

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2023 ANNUAL REPORT

PROJECT: 138

Project Title

Annual fall monitoring of young-of-year Colorado Pikeminnow and small-bodied native fishes

Bureau of Reclamation Agreement Number:

R19AP00059

Project/Grant Period:

Start date: 10/01/2018

End date: 09/30/2023

Reporting period end date: 09/30/2023

Is this the final report? No

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Abstract:

Monitoring of young-of-year (YOY) Colorado Pikeminnow (*Ptychocheilus lucius*) is an ongoing project initiated in 1986 in the upper Colorado River basin as part of the Interagency Standardized Monitoring Program (USFWS 1987) to evaluate recruitment success of age-0 endangered fishes. In 2023, we encountered 187 YOY Colorado Pikeminnow on the lower Colorado River (Reach 1), zero on the middle Green River (Reach 4), and 158 on the lower Green River (Reach 3). We will continue to monitor the annual abundance of post-larval Colorado Pikeminnow in the middle and lower Green River and the lower Colorado River to assess long-term trends in annual fall recruitment.

Study Schedule:

1986-Ongoing

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

GREEN RIVER ACTION PLAN: MAINSTEM

- V.C.3. Monitor age-0 Colorado Pikeminnow in backwaters

COLORADO RIVER ACTION PLAN: MAINSTEM

- V.D.1. Monitor age-0 Colorado Pikeminnow in backwaters

Accomplishment of FY 2023 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1. Seining the middle Green River

Middle Green River (Reach 4):

Annual monitoring for young-of-year (YOY) Colorado Pikeminnow (*Ptychocheilus lucius*) by the Utah Division of Wildlife Resources Vernal began in Reach 4 on September 19, 2023 and concluded on September 26, 2023. Beginning at Split Mountain boat ramp (river mile [RM] 319.3) and concluding at Sand Wash (RM 215.3), crews sampled 104 river miles in accordance with Interagency Standardized Monitoring Program (ISMP; USFWS 1987) protocols. Altogether, we sampled 34 backwater habitats (20 primary and 14 secondary) that met ISMP criteria, yielding a total sampling area of 4,667.6 m².

Discharge on the middle Green River is measured at USGS gage #09261000 at Jensen, Utah (Figure 1). At this location, the Green River peaked at 20,300 cubic feet per second (cfs) on May 18, 2023. The river reached base flows ($\leq 3,000$ cfs; see Bestgen and Hill 2016) on July 7, 2023. During ISMP sampling in 2023, flows averaged 2,378 cfs. Main channel temperatures, measured during sampling, averaged 18.4 °C (range = 14.0 - 21.0 °C), while habitat temperatures averaged 19.0 °C (range = 15.0 - 23.5 °C) in 2023. Mean main channel secchi depth (cm visibility) was 307 mm, while mean habitat secchi depth was also 307 mm.

We encountered no YOY Colorado Pikeminnow in Reach 4 during ISMP sampling in 2023. Native and nonnative fish encounters for 2023 are listed in Tables 1 and 2 (all species accounted for); note that Table 1 accounts for primary and secondary backwaters, whereas Table 2 summarizes nonnative fish collected from first seine hauls conducted in primary backwaters only.

Task 2. Seining the lower Green River and the Colorado River

Lower Green River (Reach 3):

Utah Division of Wildlife Resources Moab (UDWR Moab) began ISMP sampling on the lower Green River (Reach 3) on September 19, 2023, and then from 26 to 28 September 2023. Field crews sampled 120 river miles following ISMP protocol, from Green River State Park (RM 120) to the confluence with

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the Colorado River (RM 0). Altogether, UDWR Moab sampled 32 habitats (19 primary, 13 secondary, and one tertiary) on the lower Green River. Total sampling area for 2023 was 3,420 m².

Discharge on the lower Green River is measured at USGS gage #09315000 at Green River, Utah (Figure 2). At this location, the Green River peaked at 28,200 cfs on May 5, 2023. The river reached recommended base flow (1,770- 3,800 cfs; see Bestgen and Hill 2016) to benefit YOY Colorado Pikeminnow on July 15, 2023. Discharge remained within this threshold through ISMP sampling (total of 63 days) with an average flow of 2,866 cfs. During the four days of ISMP sampling average flow was 2,746 cfs.

