

COLORADO RIVER RECOVERY PROGRAM
FY 2017 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 128

I. Project Title: Abundance Estimates for Colorado pikeminnow in the Green River Basin, Utah and Colorado

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

Project/Grant Period: Start date (Mo/Day/Yr): 1 October 2014
End date: (Mo/Day/Yr): 30 Sept. 2018
Reporting period end date: 30 Sept. 2017
Is this the final report? Yes _____ No X

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IV. Abstract: Sampling conducted during this project is designed to obtain capture-recapture data needed to estimate abundance and vital rates of Colorado pikeminnow *Ptychocheilus lucius* in the lower Yampa (exclusive of Yampa Canyon) and lower White rivers and the Green River downstream of Whirlpool Canyon (Whirlpool and Split Mountain canyons

excluded). Abundance estimates of endangered Colorado pikeminnow are needed to better monitor population status and provide benchmarks against which progress toward recovery can be measured. This project was designed to have three years (2016-2018) of sampling followed by a year of data analysis and report writing. The design is essentially the same as that employed for sampling conducted from 2000-2003, 2006-2008, and 2011-2013 in the same area (Bestgen et al. 2005, Bestgen et al. 2010; Bestgen et al. 2017 draft). Sampling during the most recent three-year period began in spring 2016, and will continue through 2018, with Colorado Parks and Wildlife (CPW) and the Larval Fish Laboratory (LFL) responsible for sampling the Yampa River, the U. S. Fish and Wildlife Service, Vernal, Utah, responsible for the reach of the Green River from the White River downstream to Tusher Diversion and the White River downstream of Kenney Reservoir, and the Utah Division of Wildlife Resources responsible for the Green River reaches from lower Whirlpool Canyon to the White River confluence and from Tusher Diversion downstream to the Colorado River. The Larval Fish Laboratory also provides coordination, data checking, and data analysis. Our primary goal was to capture, mark, and recapture as many Colorado pikeminnow as possible on at least three different sampling occasions in each river reach. Sampling occurred during spring runoff and mostly ended before Colorado pikeminnow spawning migration. Electrofishing was the primary sampling gear. Captured pikeminnow were scanned for the presence of a PIT tag, unmarked fish were marked, and all were released near the point of capture. These data were used to obtain abundance estimates for each river reach. A report detailing results of sampling and parameter estimation for 2011-2013 data was submitted to the Recovery Program and is in final review; a summary of data collected was provided in previous reports and comprehensive estimates of pikeminnow abundance and survival will be completed in late 2017 or early 2018.

V. Study Schedule: Initial Year 2014
Final year 2018

VI. Relationship to RIPRAP:

Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management)

V.B. Conduct research to acquire needed life history information

V.B.2. Conduct appropriate studies to provide needed life history information.

VII. Accomplishment of FY 2017 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

A main objective in FY 2017 was to finalize reporting of results from the 2011-2013 estimation period and also to begin sampling for the next round of estimates. We have developed estimates which were provided to the Recovery Program office in earlier years and we are anticipating receiving reviews so the final report can be prepared. We retain the material below so the reader has an understanding of the other tasks involved in this sampling and analysis program.

We developed and used a Standard Operating Procedure for field personnel for use during the sampling season to ensure a consistent sampling approach and timely completion of tasks. This reduced project and sampling complexity due to the short duration of the sampling design each year, and increased consistency among the five relatively autonomous units used to complete this work. We also developed spreadsheets for data entry that should streamline that process somewhat, and some crews have implemented use of electronic data recording during field sampling.

We also coordinated a conference call with team members and field crews prior to 2017 field sampling to discuss issues and problems as well as several other calls to individual investigators through the field season. This also provided an opportunity for each group to report on progress in completing preparations for field sampling. The Larval Fish Laboratory will be responsible for routine coordination of the study.

