

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2021 ANNUAL REPORT

PROJECT: 158

Project Title

Assessment of larval Colorado pikeminnow presence and survival in low velocity habitats in the middle Green River

Bureau of Reclamation Agreement Number:

R19AP00059 (UDWR)

R20PG00024 (USFWS GRBFWCO)

Project/Grant Period:

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Is this the final report? No

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Abstract:

To document age-0 recruitment of Colorado pikeminnow (*Ptychocheilus lucius*) in the middle Green River, the Utah Division of Wildlife Resources Vernal and the United States Fish and Wildlife Service Green River Basin Fish and Wildlife Conservation Office conducted a variety of seining efforts in backwater nursery habitats in 2021. Sampling during the summer base flow period was conducted to relate age-0 Colorado pikeminnow persistence to experimental Flaming Gorge Dam releases (pre-ISMP sampling), while autumn collections were undertaken for development of a supplemental broodstock. Despite a substantial amount of effort (349 seine hauls; total area seined = 26,963.8 m²), only five age-0 Colorado pikeminnow were sampled during this project, all during broodstock collection. Other age-0 native fishes were collected during these efforts, but in extremely low abundance. Overall, lack of recruitment of age-0 CPM and other native fishes likely resulted from limited habitat availability and quality.

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Study Schedule:

2009-Ongoing

Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

- IV. Conserve genetic integrity and augment or restore populations.
- IV.A.4.a.(1) Maintain genetic refuge for each endangered species in the Middle Green River.
- IV.A.4.d.(1) Upper Colorado River Basin (Broodstock currently represented at Southwest Native ARRC and by wild fish in the river.
- V.B. Conduct research to acquire needed life history information.
- V.B.2. Conduct appropriate studies to provide needed life history information.

GREEN RIVER ACTION PLAN: MAINSTEM

- IV.A. Augment or restore populations as needed, and as guided by the Genetic Management Plan.
- V.C.3. Monitor age-0 Colorado pikeminnow in backwaters.

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

Task 1. Age-0 Colorado pikeminnow presence, densities, and community composition in backwaters.

To document age-0 recruitment success of Colorado pikeminnow (*Ptychocheilus lucius*; CPM) in relation to experimental Flaming Gorge Dam releases and to inform questions raised in the summer flow evaluation report (Bestgen et al. 2020), the Utah Division of Wildlife Resources Vernal seined backwater nursery habitats in the middle Green River throughout the summer base flow period. First emergence of larval CPM detected by drift net sampling conducted at the Echo Park site for Recovery Program Project #22f occurred on 16 June 2021 (preliminary data; K. Bestgen, Colorado State University, personal communication). As determined prior to the onset of this task, larval CPM emergence guided our sampling schedule; approximately six weeks after first emergence, and at approximately two-week intervals from 10 August to 2 September 2021 until fall sampling occurred for the Interagency Standardized Monitoring Program (ISMP; Breen and Michaud 2021).

Seining efforts for pass 1 of this task (pre-ISMP) took place from 10-18 August 2021 and pass 2 occurred from 30 August to 02 September 2021. Beginning at Split Mountain boat ramp (river mile [RM] 319.3) and concluding at Sand Wash (RM 215.3), we sampled two backwater habitats in each 5-mile sub-reach and collected associated habitat information. We selected backwaters in accordance with ISMP backwater selection criteria (USFWS 1987). However, given the main goal of pre-ISMP was to document age-0 CPM captures over time, investigators exercised flexibility of ISMP sampling protocols (USFWS 1987). For example, seining locations within backwaters were selected using our best judgment. We avoided deep, difficult-to-sample areas in favor of shallower areas where we could seine more effectively, and we often targeted the warmer tail end of backwaters. Additionally, we integrated a protocol comparison to inform future sampling design where backwaters were sampled with seines of various dimensions (Table 1). We also documented backwater condition for potential future comparisons (i.e., three transects in each backwater to measure sediment depth). Altogether, we sampled 61 backwater habitats (40 on pass 1 and 21 on pass 2) that met ISMP criteria, yielding a total sampling area of 3,865.1 m² (Table 1). Following results of the first pass and discussion with the Colorado State

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University Larval Fish Laboratory (LFL; K. Bestgen, personal communication), we shifted to a less intensive sampling regime for the second pass (i.e., typically only one backwater per 5-mile reach).