During 2023 sampling field crews documented that average main channel temperature was 19.3 °C (range = 16 - 21 °C), while average habitat temperature was 21.2 °C (range = 16 - 27 °C). Main channel visibility depth, collected with a Secchi disk as a proxy for turbidity, averaged 140 mm and sampled habitat secchi depth averaged 158 mm.

Field crews encountered and recorded 153 YOY Colorado Pikeminnow in Reach 3 during 2023 ISMP sampling (Table 3). Colorado Pikeminnow CPUE was 4.47 fish/100m² of total habitat sampled. This figure is equivalent to the 37- year median CPUE for the lower Green River (4.47 fish/100m²), but is greater than the 5-, 10-, and 15- year averages (4.21, 4.31, and 4.21 fish/100m³ respectively) (Figure 6). Field crews encountered Colorado Pikeminnow in 53.1% of the 32 habitats sampled in 2023, totaling 17 distinct backwaters. Colorado Pikeminnow mean TL for Reach 3 was 46.6 mm (range= 26-77 mm), with 33% of fish TL within the 40- 45 mm range. The 2023 average TL was greater than the 37- year average TL of 39 mm for Reach 3 (Figure 4). Additional native and nonnative fish encounters for 2023 are listed in Tables 3 and 4. Note that Table 3 displays total numbers for primary and secondary backwaters sampled, whereas Table 4 summarizes nonnative fish enumerated in the first seine hauls conducted in primary backwaters only.

Lower Colorado River (Reach 1):

Utah Division of Wildlife Resources Moab (UDWR Moab) began sampling on the lower Colorado River (Reach 1) on September 22 and 29, 2023, and October 1 and 2, 2023. Field crews sampled 110.5 river miles in accordance with the ISMP protocol, from Cisco Boat Ramp (RM 110.5) to the Colorado River and Green River confluence (RM 0). In total, field crews sampled 55 habitats (28 primary and 27 secondary) that met ISMP criteria, consisting of 2,328 m² total sampling area.

Discharge on the lower Colorado River is measured at USGS gage #09180500 near Cisco, UT (Figure 3). At this location the Colorado River peaked at 40,900 cfs on May 19, 2023. On the descending limb of the hydrograph the river reached recommended base flow threshold (3,000- 6,400 cfs; see Miller 2018) to benefit YOY Colorado Pikeminnow on July 21, 2023. From that date until the beginning of ISMP sampling (21 July- 22 Sept.) the river remained within base flow, for a total of 64 days, experiencing a mean discharge of 4,072 cfs. During the four days of ISMP sampling, average discharge was 3,629 cfs.

Field crews recorded 18 °C as average main channel temperature during sampling (range = 16 - 22 °C). Average habitat temperature was also recorded as 18 °C, however the range of temperatures was wider (range = 14 - 25 °C). Main channel visibility depth, collected with a secchi disk as a proxy for turbidity, averaged 260 mm. Similarly, average sampled habitat secchi depth was 240 mm.

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On the lower Colorado River crews encountered and recorded 187 YOY Colorado Pikeminnow in 2023 (Table 5). Colorado Pikeminnow CPUE was 8.03 fish/100m³ of total habitat sampled, a figure which is greater than the 37- year median value of 2.94 fish/100 m² for this reach. CPUE for Reach 1 was also larger in 2023 than for 5-, 10-, and 15- year medians (5.10, 5.40, and 4.94 fish/100m³ respectively). YOY Pikeminnow mean TL for 2023 was 40.8 mm (range 22-56 mm). This is slightly higher than the 37- year mean TL average of 38 mm (Figure 4). Crews identified Pikeminnow in 17 out of the 29 habitats sampled in Reach 1, comprising 58.6% of total sample area. Additional native and nonnative encounters for 2023 are listed in Tables 5 and 6. Note that Table 5 displays total numbers for primary and secondary backwaters sampled, whereas Table 6 summarizes nonnative fish enumerated in the first seine hauls conducted in primary backwaters only.