We completed a minimum of three sampling passes through the five Green River Basin reaches listed below to capture sub-adult and adult Colorado pikeminnow:

- a) Green River between the confluence of the White River upstream to the lower end of Whirlpool Canyon (i.e., upper Rainbow Park, but not Split Mtn. Canyon).
- b) White River between the confluence with the Green River upstream to Taylor Draw Dam,
- c) Yampa River between Deerlodge Park and Craig, excluding Cross Mountain Canyon,
- d) Green River from the White River confluence downstream to near Green River, Utah, and,
- e) Green River from downstream of Green River, Utah, to the confluence with the Colorado River.

The LFL and CPW attempted up to eight sampling passes in portions of the Yampa River, in part associated with bass and northern pike removal projects, in order to obtain a more precise and accurate Colorado pikeminnow abundance estimate. All other reaches were sampled three times. Data were grouped under three passes for all reaches to accommodate the need for symmetrical capture histories among reaches. Specific responsibilities and reaches are outlined below (Table 1).

We are presently finishing the assembly of data collected during 2017, and just finished proofing 2016 data after additional details from field stations were incorporated. Not all field offices have provided final data as of yet.

2016-2017 results.--Specific results to report based on 2016-2017 sampling are just below. The basic data for estimating abundance of various life stages of Colorado pikeminnow are the numbers of unique individuals captured in various sampling passes and reaches among years. Based on the recapture rates of those same individuals, estimates of abundance can be developed. If recapture rates remain approximately the same, the number of unique pikeminnow captured in each age class can be used as a metric of abundance of Colorado pikeminnow over time.

Number of unique captures for data through 2017 (Figure 1, Table 1), and abundance estimates for Colorado pikeminnow through 2013 (Bestgen et al. 2017 draft report), have declined over time. For example, in 2001 when all reaches of the Green River basin were sampled, nearly 1,000 adult (≥ 450 mm TL) Colorado pikeminnow were captured. Those numbers have declined steadily since that time. The lowest abundance of adults captured prior to beginning the 2016-2018 sampling was in 2013; 2016 and 2017 numbers are just slightly higher and lower, respectively, than the 2013 number of unique adult Colorado pikeminnow captured.

Number of recruit-sized (400-449 mm TL) Colorado pikeminnow captured in 2016 and 2017 was very low, which means few fish are available to replace adult life stages as they die. Juvenile (< 400 mm TL) numbers are slightly higher, particularly in 2017 in the lower Green River. Those fish range in size from < 100 mm to 399 mm TL.

Length frequency histograms show the sizes of fish and their abundance in each reach of the Green River basin. Yampa River Colorado pikeminnow are very few and those are exclusively large individuals. White River pikeminnow were only slightly more abundant and were all large in 2016. The doubling in abundance of White River fish captured in 2017 was due mainly to the addition of recruit and juvenile life stages.

Approximately equal numbers of Colorado pikeminnow were captured in 2016 and 2017 in the middle Green River. However, in 2016 mostly large fish were captured, whereas in 2017 many more 100-199 mm TL fish were captured. A similar pattern was evident in the Desolation-Gray Canyon and lower Green River reaches of the Green River, where the mostly larger fish in 2016 were supplemented with smaller fish in 2017, especially in the lower Green River. Increased abundance of Colorado pikeminnow 150-299 mm TL in the lower Green River is a source of optimism for adding to adult fish abundance in future years. If they survive, the smallest of those fish may be adults in 3-4 years, while the largest may be adults in 2-3 years. Relatively large numbers of those smaller fish were also present in the lower Green and Desolation-Gray Canyon reaches in 2011 as well, but by 2012-2013 they were largely absent, presumably because of predation by walleye. Thus, caution is merited when forecasting these patterns into the future. Those relatively abundant juvenile year-classes likely derived from recruitment of pikeminnow hatched in 2012-2015, based on growth rates of those fish.

We endeavor to resolve issues with some data in some reaches, so we can begin to derive preliminary abundance estimates for Colorado pikeminnow in the Green River basin. We hope to have those estimates in early 2018.

New task (Task 6 in scope of work, for FY 2016-2017). Razorback sucker abundance and survival estimation, Green River Basin.

