Project Title
Remote monitoring of endangered fishes in the middle Green River

Bureau of Reclamation Agreement Number:
R19AP00059

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Is this the final report? No

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Abstract:
In order to increase encounters of endangered fish in the Green River sub-basin, we deployed remote submersible PIT antennas in the middle Green River to complement Recovery Program Project #169. Seven antenna sites included known and suspected razorback sucker spawning locations and flooded tributary mouths. In 2020, remote submersible antennas logged 11,292 total detections, comprised of 1,499 unique tags. We were able to associate 1,353 of these tags with database implantation records, indicating that we detected 1,248 razorback sucker, 75 Colorado pikeminnow, 15 bonytail, six flannelmouth sucker, six flannelmouth X razorback sucker hybrids, two roundtail chub, and one bluehead sucker. For the third consecutive year this project yielded a large number of native fish detections, predominately razorback sucker. We will continue making adjustments as needed for future implementation as we collect more data for comparisons.

Study Schedule:
2018-Ongoing

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.A.1.a.(2) Investigate improving recapture rates through passive PIT tag monitoring, nets, etc. to improve population abundance estimates.
V.A.3. Collect and submit data according to standard protocol (e.g., location, PIT tag #, length, weight, etc.) on endangered fish encountered in all field activities in order to provide annual information on population status outside of formal population estimates.
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
V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring and data management).
V.D.1. Implement razorback sucker monitoring plan.

Accomplishment of FY 2020 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1. Submersible antenna deployment, maintenance, and downloads.
Passive detection of PIT-tagged fish at Razorback Bar (river mile [RM] 310.9) is undertaken annually by the Green River Basin Fish and Wildlife Conservation Office (GRB-FWCO) under Recovery Program Project #169 and has proven to be an efficient means of detecting PIT-tagged razorback sucker *Xyrauchen texanus* (Smith et al. 2018; Webber and Beers 2014). Therefore, to compliment this project, we deployed three remote submersible PIT antennas in the middle Green River to further increase razorback sucker encounters. Antennas have been deployed at cobble substrate microhabitats downstream of Razorback Bar each spring since 2018 (Partlow et al. 2018). Following antenna downloads, we associated PIT-tagged individuals to deployment records and past encounters cataloged in the Recovery Program's STReaMS database (STReaMS, 10/21/2020). Unique detections with associated records are quantified on a site by site basis in Table 1.

Escalante Ranch
For consistency, in 2020 we deployed antennas in the same three Escalante Ranch locations as in 2018 (Partlow et al. 2018). These locations included sites on the right bank at RM 309.7 (Escalante Ranch #1) and RM 309.5 (Escalante Ranch #2), and the left bank at RM 306.8 (Escalante Bar).

We deployed antennas at Escalante Bar and Escalante Ranch #1 from 29 April to 3 June 2020 and at Escalante Ranch #2 from 12 May to 3 June 2020. The antenna at Escalante Bar detected 180 razorback sucker as well as 14 Colorado pikeminnow *Ptychocheilus lucius*, a flannelmouth sucker *Catostomus latipinnis*, a flannelmouth X razorback sucker hybrid and a roundtail chub *Gila robusta* (Table 1). At Escalante Ranch #1 we associated detections with 190 individual razorback sucker, while just downstream 147 razorback sucker were detected by the Escalante Ranch #2 antenna (Table 1). Colorado pikeminnow, bonytail *Gila elegans*, flannelmouth sucker X razorback sucker hybrids, flannelmouth sucker, a bluehead sucker *Catostomus discobolus* and roundtail chub were also detected.

Other antenna locations
In an attempt to increase detections of Colorado pikeminnow and bonytail, and to provide additional opportunities for razorback sucker detections, we deployed antennas in flooded tributary mouths and backwater habitats. These sites included Ashley (RM 299.0) and Brush creeks (RM 304.6), as well as an antenna placed in Stewart Lake drain adjacent to the wetland drain gate.

A single antenna was deployed in Ashley Creek from 8 April to 3 June 2020. At this site we detected 732 razorback sucker (Table 1), which is more than the 455 detected in 2019 and 449 detected in 2018 (Elbin et al. 2019; Partlow et al. 2018). Furthermore, Colorado pikeminnow, bonytail, and a flannelmouth sucker x razorback sucker hybrid were also detected in Ashley Creek (Table 1).

We also deployed a single antenna near the mouth of Brush Creek from 8 April to 3 June 2020. This antenna detected 95 razorback sucker, nine Colorado pikeminnow, and four bonytail (Table 1).

Additionally, an antenna was deployed at Placer Point (RM 315.9), in Dinosaur National Monument, where Colorado pikeminnow have been detected in the past (Partlow et al. 2018). From 11 June 2020 to 25 July 2020 this antenna recorded 44 unique tags, 39 of which were associated with Colorado pikeminnow (Table 1).