Additional noteworthy observations:

- Sampling on the lower Colorado and lower Green Rivers was impacted by equipment failures, resulting in a non-standard timeline during 2023. Lower Colorado River sampling occurred during four days spread out over an 11-day period, and the lower Green River sampling occurred for four days over a 10-day period. However, the data does not reveal any noteworthy discrepancies that can be attributed to this abnormal timeline.
- In 2023 Utah Department of Wildlife Resources encountered large numbers of Colorado Pikeminnow during Upper Colorado River Endangered Fish Recovery Program (UCREFRP) Project 160. This sampling occurred during the first and last weeks of August, into the first week of September. Similar to ISMP, crews seined zero to low velocity backwaters on the lower Green River (RM 120-0) and the lower Colorado River (RM 110.5-0). During Project 160 seining crews encountered 844 Pikeminnow on the lower Green River (CPUE 9.2 fish/100m³) and 73 Pikeminnow on the lower Colorado River (CPUE 2.9 fish/100m³) (Hansen and McGuire, 2023).
- Although nonnative fishes are typically enumerated only on the first seine haul in primary backwaters, we counted all Smallmouth Bass (*Micropterus dolomieu*) encountered in the middle Green River. Despite relatively wet hydrologic conditions in spring 2023, we caught 71 Smallmouth Bass in the middle Green River. To maintain consistency, data reported in Table 2 represent the first seine haul in primary backwaters only. In 2023, CPUE for Smallmouth Bass in the first seine haul in primary backwaters (0.43 fish/100m²) was the highest since 2019 (0.67 fish/100m²), and the number of Smallmouth Bass captured in 2023 (n=12) was the highest since 2013 (n=23, CPUE not reported).

Recommendations:

Continue to monitor annual relative abundance of post-larval Colorado Pikeminnow in the middle and lower Green River and the lower Colorado River to assess long-term trends in annual fall recruitment.

Consider designing and pursuing a habitat study to better understand how the quantity and quality of Colorado Pikeminnow nursery habitats are changing through time and affecting recruitment.

Determine the best avenue (i.e., project or responsible entity) for pursuing additional analyses to provide historical context and a more comprehensive look at ISMP long-term data. Additionally, consider the creation of an analysis drawing data from all small-bodied fish work in the upper Colorado River basin;

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including data from projects 138, 158 and 160. Because the scope of this analysis would encompass multiple projects and agencies, an appropriate entity to produce this work should be identified.

Project Status:

On track and ongoing

FY 2022 Budget Status

Funds Provided: \$61,577

Funds Expended: \$61,557

Difference: -0-

Percent of the FY 2022 work completed, and projected costs to complete: 100%

Recovery Program funds spent for publication charges: -0-

Status of Data Submission

Data is formatted, has been QA/QC checked, and will be submitted by January 2024.

Signed:

Michael S. Partlow and Anna R. Amidon

Principal Investigators

11/8/2023

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Table 1. Native fish captures on the middle Green River during ISMP sampling, fall 2023.

Species	Number	Density (fish/100 m ²)
Flannemouth Sucker	4	0.086

Table 2. Nonnative fish captures on the middle Green River during ISMP sampling, fall 2023. Nonnative fish are enumerated only during the first seine haul within primary habitats.

Species	Number	Density (fish/100 m ²)
Black Bullhead	2	0.07
Black Crappie	4	0.14
Channel Catfish	2	0.07
Common Carp	32	1.15
Fathead Minnow	54	1.93
Green Sunfish	27	0.97
Red Shiner	835	29.90
Smallmouth Bass	12	0.43
Sand Shiner	342	12.24
unidentified nonnative cyprinid	370	13.24
White Sucker	4	0.14

Table 3. Native fish captures on the lower Green River (Reach 3) during ISMP sampling, fall 2023.

Species	Number	Density (fish/100m ²)
Bluehead Sucker	2	0.09
Colorado Pikeminnow	153	6.57
Flannemouth Sucker	3	0.13

Table 4. Nonnative fish captures on the lower Green River (Reach 3) during ISMP sampling, fall 2023. Nonnative fish are enumerated only during the first seine haul within primary habitats.

Species	Number	Density (fish/100m ²)
Black Crappie	1	0.04
Bluegill	1	0.04
Common Carp	7	0.30
Fathead Minnow	211	9.06
Green Sunfish	4	0.12
Gizzard Shad	1	0.04
Red Shiner	2066	88.75
Sand Shiner	570	24.49
White Sucker	1	0.04

Table 5. Native fish captures on the lower Colorado River (Reach 1) during ISMP sampling, fall 2023.