The Recovery Program requested an analysis of razorback sucker data collected during Colorado pikeminnow abundance estimation from 2011-2013 to estimate their abundance and survival in the Green River Basin. A main goal was to determine if data collected during that study was adequate to monitor razorback sucker abundance and vital rates. We provide razorback sucker abundance estimates for the three Green River segments;

White River and Yampa River data were too sparse to develop abundance estimates. Analyses were completed essentially the same as for Colorado pikeminnow data described above and showed increasing abundance of razorback suckers but estimate precision was poor. We also conducted survival rate analysis, updating older analyses that were complete through 2008 and portions through 2011 (Zelasko et al. 2011, Bestgen et al. 2012). Those estimates were less than satisfactory in terms of precision and varied in ways that were difficult to explain. Thus, estimates derived just from data collected during pikeminnow sampling are deemed not as useful as we thought it might be for monitoring razorback sucker vital rates.

If there is sufficient funding available after project completion, we will look into use of razorback sucker tag antenna array data including for the White River and Tusher Wash (which may fit well into the Deso-Grey survival question) to enhance analyses of survival rates.

Table 1. Capture records for razorback sucker obtained during Colorado pikeminnow abundance estimation sampling, 2011-2013, in four river reaches of the Green River basin. MGR = Middle Green River, WH = White River, DGR = Desolation-Gray Canyon reach of the Green River, and LGR = lower Green River. No razorback suckers were captured during sampling in the Yampa River. Sampling passes are indicated by numerals 1, 2 or 3, and nnf refers to razorback suckers captured during non-native fish removal sampling.

reach	2011					2012					2013					Grand Total
	pass					pass					pass					
	1	2	3	nnf	total	1	2	3	nnf	total	1	2	3	nnf	total	
MGR	33	125	80	4	242	77	42	41	85	245	32	141	209	126	508	995
WH	1	1	45	0	47	0	1	1	0	2	0	9	102	0	111	160
DGR	129	152	167	81	529	153	462	148	127	890	129	208	150	37	524	1943
LGR	341	318	323	0	982	256	267	192	0	715	48	86	158	0	292	1989
total	504	596	615	85	1800	486	772	382	212	1852	209	444	619	163	1435	5087

While the White River records were not useful for abundance estimation, additional use of the PIT tag detector array data from there may enhance estimates in the future. Minimally, razorback sucker may be moving into the White River during later sampling passes, as evidenced by higher abundance during pass 3 sampling in 2011 and 2013. Because lower White River sampling has been suspended in some years due to permitting issues, we will use that information to assess utility of those records. All capture records should be useful for survival estimation. A draft report for abundance and survival rate estimation efforts was submitted to the Recovery Program Director's office in October 2017.

- VIII. Recommendations: Complete Colorado pikeminnow and razorback sucker abundance estimation reports as soon as possible so that further management can be implemented to attempt to bolster populations. Implement additional abundance estimation sampling in 2018.

- IX. Project Status: On track and ongoing.
- X. FY 2017 Budget Status
- A. Funds Provided: \$429,463
 - B. Funds Expended: \$397,316
 - C. Difference: \$32,147
 - D. Work completed: 85%, analysis and reporting work remains.
 - E. Recovery Program funds spent for publication charges: None
- XI. Status of Data Submission: Each agency submits data independently and to the Larval Fish Laboratory, for analysis. This has occurred for most sampling reaches. Upon compilation, all data from 128 sampling will be submitted to the PDO to be uploaded into STReaMS.
- XII. Signed: Kevin Bestgen 12 November 2017
Principal Investigator Date
(Just put name and date here, since you will be submitting the report electronically)

Table 1. Captures of unique individual Colorado pikeminnow in sampling conducted in each of fish reaches of the Green River basin, in 2016 and 2017. Adult Colorado pikeminnow are ≥ 450 mm TL, recruits are 400-449 mm TL, and juveniles are < 400 mm TL.

