FY 2021 ANNUAL REPORT PROJECT: 128

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

Bureau of Reclamation Agreement Number:
R19AP00058

Project/Grant Period:
Start date: 10/01/18
End date: 09/30/23
Reporting period end date: 09/30/21
Is this the final report? _____ No __

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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 two years 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. 2018). Sampling during the most recent three-year period began in spring 2016, and continued through 2018, with Colorado Parks and Wildlife and the Larval Fish Laboratory 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 was approved in 2018 (Bestgen et al. 2018); a summary of data collected was provided in previous reports and comprehensive estimates of pikeminnow abundance, survival, and movement will be completed in 2022. Colorado pikeminnow data analysis is completed and report preparation is ongoing. Another draft report was also produced that examines the effects of including numerous additional PIT tag records gained by detections from antennas on razorback sucker survival. That report (citation below) was recently submitted and approved by Recovery Program coordinators and sent out to peer reviewers.

Study Schedule:

Initial Year 2016, final year unknown

Relationship to RIPRAP:
Green River Action Plan
V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management)
V.C. Conduct population estimate for Colorado pikeminnow

Accomplishment of FY 2021 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

2016-2018 results.--Specific results to report based on 2016-2018 sampling are 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 2018 (Figure 1, Table 1), and abundance estimates for Colorado pikeminnow through 2018 (Bestgen et al. 2018 final report; Figure 1 here), 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, and 2018 numbers (141) are lower yet.

Number of recruit-sized (400-449 mm TL) Colorado pikeminnow captured in 2016, 2017, and 2018 was very low (Appendix I), 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 and 2018 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; numbers were very low in 2018. 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. The more recent abundant juvenile year-classes observed in 2017 likely derived from recruitment of pikeminnow hatched in 2012-2015, based on growth rates of those fish.

Abundance estimates show adult populations of Colorado pikeminnow declined again in the 2016-2018 period (Figure 1), consistent with capture of fewer unique individual fish. The 2016 estimate was highest at nearly 1250 fish, but 2017-2018 estimates declined to an average of about 850 fish.

Task 6 in the scope of work for FY 2016-2017 involved razorback sucker abundance and survival estimation, Green River Basin, using data collected during Colorado pikeminnow abundance estimation from 2011-2013 to estimate their abundance and survival in the Green River Basin. We completed that report, and it was approved by the Biology Committee (https://www.coloradoriverrecovery.org/documents-publications/technical-reports/rsch/Zelaskoetal2018_Final_1Feb2018.pdf).

We also completed a draft of a new report that examines the effects on razorback sucker survival of including numerous additional PIT tag records gained by detections from antennas. That report (citation below) was recently submitted and approved by Recovery Program coordinators and sent out to peer reviewers.

Zelasko, K. A., K. R. Bestgen, and G. C. White. 2021. Incorporating passive antenna detections with physical recaptures improves survival rate estimates for razorback suckers *Xyrauchen texanus* stocked in the Upper Colorado River Basin. Final report to the Upper Colorado River Endangered Fish Recovery Program. Denver, Colorado. Larval Fish Laboratory Contribution 225.

Recommendations:
Finish final Colorado pikeminnow report and prepare for sampling in 2022. No sampling is planned for FY 2021. Continue with parameter estimation analyses for razorback sucker data.

Project Status:
Pikeminnow abundance estimation report delayed but progressing. Analysis of 2016-2018 razorback sucker abundance data is proceeding.

FY 2021 Budget Status:
Funds Provided: $70,180
Funds Expended: $65,100
Difference: $5,080
Percent of the FY 2021 work completed is 80%, and projected costs to complete is within budget.
Recovery Program funds spent for publication charges: None

Status of Data Submission:

Data has been submitted to STREaMS.