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Species	Number	Density (fish/100m ²)
Bluehead Sucker	16	0.69
Colorado Pikeminnow	187	8.03
Unidentified Gila sp.	1	0.04

Table 6. Nonnative fish captures on the lower Colorado River (Reach 1) during ISMP sampling, fall 2023. Nonnative fish are enumerated only during the first seine haul within primary habitats.

Species	Number	Density (fish/100m ²)
Common Carp	3	0.13
Fathead Minnow	817	35.19
Gizzard Shad	92	3.95
Green Sunfish	1	0.04
Largemouth Bass	3	0.13
Red Shiner	646	27.75
Sand Shiner	783	33.65
Smallmouth Bass	10	0.43
Western Mosquitofish	8	0.34

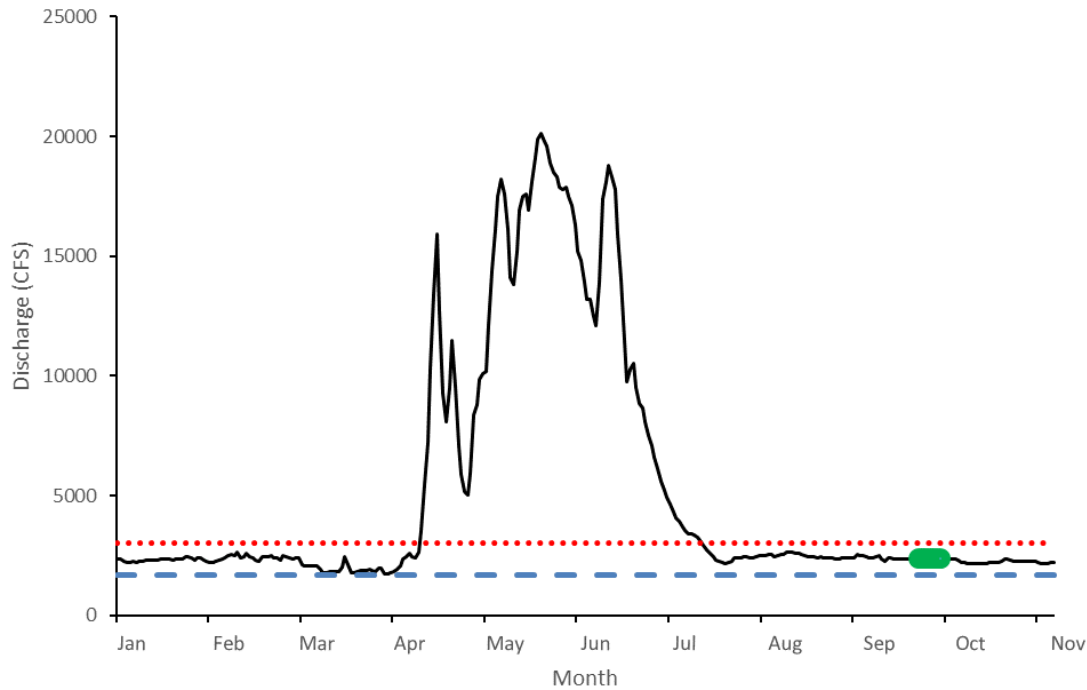


Figure 1. Discharge recorded in 2023 at USGS gage #09261000 at Jensen, UT. Red and blue dotted lines represent recommended base flow ranges for the middle Green River (1,700-3,000 cfs) identified in Bestgen and Hill (2016). Green highlight denotes sampling period.