Reach	Adult	Recruits	Juveniles	Total
2016				
Deso-Gray	71	8	6	85
Lower Green	71	20	71	164
Middle Green	35		5	40
White	23			23
Yampa	9			9
totals	209	28	82	321
2017				
Deso-Gray	45	1	31	77
Lower Green	54	2	262	318
Middle Green	29	2	29	60
White	35	5	16	56
Yampa	1			1
totals	164	10	338	512

Green River basin pikeminnow captures, 2000-2017

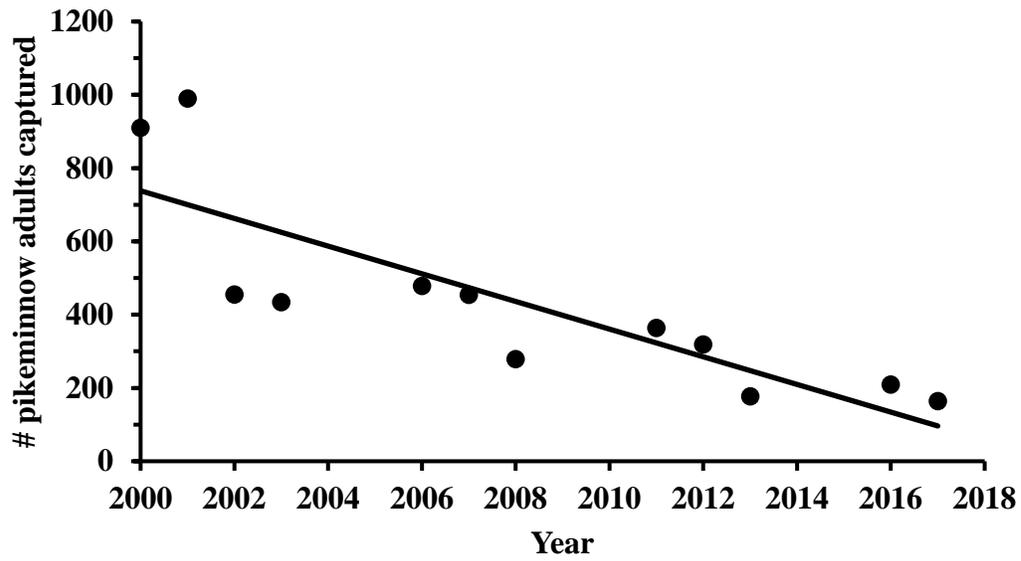


Figure 1. Number of unique Colorado pikeminnow adults (≥ 450 mm TL) captured, 2000-2017, on the Green River basin.

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R14AP00001

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 128

Project Title: Abundance Estimates for Colorado pikeminnow in the Green River Basin, Utah and Colorado

Principal Investigator: Kevin Bestgen (Lead)/ John Hawkins/ Gary White/Cameron Walford
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Project/Grant Period: Start date (Mo/Day/Yr): 1 October 2014
End date: (Mo/Day/Yr): 30 Sept. 2018
Reporting period end date: 30 Sept. 2017
Is this the final report? Yes _____ No X

Performance: Sampling passes were completed in the Yampa River portion of the Green River Basin study area by the Larval Fish Laboratory. We tagged and released Colorado pikeminnow in accordance with specified protocols which will contribute to abundance estimates for pikeminnow of three life stages in the Green River Basin from 2016-2018. We also summarized data from the four other entities that contributed capture information for this sampling effort (see attached report).

ANNUAL PERFORMANCE PROGRESS REPORT (PPR) occlude

BUREAU OF RECLAMATION AGREEMENT NUMBER: R14AP00007

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 128

Project Title: Abundance Estimates of Colorado pikeminnow in the Green River Basin, Utah and Colorado

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Project/Grant Period: Start date: 05/01/2014
 End date: 09/30/2018
 Reporting period end date: 10/30/2017
 Is this the final report? Yes _____ No X

Performance: Three sampling passes were successfully completed (4/18-4/27/17, 5/5-5/14/17, 5/22-5/31/17) on the lower Green River section from Green River, UT (RM 120.0) to the confluence with the Colorado River (RM 0.0). Tasks 1-3 were completed. During this effort crews captured 317 Colorado pikeminnow, 1,104 razorback sucker (one juvenile untagged fish; 200 mm) and 18 bonytail. All endangered fish that were large enough and did not already have a PIT tag received a tag. Additionally, crews captured and removed one brown trout, two kokanee salmon, three grass carp (confirmed diploid), 25 green sunfish, four gizzard shad, three smallmouth bass, 68 walleye, three white sucker, one white sucker flannelmouth sucker hybrid, one northern pike, one channel catfish (> 450 mm), three yellow bullhead, and one black bullhead. Data were formatted and sent to the PI in July of 2017.

