens), 7 seine (12 lots-13 specimens) and 59 Colorado River light-trap (150 lots-918 specimens), 13 seine (22 lots-62 specimens) collections were taken and processed. For Task 1e (Project 163), 97 Colorado River dip nets (242 lots-1,184 specimens), 13 seines (43 lots-630 specimens) and 195 Gunnison River dip nets (602 lots-4,421 specimens), 24 seines (132 lots-3,500 specimens) were processed from 2011 collections. Collections for 2012 consisted of 220 Colorado River

dip nets (636 lots-5,075 specimens)[b], 18 seines (54 lots-11,964 specimens) and 162 Gunnison River dip nets (373 lots-3,768 specimens), 22 seines (41 lots-892 specimens). Collections for 2013 consisted of 268 Colorado River dip nets (806 lots-5,780 specimens), 32 seines (140 lots-22,276 specimens) and 230 Gunnison River dip nets (515 lots-2,404 specimens), 14 seines (39 lots-2,376 specimens). Collections for 2014 consisted of 142 Colorado River dip nets (382 lots-1,626 specimens) and 163 Gunnison River dip nets (472 lots-2,139 specimens). Task 1g (Project FR-165), we processed 119 light-trap collections taken in 2014 from Stewart Lake (239 lots-1,909 specimens). All processed specimens have been cataloged and shelved as part of the LFL Collection and the collection data forwarded to the responsible principal investigators (PIs) for analysis and reporting.

Footnotes—

[a] Single sample (3 lots, 538 specimens) discarded due to poor preservation and not included in figures, but reported to PIs.

[b] Single Sample (4 lots, 269 specimens) discarded due to poor preservation and not included in figures, but reported to PIs.

Task 2, Ongoing Collection Maintenance and Management—We: (1) added, as of 30 September, a total of 7,943 lots of fish (145,316 specimens) from UCRB collections or investigations to the cataloged collection (Appendix A), (2) submitted an updated *Access* database version of our catalog records through FY 2015 (selected fields, flat file) to the Interagency Database Management Program (IDMP) archive, (3) made collection holdings and selected data available to UCRB researchers and other interested parties, including specimens used for developmental study of cyprinid larvae for Project 149 and inventory checks requested by the NPS, (4) responded to incidental requests from UCRB researchers for taxonomic assistance or consultation on larval-fish sampling and collection handling matters, (5) corrected incidentally found errors in our catalog database, (6) installed and tested the latest version of our collection database and management program, *Specify 6*, and (7) conducted an annual fluid level and condition check of our holdings. As of 30 September 2015, we maintain and manage 127,785 lots of cataloged fish (4,097,862 specimens) collected from the UCRB or used for UCRB Recovery Program investigations. These holdings represent just over 95% of all LFL cataloged lots (97% of cataloged specimens).

No significant progress was made in FY 2015 towards plans for housing the LFL Collection and other natural history collections on campus together as a university natural history museum. The museum facility awaits adequate development-grant funding.

Shortcomings—None.

VIII. Additional noteworthy observations: Reports of such observations are appropriately deferred to the PI's to whom the processed collection data has been submitted.

IX. Recommendations: We recommend continued annual support of Project 15 with sufficient funds for processing newly preserved collections covered by this project, incidental taxonomic services and consultation, and on-going maintenance and management (curation) of all UCRB specimens held by LFL.

X. Project Status: On-track and ongoing.

XI. FY 2015 Budget Status

A. Funds Provided: $240,120
B. Funds Expended: $229,000
C. Difference: $11,200
Explanation: Additional work remains to accomplish 2014 tasks; see Section VII.
D. Percent of FY 2014 work completed and projected costs to complete: about 95% of work completed; funds are sufficient to complete tasks.
E. Recovery Program funds spent for publication charges: $0

XII. Status of Data Submission (Where applicable): 2013 and 2014 collection data for Project 22F (Task 1a) was internally submitted to Kevin Bestgen. 2013 and 2014 collection data for Project 160 (Task 1c) was submitted to respective PI's. 2011 to 2014 collection data for Project 163 (Task 1e) was submitted to respective PI's. 2014 collection data for Project FR-165 (Task 1g) was submitted to respective PI's. An updated *Access* database version of our LFL Collection catalog for UCRB holdings (selected fields, flat file) through FY 2015 was submitted to the IDMP archive.

XIII. Signed: Darrel E. Snyder
Principal Investigator Date

Signed: Sean C. Seal
Principal Investigator Date

Signed: Kevin R. Bestgen
Principal Investigator, Date: 13 November 2015
Project Manager

APPENDIX A:

Study-year sets of Upper Colorado River Basin collection-species lots cataloged as part of the Colorado State University Larval Fish Laboratory Collection from October 1, 2014 through September 30, 2015 (7,943 lots; 145,316 specimens).