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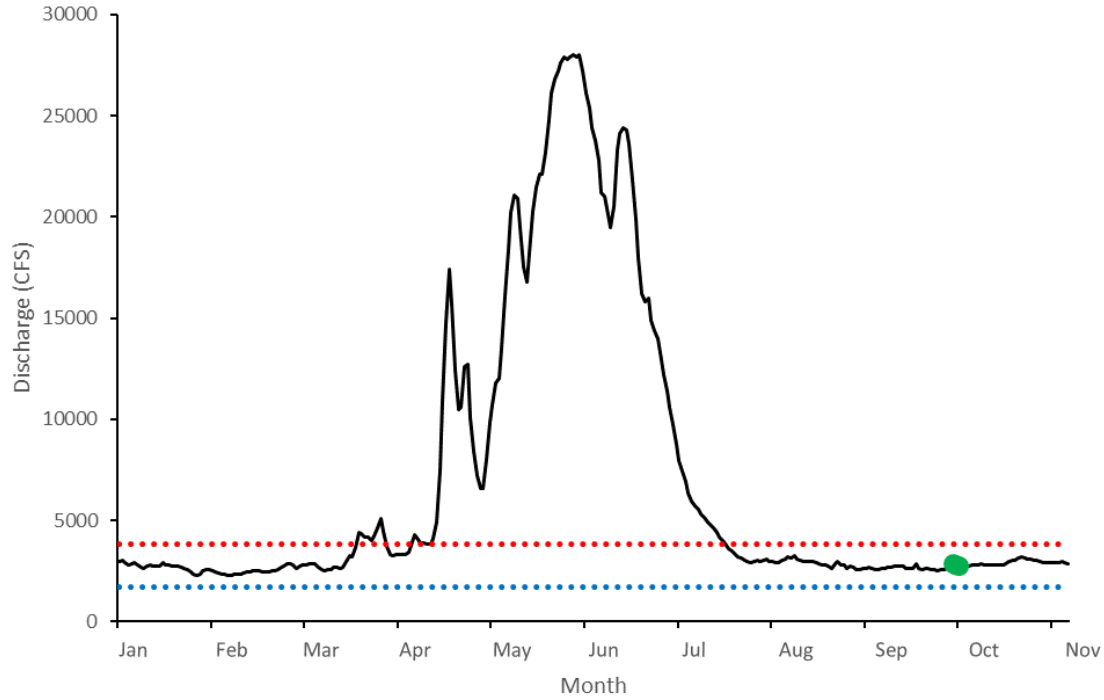


Figure 2. Discharge recorded in 2023 at USGS gage #09315000, Green River, UT. Red and blue dotted lines represent recommended base flow ranges for the lower Green River (1,700-3,800 cfs) identified in Bestgen and Hill (2016). Green highlighted area denotes sampling events.

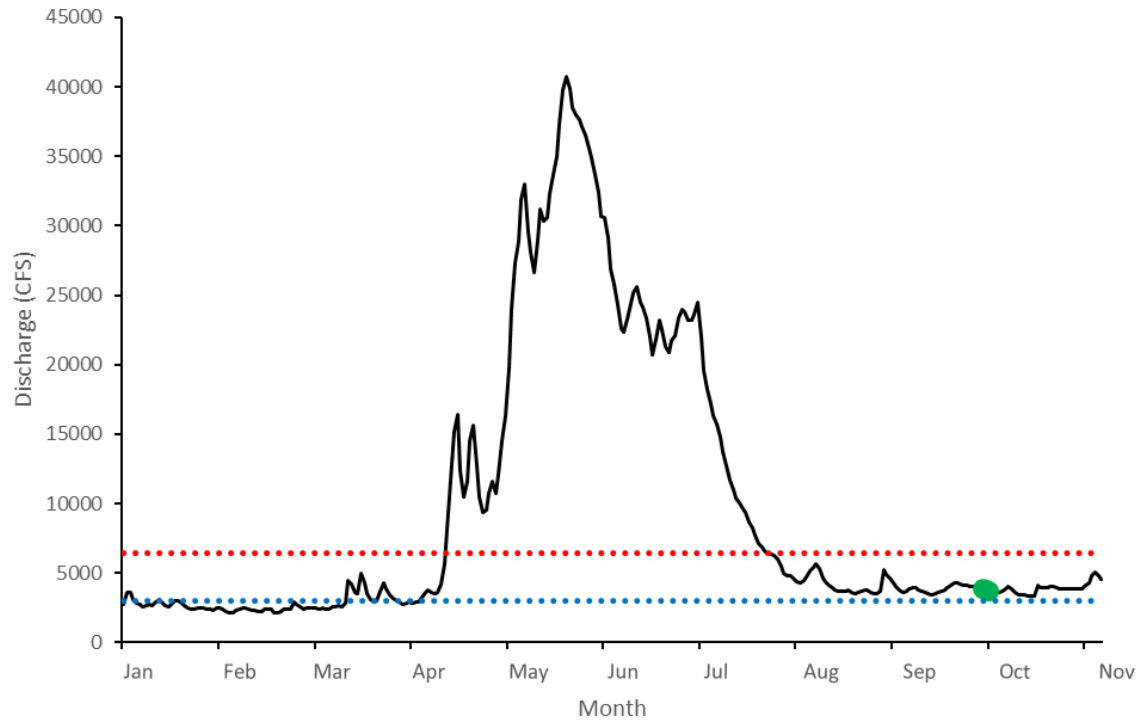


Figure 3. Discharge recorded in 2023 at USGS gage #09180500, near Cisco, UT. Red and blue dotted

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lines represent recommended base flow ranges for the lower Colorado River (3,000-6,400 cfs) identified in Miller (2018). Green highlight denotes sampling events.