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R14AP00007

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 128

Project Title:

Abundance Estimates of Colorado pikeminnow in the Green River Basin, Utah and Colorado

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Project/Grant Period: Start date: 05/01/2014
End date: 09/13/2018
Reporting period end date: 10/30/2017
Is this the final report? Yes _____ No X

Performance:

Three sampling passes were successfully completed in 2017 on the middle Green River from the lower end of Whirlpool Canyon (RM 334.0) to the confluence with the White River (RM 246.1). Tasks 1-3 were completed. A total of 60 Colorado pikeminnow were captured and PIT-tagged when necessary. Colorado pikeminnow total length ranged from 100-799 mm. Data were formatted and will be sent to the lead PI (Colorado State University) by November 2017.

ANNUAL PERFORMANCE PROGRESS REPORT

BUREAU OF RECLAMATION AGREEMENT NUMBER: R15PG00083

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 128

Project Title: Abundance estimates for Colorado pikeminnow in the Green River

Principal Investigator:

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Project/Grant Period:

Start date: 10/01/2014

End date: 09/30/2019

Reporting period end date: 09/30/2017

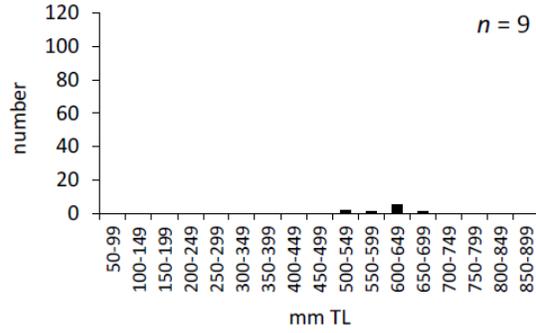
Is this the final report? Yes _____ No X

Performance:

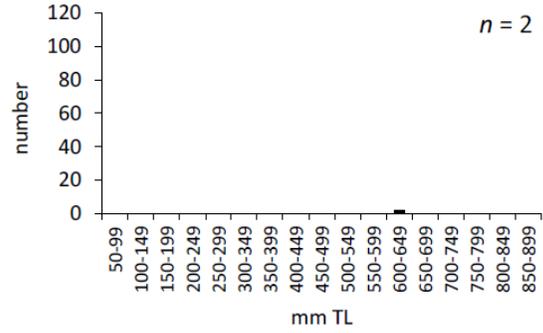
US Fish & Wildlife Service completed our portions of Tasks 1-3, sampling both the Green and White Rivers for Colorado pikeminnow and ancillary T&E fish. We completed three sampling trips on 104 miles of the White River from Taylor Draw Dam to the Green River confluence, and from the confluence to Tusher Wash Diversion Dam on the Green. Our office also collected and recorded data for all razorback sucker encountered on both sections of river in order to assist with abundance and survival estimation for that species. All data have been compiled and sent to CSU-LFL for analysis and reporting.

Appendix I. Length-frequency histograms for Colorado pikeminnow captured in five reaches of the Green River basin, 2017.