Despite a substantial amount of effort during pre-ISMP sampling (Table 1), we did not encounter age-0 CPM in 2021 (unless revealed later by identification of preserved samples; see below). Other fish species collected during this effort are described in Table 2, as well as gear-specific catch-per-unit-effort and length data summaries. However, this information does not describe the majority of the fish collected during pre-ISMP because a large portion of the samples (see Table 1) were preserved (100% EtOH, or 10% buffered formalin for samples with an abundance of organic material) for later identification by LFL under Recovery Program Project #22f. Preventing desiccation in the field was especially important for overwhelmingly large samples. All seine hauls were quickly sorted to remove natives and rare nonnatives for measurement. Then fishes from seine hauls that were manageable were identified and enumerated in the field, while larger samples were preserved. Until preserved samples are fully identified, enumerated, and incorporated into our data set, fish information presented here is incomplete and should be interpreted with caution. Of fishes that were not preserved when processing samples in the field, 15 age-0 native fishes were captured during 2020 pre-ISMP sampling (Breen et al. 2020), whereas only seven native fishes were collected in 2021 (Table 2); five flannelmouth sucker (*Catostomus latipinnis*) and two bluehead sucker (*C. discobolus*). In contrast, 41 age-0 smallmouth bass (*Micropterus dolomieu*; Table 2) were collected during 2021, and were present in 21.3% of the habitats sampled. Possibly related to predation in overlapping rearing habitats, only 28.6% of total native fish captures occurred on pass 2 (one bluehead and one flannelmouth).

Task 2. Collect age-0 Colorado pikeminnow from backwaters during fall and transfer them to SNARRC. The Green River Basin Fish and Wildlife Conservation Office with assistance from American Southwest Ichthyological Researchers personnel attempted to collect age-0 CPM over the course of nine days between 28 September and 21 October 2021. Field crews conducted 282 seine hauls (Area = 23,098.7 m²; Table 1) within 71 backwaters between the Brush Creek confluence (RM 305.0) and the Ouray bridge (RM 248.1) of the middle Green River. A total of five individuals were collected and transferred to Ouray National Fish Hatchery, one of which did not survive. Three of these fish were caught in one backwater on the first day of this collection effort. In comparison, the 2020 effort encompassed 378 seine hauls (Area = 48,697.2 m²) in 108 backwaters over 15 days, and no CPM were captured (Breen et al. 2020).

Additional noteworthy observations:

Limited age-0 Colorado pikeminnow recruitment was observed in the middle Green River in 2021. Despite a substantial amount of effort, only six age-0 CPM were collected during all seining efforts combined; five during CPM broodstock collection (this project) and one during ISMP efforts (Breen and Michaud 2021). Of many potential reasons, lack of recruitment may have resulted from a lower larval transport index (Bestgen and Hill 2016), which can limit downstream transport of larvae to nursery habitats under a drier hydrologic regime (e.g., 2012; Breen and Jones 2019) as was observed in 2021.

Lack of recruitment may have also been a reflection of available habitat and habitat quality. During broodstock collection efforts, crews only seined backwater habitats that were not connected to mainstem currents (i.e., did not flow through), between the Brush Creek confluence (RM 305.0) and the Ouray bridge (RM 248.1). The 2020 effort occurred within the same study reach (Breen et al. 2020). However, fewer backwaters were encountered in 2021 that met our criteria, which resulted in 37 fewer backwaters sampled in 2021 compared to 2020. Possibly an effect of lower spring runoff in 2021, this reduction in

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habitat type could have contributed to the sparsity of CPM this year. Additionally, high sediment loads were pervasive in the middle Green River throughout much of the base flow period in 2021, likely having a detrimental impact on the small-bodied fish community in backwater nursery habitats and subsequent fall recruitment. Many backwater habitats, especially downstream of the White River confluence (RM 246.1), were largely filled in with fine sediments due to numerous flash-flood events throughout the months of August and September. Moreover, water clarity never recovered following the first of several extreme rain events in the upper Colorado River basin beginning the last week of July 2021, and high turbidity levels persisted throughout the summer and into autumn (i.e., continued disruption of nursery habitats being filled in with sediment). Furthermore, sediment depth exceeded water depth in several backwaters surveyed in 2021, likely limiting valuable resources for growth and survival of small-bodied fishes relying on these areas.