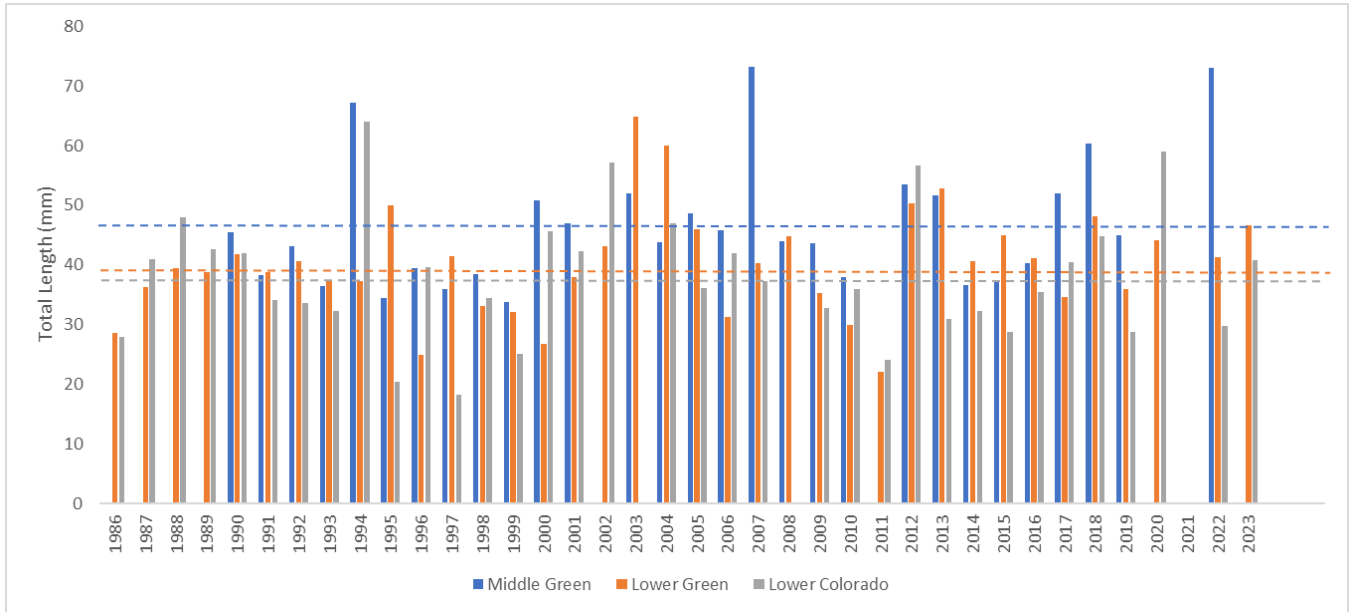


Figure 4. Young-of-year Colorado Pikeminnow annual mean total length collected during annual ISMP sampling from 1986-2023. Horizontal dotted lines represent average total length per reach for the study period.