Catalog No.	Field Numbers	Description of Sample Sets
41082, 41465	CDOW-92DR-CL003, CU061***	92 DR, Lower and Upper Colorado R, CO
67957	(non-UCRB collection)	
99655-663	EJW-12GR-001**	12 LT, Green River, CO
99664-669	UDWR-13GR-ISMP03, 09, 13, 41, 79, 84	13 SN, Green River, UT
125992-6539	LFL-13YA-6131 to 8161	13 Larvae, DR, Yampa R, Echo Pk,DNM,CO
126540-6603	LFL-13YA-708S1 to 816S2	13 Larvae, SN, Yampa R, Echo Pk,DNM,CO
126604-6649	LFL-13GR-7053 to 8161	13 Larvae, DR, Green R, Echo Pk,DNM,CO
126650-6675	LFL-13GR-708S1 to 812S1	13 Larvae, SN, Green R, Echo Pk,DNM,CO
126676-6728	UDWR-13LRZ-L101 to L350	13 Larvae, Lower RZ LT, Green R, UT
126729-6748	UDWR-13LRZ-S101 to S373	13 Larvae, Lower RZ SN, Green R, UT
126749-6750	UDWR-13LRZ-L101 to L350*	13 Larvae, Lower RZ LT, Green R, UT
126751-6764	UDWR-14GR-ISMP02 to 72	14 SN, Green River, UT
126765-7003	UDWR-14GR-SL001 to 119	14 LT, Green R, Stewart Lake Eval, UT
127004-7403	FWS/V-14RZ-119 to 341	14 Larvae, RZ LT, Green R, UT
127404-8158	LFL-14YA-6261 to 8183	14 Larvae, DR, Yampa R, Echo Pk,DNM,CO
128159-8231	UDWR-13LRZ-L102 to L482*	13 Larvae, Lower RZ LT, Green R, UT
128232-8290	UDWR-13LRZ-S102 to S373*	13 Larvae, Lower RZ SN, Green R, UT
128291-8532	FWS/GJ-11CO-007 to 292	11 Larvae, DN, Colorado R, CO
128533-9134	FWS/GJ-11GU-001 to 271	11 Larvae, DN, Gunnison R, CO
129135-9177	FWS/GJ-11CO-Y02 to Y24	11 Young of Year, SN, Colorado R, CO
129178-9308	FWS/GJ-11GU-Y01 to Y29	11 Young of Year, SN, Gunnison R, CO
129309-9330	LFL-YART1-10 to 4649**	Reference RT series, Yampa R, CO
129331-9343	LFL-YART2-10 to 3538**	Reference RT series, Yampa R, CO

Catalog No.	Field Numbers	Description of Sample Sets
129344-9364	RTM-83CULT-RT24, 27, 30; CDOW/LFL-79W, 79Y, 79G; LFL-YART1-14, 16, 22, 4245; LFL-YART2-14**	Study RT series, Reared, White R, Green R, Yampa R, CO
129365-9514	UDWR-14LRZ-CL21 to CL84	14 Larvae, Lower RZ LT, Colorado R, UT
129515-9536	UDWR-14LRZ-CS00 to CS44	14 Larvae, Lower RZ SN, Colorado R, UT
129537-9691	UDWR-14LRZ-GL09 to GL93	14 Larvae, Lower RZ LT, Green R, UT
129692-9703	UDWR-14LRZ-GS03 to GS35	14 Larvae, Lower RZ SN, Green R, UT
129704-30509	FWS/GJ-13CO-001 to 720	13 Larvae, DN, Colorado R, CO
130510-1024	FWS/GJ-13GU-016 to 606	13 Larvae, DN, Gunnison R, CO
131025-1660	FWS/GJ-12CO-001 to 381	12 Larvae, DN, Colorado R, CO
131661-2033	FWS/GJ-12GU-006 to 362	12 Larvae, DN, Gunnison R, CO
132034	FWS/GJ-11GU-Y24*	11 Young of Year, SN, Gunnison R, CO
132035-2088	FWS/GJ-12CO-Y01 to Y24	12 Young of Year, SN, Colorado R, CO
132089-2129	FWS/GJ-12GU-Y01 to Y28	12 Young of Year, SN, Gunnison R, CO
132130-2511	FWS/GJ-14CO-001 to 142	14 Larvae, DN, Colorado R, CO
132512-2983	FWS/GJ-14GU-001 to 163	14 Larvae, DN, Gunnison R, CO
132984-3123	FWS/GJ-13CO-Y01 to Y32	13 Young of Year, SN, Colorado R, CO
133124-3162	FWS/GJ-12GU-Y01 to Y28	13 Young of Year, SN, Gunnison R, CO
133163-3572	LFL-13GR-LW001 to LW035	13 SN, Green R, Lodore-Whirlpool, CO, UT
133573	(blank)	
133163-3915	LFL-13GR-LW035 to LW063	13 SN, Green R, Lodore-Whirlpool, CO, UT
133916	LFL-13GR-LW005*	13 SN, Green R, Lodore-Whirlpool, CO, UT
133917	LFL-13GR-LW025*	13 SN, Green R, Lodore-Whirlpool, CO, UT
133918-3920	LFL-13GR-LWUNK*	13 SN, Green R, Lodore-Whirlpool, CO, UT

* Separately cataloged portion of previously cataloged set of collections.
** UCRB collections from a non-Recovery Program project.
*** Previously cataloged then found removed from catalog, re-added to catalog.