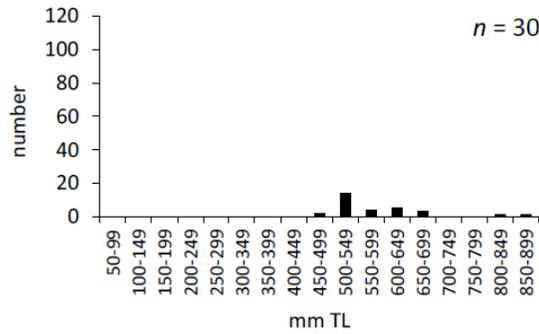
Yampa R., 2016



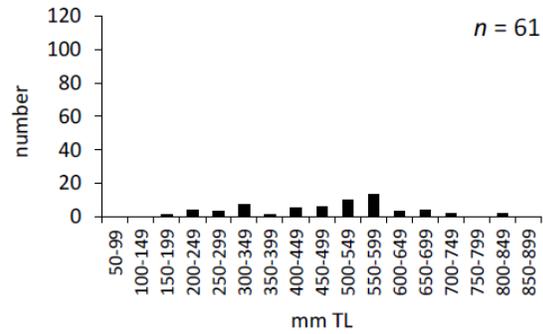
Yampa R., 2017



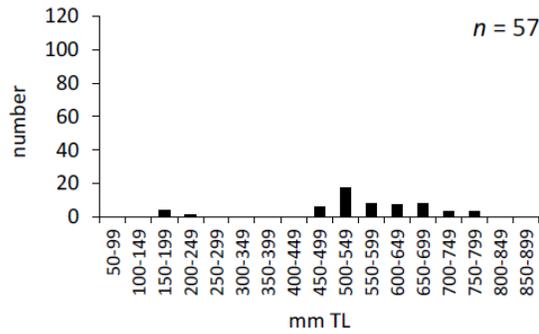
White R., 2016



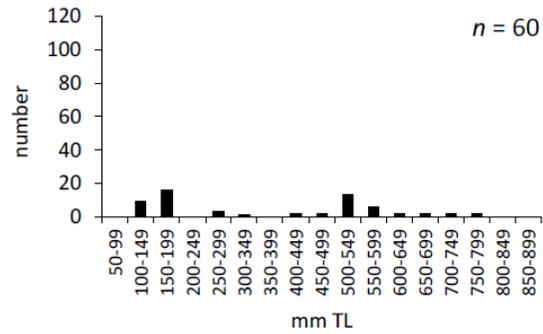
White R., 2017



Middle Green R., 2016

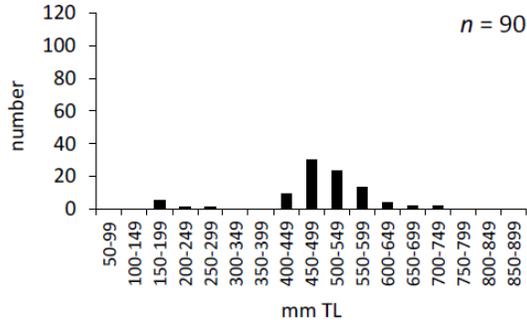


Middle Green R., 2017

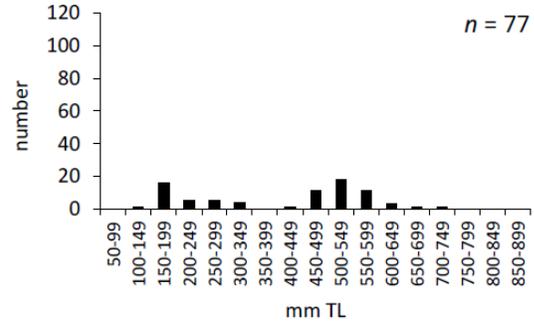


Appendix I cont.

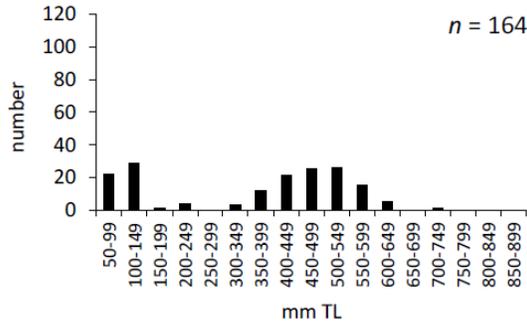
Deso-Gray, 2016



Deso-Gray, 2017



Lower Green R., 2016



Lower Green R., 2017