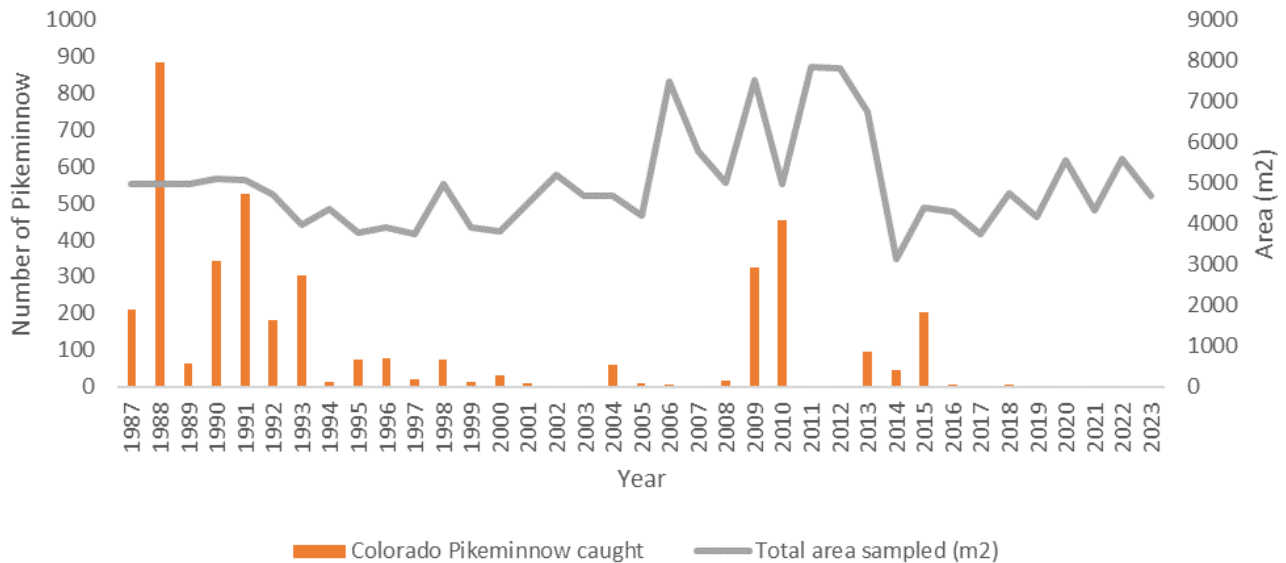


Figure 5. Annual ISMP sampling Catch Per Unit Effort (CPUE) for the middle Green River from 1986- 2023. Here CPUE is displayed as two distinct data sets, total number of Colorado Pikeminnow encountered and total area of habitat sampled per year.

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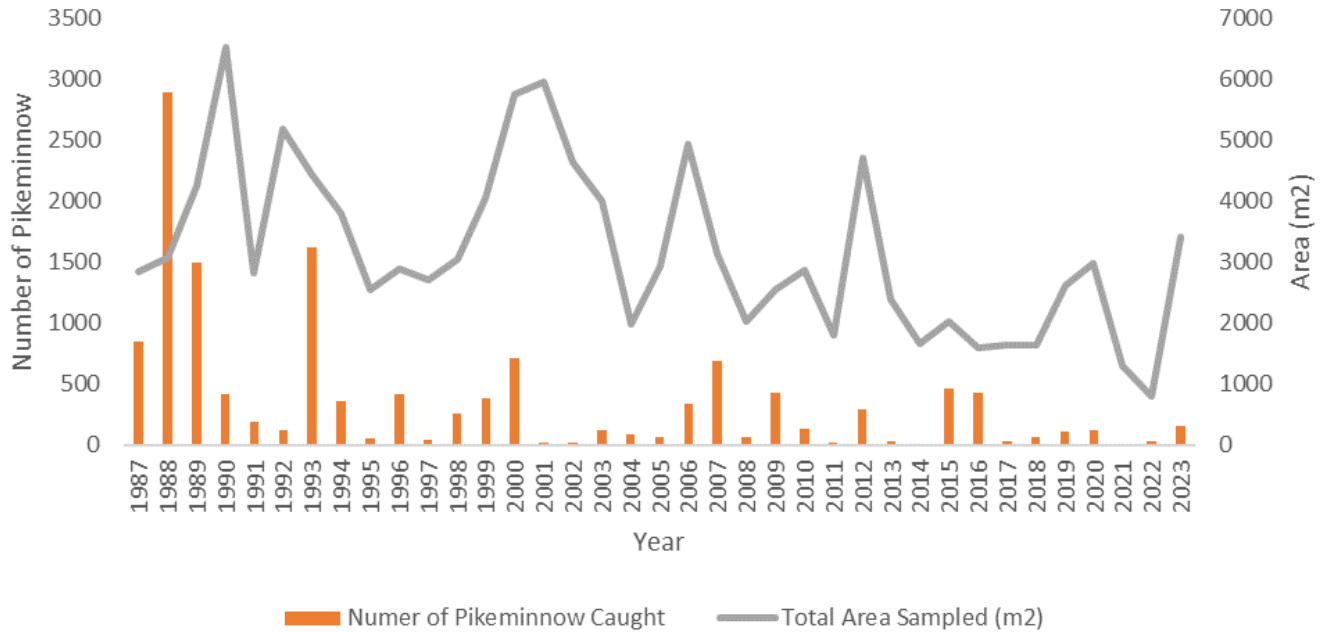


Figure 6. Annual ISMP sampling Catch Per Unit Effort (CPUE) for the lower Green River from 1986- 2023. Here CPUE is displayed as two distinct data sets, total number of Colorado Pikeminnow encountered and total area of habitat sampled per year.