Signed:
Kevin R. Bestgen
Principal Investigator
11 November 2021

Table 1. Captures of unique individual Colorado pikeminnow in sampling conducted in each of fish reaches of the Green River basin, in 2016-2018. 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	64	8	5	77
Lower Green	61	20	16	97
Middle Green	35		3	38
White	22			22
Yampa	9			9
totals	191	28	24	243
2017				
Deso-Gray	44	1	27	72
Lower Green	49	1	229	279
Middle Green	28	2	19	49
White	33	4	16	53
Yampa	2			2
totals	156	8	291	455
2018				
Deso-Gray	37	5	40	82
Lower Green	33	8	124	165
Middle Green	20		2	22
White	42	1	7	50
Yampa	9			9
totals	141	14	173	328

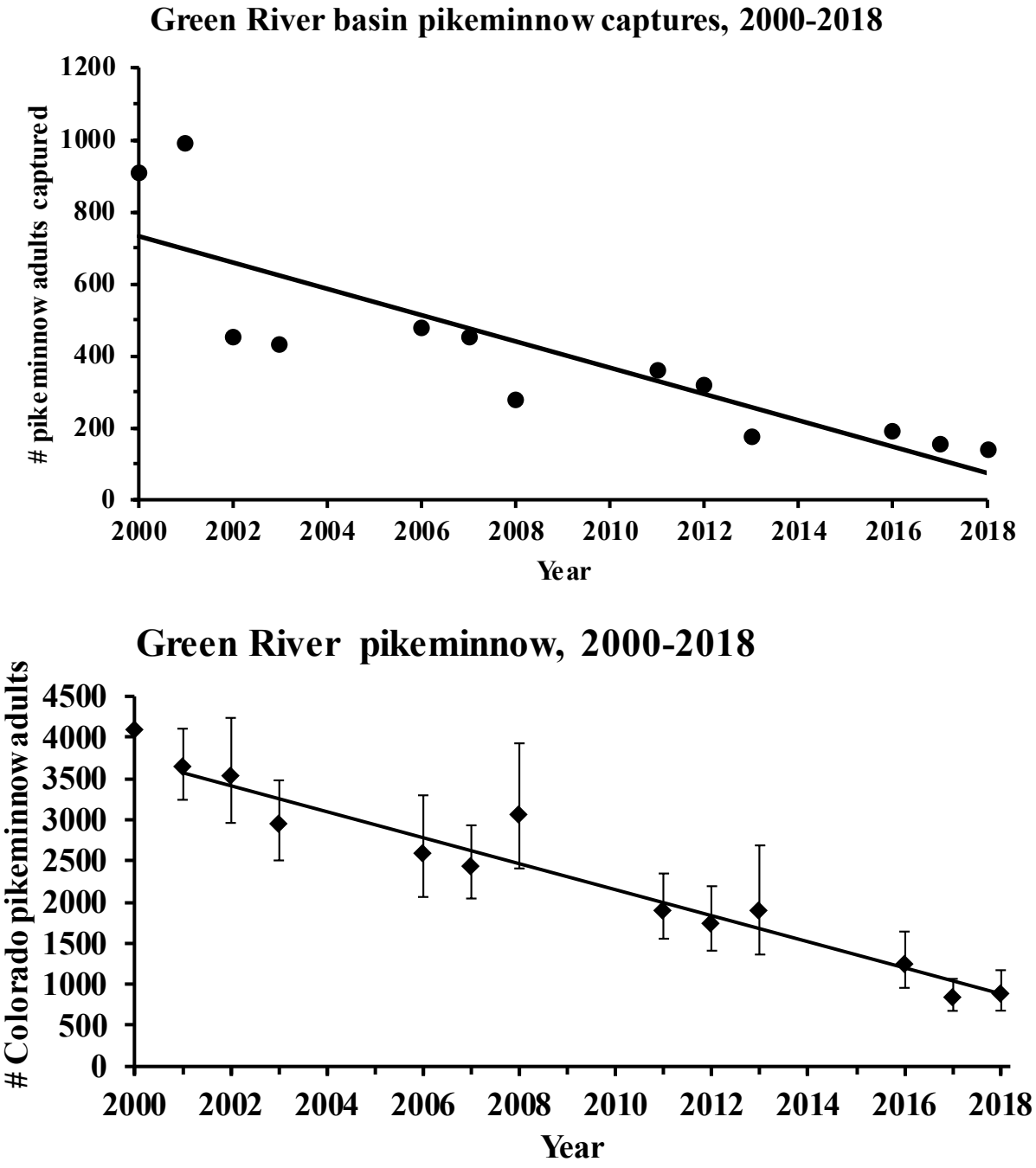
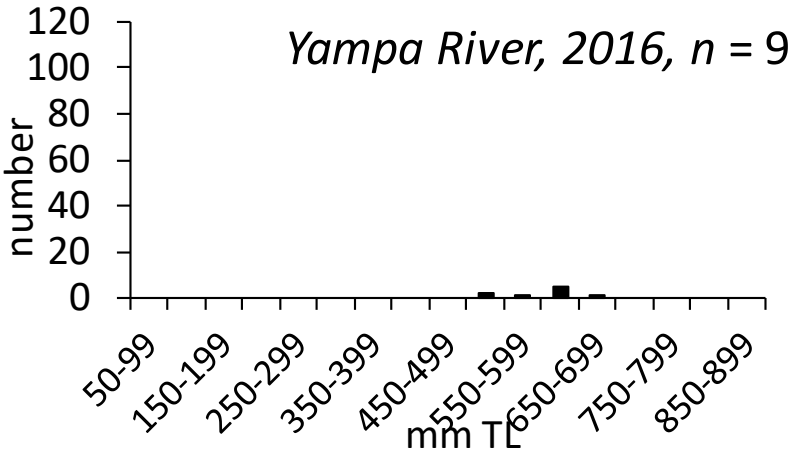
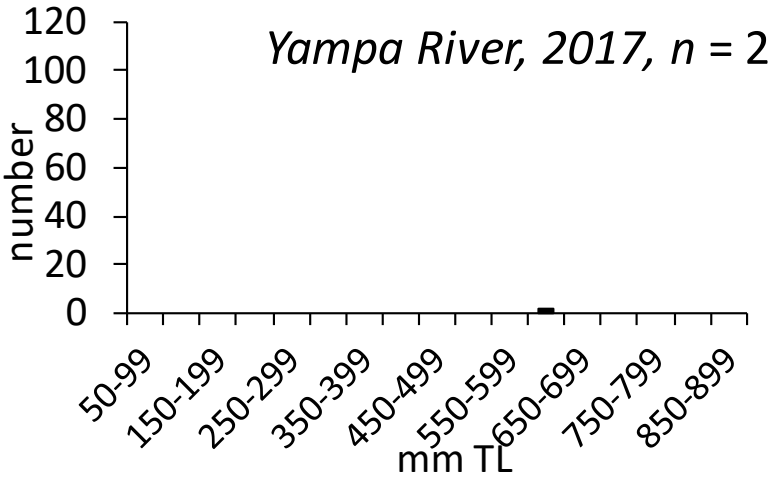
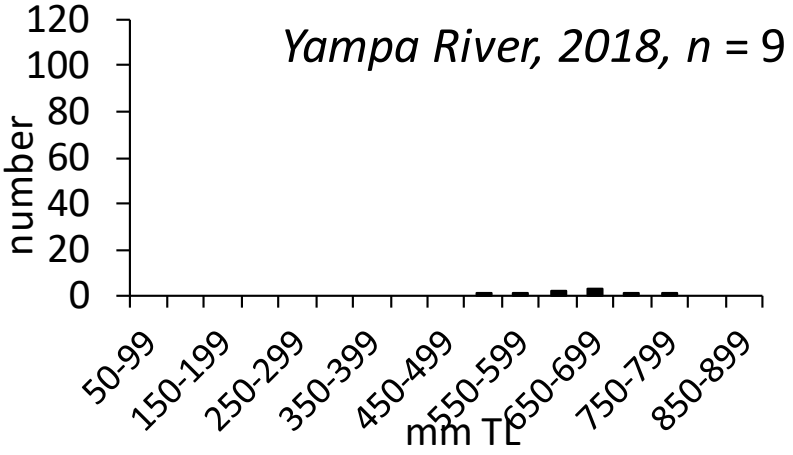