Finally, one antenna was deployed in the Stewart Lake outlet canal near the control gate structure to document fish attempting to enter the wetland. This antenna detected 34 razorback sucker, six Colorado pikeminnow, and four bonytail. Noteworthy individuals detected at the wetland control gate include four razorback suckers that were captured and tagged during 2019 draining of Stewart Lake (Partlow et al. 2019). It should be noted that this antenna was exposed for two weeks during the end of April and again in mid-May due to fluctuating water levels and limited staff due to COVID-19 restrictions.

Additional noteworthy observations:
We had more total detections in 2020 than in 2019 and 2018 (Elbin et al. 2019; Partlow et al. 2018). However, we were able to associate PIT tags to a fewer number of unique individual fish than the 2,893 in 2019 (Elbin et al. 2019). Despite having fewer individuals detected on antennas placed in the Escalante Ranch locations than in 2019, total unique razorback sucker detections were similar in 2020 (Table1).

In 2018 and 2019 we were able to compare overlap of individuals whom were also detected with GRB-FWCO's project #169 antennas. In the past, over half of the individual fish detected were unique to project #172 antennas (Elbin et al. 2019; Partlow et al. 2018). However, this year, we were not able to compare the overlap between the two projects. Due to COVID-19 restrictions, antennas were not deployed at the Escalante Ranch locations until later and yielded lower numbers of detections compared to previous years (Elbin et al. 2019; Partlow et al. 2020).

Overall, greater numbers of Colorado pikeminnow were detected by our submersible antennas in 2020. Most of these individuals (39 of 75) were detected by the antenna located at Placer Point, however, this is a slightly lower proportion than in 2018. In 2018, Placer Point detected 52 of 88 total pikeminnow in just 20 days of deployment (Partlow et al. 2018). Although detections at this location have fluctuated since the start of this project, we suggest that it provides valuable information about a potential alternative spawning area utilized depending on hydrology each year.

Recommendations:
Continue to deploy an antenna at the Placer Point location in the future to obtain additional data on this prospective low-water spawning habitat.

Continue to deploy an antenna in the Stewart Lake outlet canal near the control gate structure in the future to document native fish attempting to access the wetland.

If resources become available in future scopes of work, conduct a comprehensive analysis of the overlap between Recovery Program Projects #169 and #172 to determine how fish utilize different parts of the middle Green River in response to hydrologic indices and other factors.

Project Status:
On track and ongoing.

FY 2020 Budget Status
Funds Provided: $8,914
Funds Expended: $8,914
Difference: $0
Percent of the FY 2020 work completed, and projected costs to complete: 100%
Recovery Program funds spent for publication charges: $0

Status of Data Submission
Data were submitted to the STReaMS database manager on 09/17/2020.

Signed:
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11/12/2020

Works Cited

Elbin, K.R., M.S. Partlow, and M.J. Breen. 2019. Remote monitoring of endangered fishes in the middle Green River. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.

Partlow, M.S., K.R. Elbin, M.J.Breen and G.T. Tournear. 2019. Use of Stewart Lake floodplain by larval and adult endangered fishes. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.

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Smith, C.T., D. Beers, and M.T. Jones. 2018. Detecting endangered fishes using PIT tag antenna technology in the Upper Colorado River Basin. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.

Species Tagging, Research and Monitoring System (STReaMS). 2020. Accessed via the internet at http://streamsystem.org on 10/21/2020.

Webber, P.A. and D. Beers. 2014. Detecting razorback suckers using passive integrated transponder tag antennas in the Green River, Utah. Journal of Fish and Wildlife Management 5: 191-196.

Table 1.
Remote submersible PIT antenna locations and detections by species in the middle Green River in 2020. Unique detections and associated individuals (STReaMS, 10/21/2020) are reported on a site by site basis. Nearest river mile (RM) is included next to site name for reference.

Site	Species	Unique Detections
Ashley Creek (RM 299.0)	Razorback sucker	732
	Colorado pikeminnow	14
	Bonytail	8
	Flannelmouth x razorback sucker	1
Brush Creek (RM 304.6)	Razorback sucker	95
	Colorado pikeminnow	9
	Bonytail	4
	Flannelmouth sucker	1
Escalante Bar (RM 306.8)	Razorback sucker	180
	Colorado pikeminnow	14
	Flannelmouth sucker	1
	Flannelmouth x razorback sucker	1
	Roundtail chub	1
Escalante Ranch #1 (RM 309.7)	Razorback sucker	190
	Colorado pikeminnow	9
	Bonytail	2
	Flannelmouth sucker	2
	Flannelmouth x razorback sucker	2
	Roundtail chub	1
Escalante Ranch #2 (RM 309.5)	Razorback sucker	147
	Colorado pikeminnow	1
	Bonytail	1
	Bluehead sucker	1
	Flannelmouth sucker	4
	Flannelmouth x razorback sucker	3
Placer Point (RM 315.9)	Colorado pikeminnow	39
Stewart Lake Drain (RM 299.2)	Razorback sucker	34
	Colorado pikeminnow	6
	Bonytail	4