Recommendations:

During 2021 pre-ISMP sampling we only used 1/8" and 1/16" mesh seines (both 15 ft. wide), which worked well for a rapid sampling protocol (essential for this project). We recommend continuing the use of these nets unless exceptional age-0 growth is observed post-spawn due to warmer temperatures (e.g., Table 2). If this is the case in future sampling, we recommend only using 1/8" mesh nets because larger mesh limits the amount of algae and debris in our samples, ultimately simplifying each stage of sample processing.

Middle Green River CPM contributions to basin-wide broodstock over the past few years have been minimal, which warrants rethinking our collection methods. In addition to seining, employing passive gear such as fyke nets could increase CPM captures by fishing individual backwaters over a longer period of time.

Age-0 smallmouth bass are consistently present in backwater nursery habitats in the middle Green River and have increased in abundance more recently (e.g., Breen et al. 2020; this report). Moreover, predation by nonnative fishes in these critical habitats is pervasive (e.g., Breen and Jones 2019), yet poorly understood. We recommend conducting an evaluation of predation by nonnative fishes in backwaters by deploying directional fyke nets at the mouth of select backwaters during the summer base flow period. This will allow us to better understand the dynamics and extent of nonnative fishes moving between riverine and backwater habitats to forage on native fishes. Reinstatement of funding to complete this task would increase our knowledge in this poorly understood area, and may lead to the development and implementation of additional recovery actions for CPM to help bolster recruitment potential.

Project Status:

On track and ongoing

FY 2021 Budget Status

Funds Provided: \$123,463

Funds Expended: \$123,463

Difference: -0-

Percent of the FY 2021 work completed, and projected costs to complete: 100%

Recovery Program funds spent for publication charges: -0-

Status of Data Submission

Data are formatted, have been QA/QC checked, and will be submitted to the USFWS by January 2022.

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Signed:

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Principal Investigators

11/16/2021

Table 1. Summary of 2021 seining efforts in the middle Green River.

Purpose	Seine Dimensions	# Seine Hauls	Total Area Seined (m ²)	# Samples Preserved
Pre-ISMP	1/16" Mesh x 15' Width	33	1,831.2	32
Pre-ISMP	1/8" Mesh x 15' Width	34	2,033.9	28
Broodstock Collection	1/8" Mesh x 15' Width	282	23,098.7	NA
TOTALS		349	26,963.8	60

Table 2. Seine haul results during 2021 summer sampling efforts in the middle Green River. Note that this table only accounts for fishes that were identified and enumerated in the field; samples preserved for later identification are not included.

Species	Seine Dimensions	Total	CPUE (fish/100 m ²)	Mean TL (mm) & Range
black bullhead	1/8" Mesh x 15' Width	1	0.049	–
black crappie	1/8" Mesh x 15' Width	1	0.049	–
	1/16" Mesh x 15' Width	3	0.147	74 (69–80)
bluehead sucker	1/8" Mesh x 15' Width	2	0.098	48, 56
channel catfish	1/16" Mesh x 15' Width	1	0.049	74
common carp	1/8" Mesh x 15' Width	4	0.197	–
	1/16" Mesh x 15' Width	1	0.049	–
fathead minnow	1/8" Mesh x 15' Width	37	1.819	–
	1/16" Mesh x 15' Width	50	2.458	–
flannelmouth sucker	1/8" Mesh x 15' Width	3	0.147	58 (46–64)
	1/16" Mesh x 15' Width	2	0.098	49, 49
green sunfish	1/8" Mesh x 15' Width	112	5.507	–
	1/16" Mesh x 15' Width	5	0.246	–
red shiner	1/8" Mesh x 15' Width	596	29.303	–
	1/16" Mesh x 15' Width	611	30.041	–
smallmouth bass	1/8" Mesh x 15' Width	24	1.180	66 (36–125)
	1/16" Mesh x 15' Width	17	0.836	49 (39–77)
sand shiner	1/8" Mesh x 15' Width	273	13.422	–
	1/16" Mesh x 15' Width	70	3.442	–
white sucker	1/8" Mesh x 15' Width	10	0.492	–
	1/16" Mesh x 15' Width	3	0.147	–
TOTALS		1,826		

Literature Cited

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