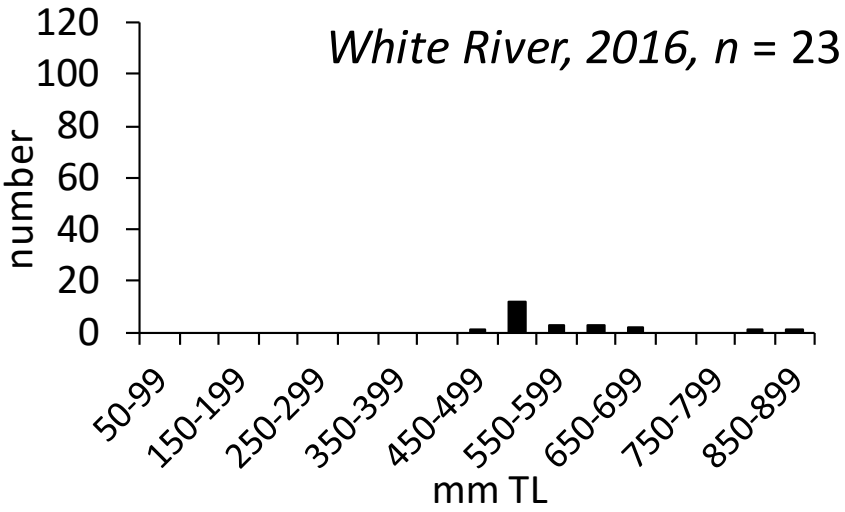
Figure 1. Number of unique Colorado pikeminnow adults (≥ 450 mm TL) captured (upper panel), 2000-2018, Green River basin and their estimated abundance (lower panel). Number of unique fish captured declined from over 900 fish in year 2000 to less than 200 in 2018. Estimated abundance of Colorado pikeminnow adults declined from about 4000 fish in year 2000 to about 850 in 2018.

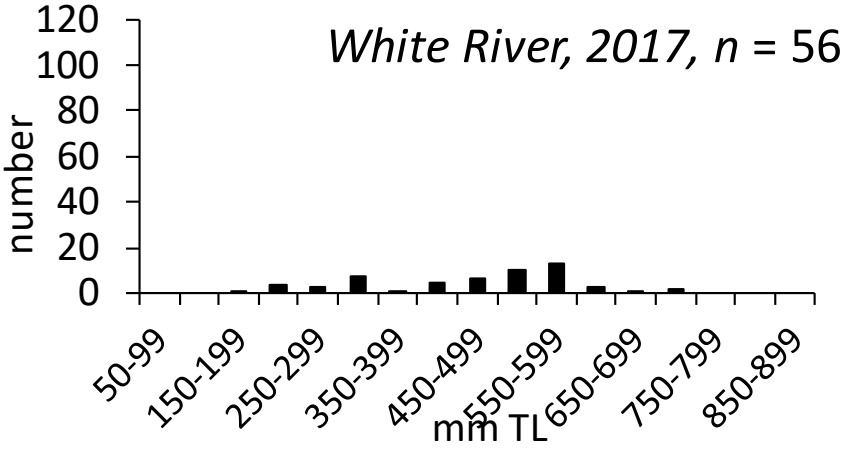
Appendix I. Length-frequency histograms for Colorado pikeminnow captured in five reaches of the Green River basin, 2016-2018. The few fish captured in the Yampa River were large, with mean length about 600 mm TL. White River and middle Green River reach fish were also mostly large and averaged about 550 mm TL, although fish smaller than 200 mm TL were present. A mixture of fish sizes were present in the Deso-Gray and lower Green River reaches, and fish less than 300 mm TL were especially common in the lower Green River.