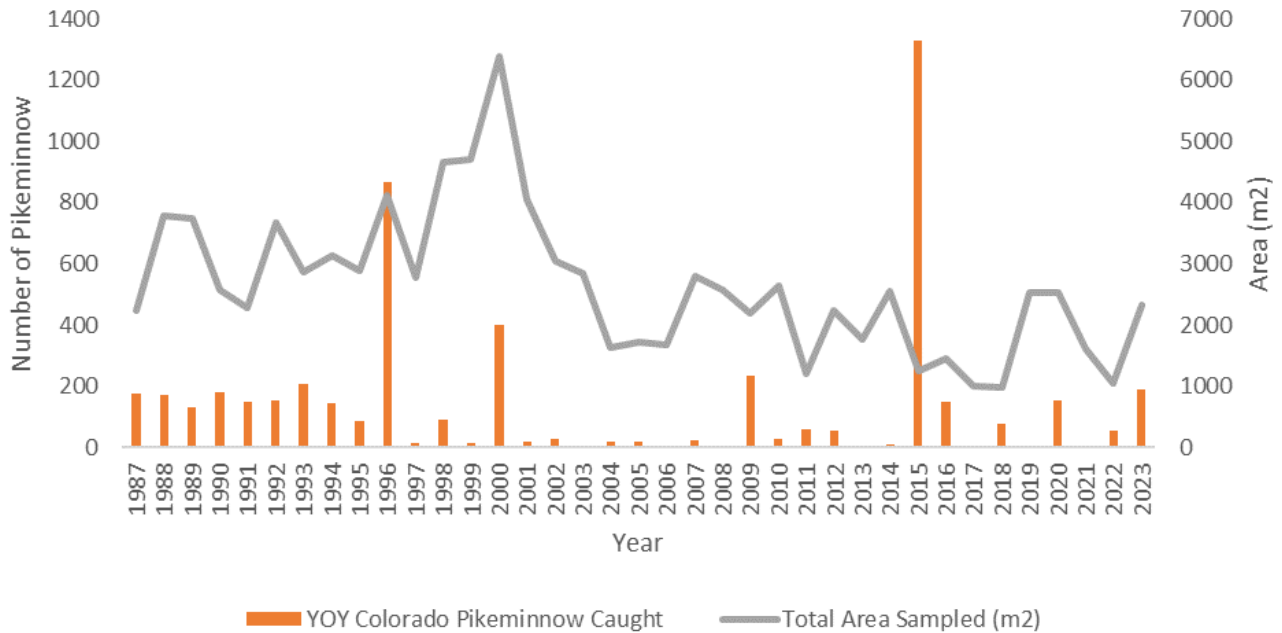


Figure 7. Annual ISMP sampling Catch Per Unit Effort (CPUE) for the lower Colorado River from 1986- 2023. Here CPUE is displayed as two distinct data sets, total number of Colorado Pikeminnow encountered and total area of habitat sampled per year.

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Literature Cited

Bestgen, K.R. and A.A. Hill. 2016. Reproduction, abundance, and recruitment dynamics of young Colorado Pikeminnow in the Green and Yampa rivers, Utah and Colorado, 1979-2012. Final report to the Upper Colorado River Endangered Fish Recovery Program, Project FW 51 BW-Synth, Denver, CO. Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins, CO. Larval Fish Laboratory Contribution 183.

Hansen, B.G. and McGuire, T.G. 2023. Assessment of Stocked Razorback Sucker Reproduction in the Lower Green and Lower Colorado Rivers, Annual Report. Upper Colorado River Endangered Fish Recovery Program Project 160.

Miller, P. S. 2018. Population Viability Analysis for the Colorado Pikeminnow (*Ptychocheilus lucius*) An Assessment of Current Threats to Species Recovery and Evaluation of Management Alternatives. Final Report of the IUCN SSC Conservation Planning Specialist Group to Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

USFWS. 1987. Interagency standardized monitoring protocol handbook. U.S. Fish and Wildlife Service. Grand Junction, CO.