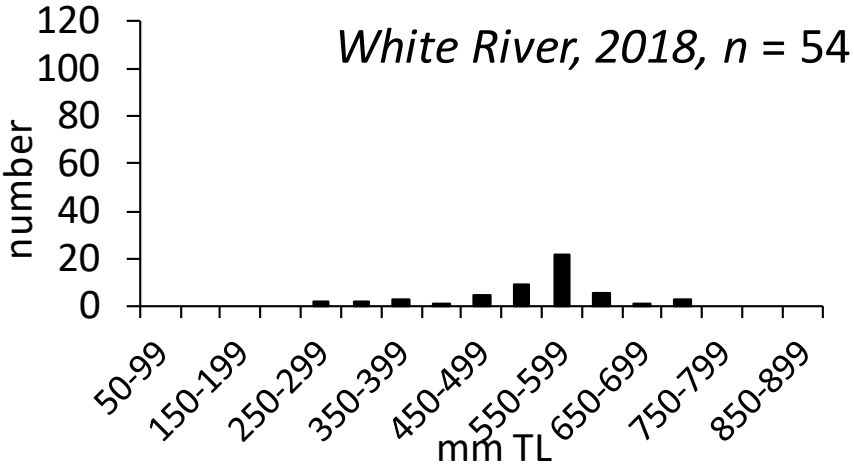


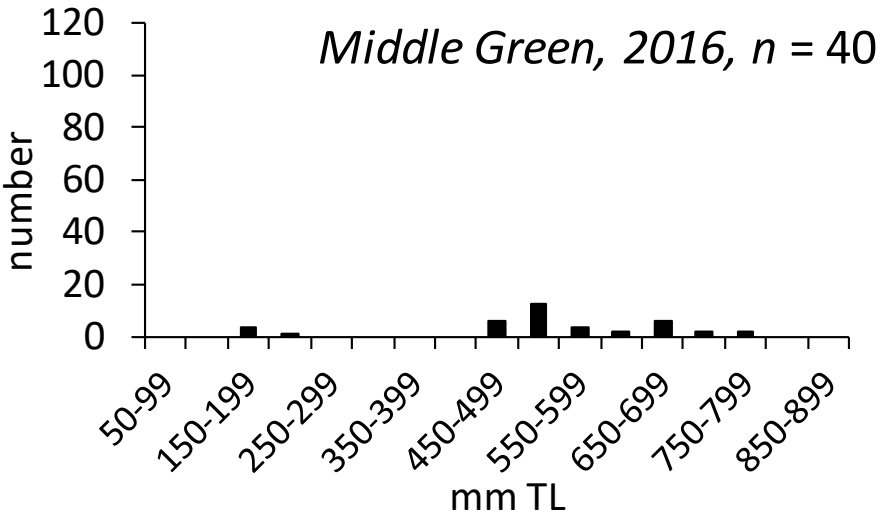


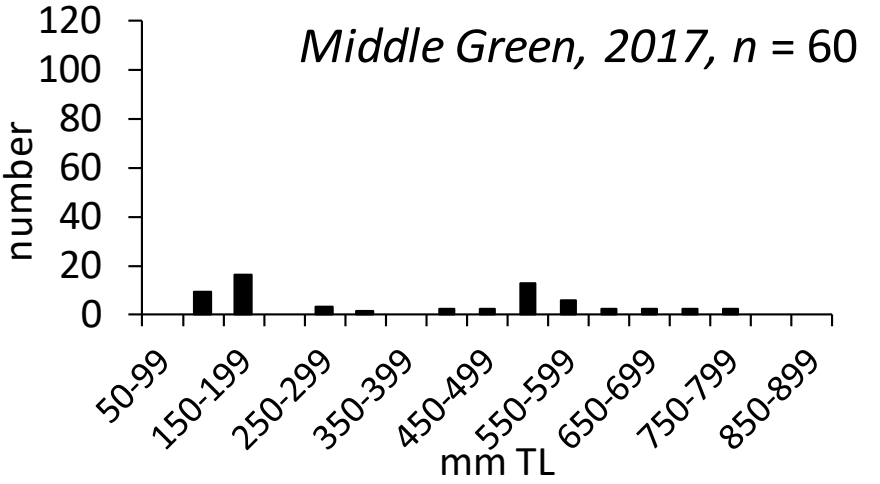


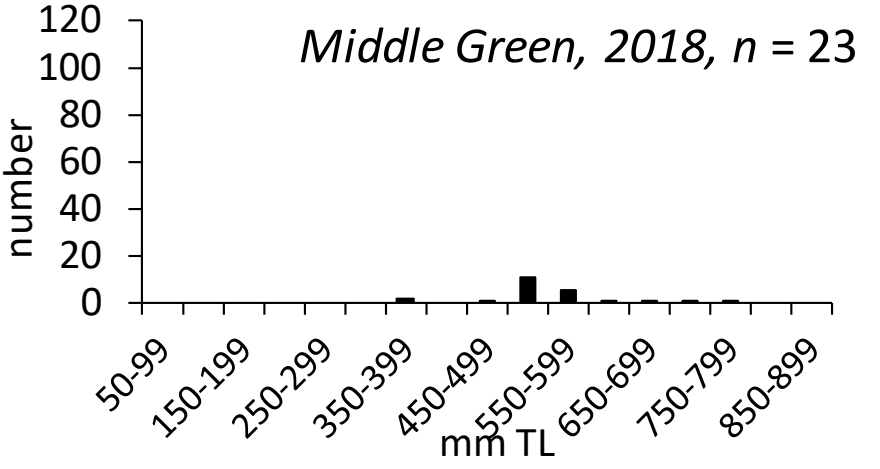

White River, 2016, n = 23
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL

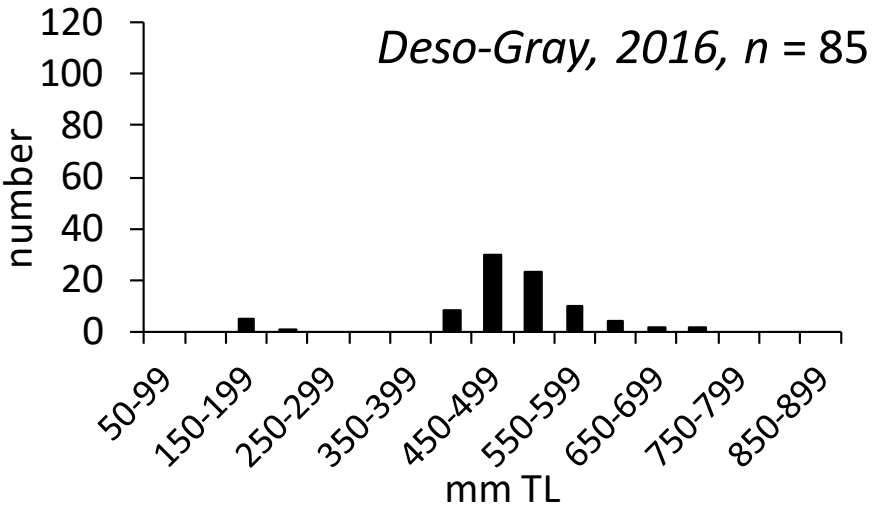

White River, 2017, n = 56
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL

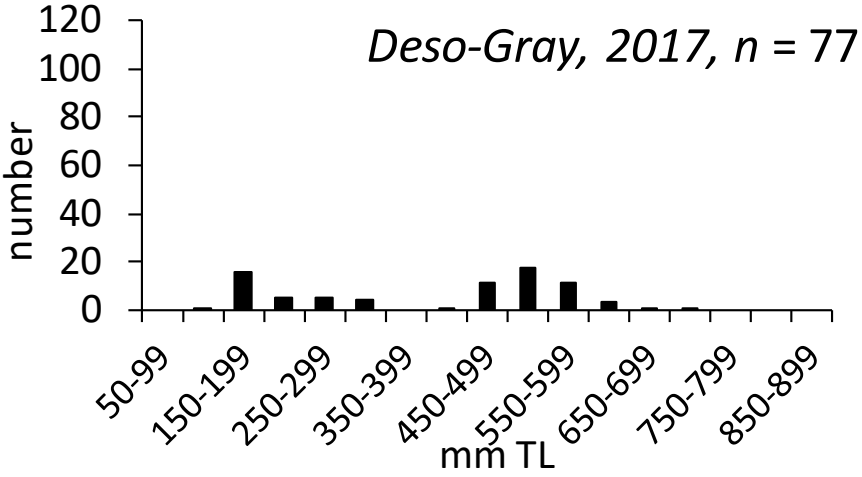

White River, 2018, n = 54
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL

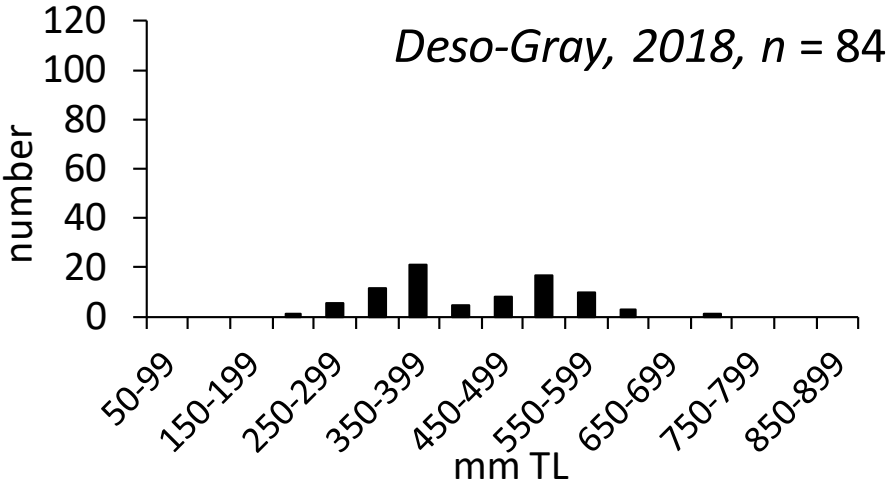

Middle Green, 2016, n = 40
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL


Middle Green, 2017, n = 60
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL


Middle Green, 2018, n = 23
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL


Deso-Gray, 2016, n = 85
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL


Deso-Gray, 2017, n = 77
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL


Deso-Gray, 2018, n = 84
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
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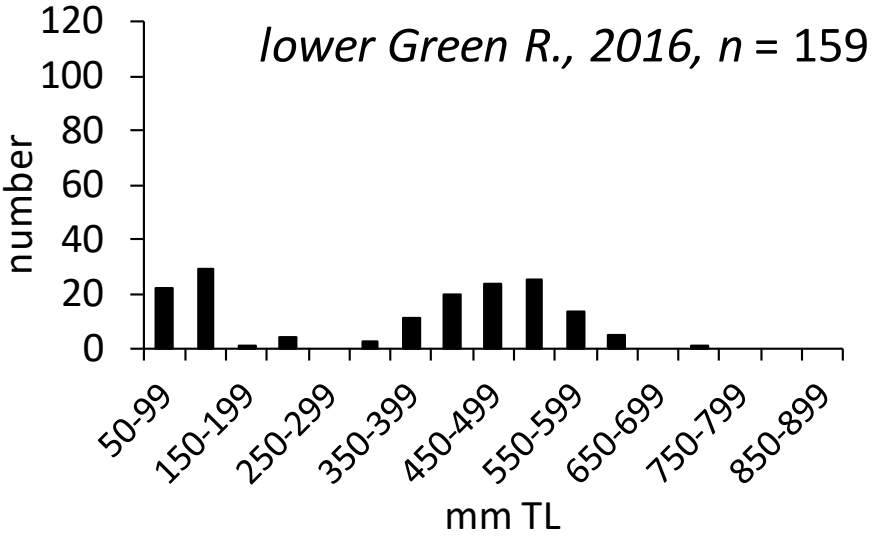
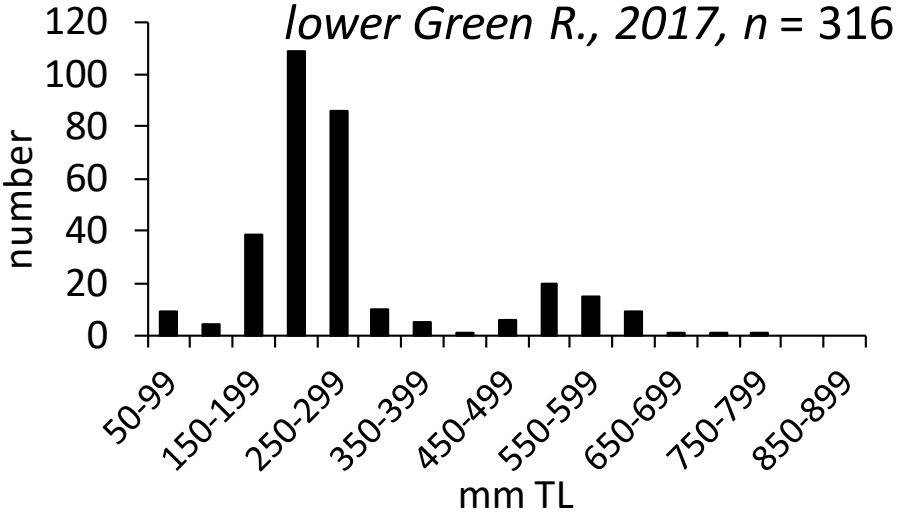
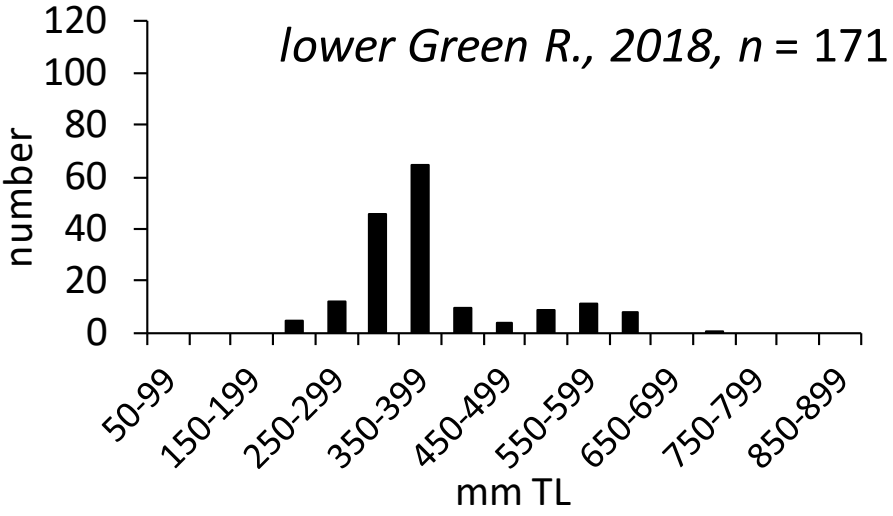
550-599
650-699
750-799
850-899
mm TL


lower Green R., 2016, n = 159
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL


lower Green R., 2017, n = 316
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL


lower Green R., 2018, n = 171
number
120
100
80
60
40
20
0
50-99
150-199
250-299
350-399
450-499
550-599
650-699
750-799
850-899
mm TL

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R19AP00058

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 128

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

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Bureau of Reclamation Agreement Number:
R19AP00058

Project/Grant Period:
Start date (Mo/Day/Yr): 1 Oct. 2018
End date: (Mo/Day/Yr): 30 Sept. 2023
Reporting period end date: 30 Sept. 2021
Is this the final report? Yes _____ No _X__

Performance:
No sampling was conducted in 2021 per the schedule outlined by the Recovery Program. We prepared one report that examines razorback sucker survival using PIT tag detections as well as physical capture data. We are working on another report that provides estimates of Colorado pikeminnow abundance and survival and should have a draft of that completed in 2022.