RECOVERY PROGRAM Recovery Program Project Number: _140_
FY 2020-2021 SCOPE OF WORK for:

Evaluating effects of non-native predator fish removal on native fishes in the Yampa River

Reclamation Agreement number: New agreement pending
Reclamation Agreement term: Oct. 1, 2018 – Sep. 30, 2023

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Category:
__ Ongoing project
X Ongoing-revised project
__ Requested new project
__ Unsolicited proposal

Expected Funding Source:
X Annual funds
__ Capital funds
__ Other (explain)

I. Title of Proposal: Evaluating effects of non-native predator removal on native fishes in the Yampa River, Colorado.

II. Relationship to RIPRAP:

Green River Action Plan: Yampa and Little Snake Rivers
See RIPRAP at http://www.coloradoriverrecovery.org/documents-publications/foundational-documents/recovery-action-plan.html

III.A.1. Implement Yampa Basin aquatic wildlife management plan to develop nonnative fish control programs in reaches of the Yampa River occupied by endangered fishes. Each control activity will be evaluated for effectiveness and then continued as needed.
III.B.2.h. Monitor native and endangered fish response

III. Study Background/Rationale and Hypotheses:

Control actions for several non-native fish predators have been implemented in several rivers of the upper Colorado River Basin but effects of those removals on restoration of native fishes is poorly known and needs ongoing monitoring. Understanding the response of the native fish community to predator removal is needed to understand if removal programs are having the desired effect. Strong scientific inferences can be obtained only from studies conducted with a valid methodology. Some of the critical components of an experimental design to assess effects of non-native predator fish removal include estimating the level and precision of the nonnative removal effort, achieving a large treatment (removal) effect, quantifying the response by native fishes to fish removal, comparing results in treatment and

reference (control) reaches, replicating those treatments and controls in space and time, and controlling for extraneous confounding variables. I include some discussion of those points below to serve as the basis and justification for a proposed study design.

The summary report completed in March 2007 recommended additional sampling in anticipation that larger scale removals and environmental effects such as higher flows or lower temperatures that may reduce predator abundance in the study reach and elicit a positive native fish response (Bestgen et al. 2007) such as happened in 2008 through 2011. Understanding causes of negative responses of native fish are also important, as occurred in lower flow years 2012-2018. We intend to continue broader scale sampling including efforts in Lily Park if such is possible. We also plan to continue to evaluate removal efficiency annually. This gives a greater understanding of levels of removal each year with our single pass sampling, and also allows evaluation of temporal trends in abundance at several sites so changes in bass abundance can be assessed.

IV. Study Goals, Objectives, End Product: The goal of this work is to reliably estimate the response of resident native fishes to a known, relatively large, and well-estimated level of predator removal.

Specific objectives necessary to achieve that goal for Yampa River fish removal evaluation studies follow.

1. Select treatment and reference areas for study.
2. Implement removal of smallmouth bass and northern pike in treatment reaches in spring (mostly conducted in Project 125).
3. Assess relative abundance of predators in treatment and reference reaches to determine removal effects.
4. Conduct additional removals of small smallmouth bass prior to summer and early autumn (mostly under project 125, but also some associated with evaluation sampling in this study).
5. Analyze age-0 smallmouth bass otolith micro-increments as needed to understand timing and intensity of reproduction in the Yampa River.
6. Estimate response of native fishes in autumn in control and treatment reaches after spring-summer predator removal, including some emphasis on the Lily Park section of the Yampa River.

End Product: RIP annual reports submitted following the field seasons after sampling was conducted. We have also participated in the annual non-native fish workshops and presented data that were collected as recently as one month prior to the meeting. We completed a four-year data summary and evaluation (Bestgen et al. 2007) in March 2007. Another such effort is underway and planned for completion in 2019.

V. Study area: Yampa River, Colorado

Treatment and reference reaches have been established in the Yampa River as a part of non-native predator removal studies. The upper study area consists of a 24-mile reach (RM 125-101) beginning upstream of Morgan Gulch and ending downstream of Little Yampa Canyon. The downstream 12-mile reach has been designated the removal reach, and the upstream 12-mile reach has been designated the reference reach. This reach was chosen because it is relatively accessible and the reference reach has a sampling history (R. Anderson, then Colorado Division of Wildlife, now Colorado Parks and Wildlife, this study) that will be valuable to assessing trends in fish abundance over time.

The other treatment area (no reference) is a 5-mile river reach in Lily Park. We plan to continue sampling in the Lily Park reach of the Yampa River if we can obtain access, because it offers a substantially more intact native fish assemblage than the upstream reach and will give us insights into effects of removal in that setting. Sampling in that reach will also offer insights into longitudinal patterns of the fish community, both for native and non-native species, which will allow us to put findings in the upstream reach into better perspective. This sampling is also consistent with nonnative fish predator removal efforts planned under associated project 125. For the past several years we have not been able to sample Lily Park so shifted work to Little Yampa Canyon.

VI. Study Methods/Approach:

Study reaches were designated in spring 2003 following discussions with personnel from the Colorado Parks and Wildlife. This includes assignment of reference and treatment reaches. Removals will be implemented in spring from designated reaches during sampling designed to assess abundance and ultimately, remove, non-native predators. Additional sampling and removal will occur during sampling to estimate abundance of Colorado pikeminnow. Details of sampling and the history of sampling reach changes are summarized in Bestgen et al. (2007); those descriptions are still valid.

The plan at present is to mark predator fish (Project 125) on one or more passes in all reaches to assess their distribution, abundance, and size-structure. Removal efforts in treatment reaches will then commence and will add to the data available to estimate abundance of predator fishes in the reach. A minimum of 5 and often up to 9 or 10 removal passes is typically conducted; the number of marking and removal passes largely dependent on sampling success and water levels that will support extended sampling efforts. Additional removal sampling conducted during the beginning of the smallmouth bass spawning season (Surge) with smaller craft (e.g., rafts) has been successful and will continue into the future.

Capture-recapture data collected in the sampling reaches will be used to generate estimates of abundance of non-native predator fishes following spring and early-summer sampling. These estimates will allow us to determine if we have achieved target levels of reduction for fish predators. Additional summer and early autumn removals of small-bodied bass will be conducted with electric seines, as has been done in the past.

Small-bodied fishes evaluation.–In each of the reference and treatment reaches, we will identify suitable low-velocity channel margin areas for sampling. Low-velocity shoreline areas and backwaters are typically the most sampled habitat types. We also choose areas that are typically available from year to year for sampling if similar areas can be found in each of the reference and treatment reaches, which allows for some documentation of annual changes in young bass abundance. An effort will also be made to choose sampling areas in treatment and reference reaches that are similar in size and habitat characteristics. We have sampled mostly with an electric seine in the past several years although a backpack shocker and conventional seine have been used when turbidity limits sampling efficiency. Samples of each species captured are measured and weighed so that comparisons of size structure could be made. Non-native predators captured in the treatment reach are removed, fish captured in reference areas are returned. We attempt to generate catch/effort estimates for all species captured, including non-native cyprinids, because these species may also show a response to removal of non-native fish predators in the reach. Sampling area and other aspects of the habitat would be quantified so that comparisons could be made between control and reference areas. Data available for comparison among treatment and reference areas would be fish community composition, density estimates based on effort or area sampled, and community size-structure. Large-bodied fish response data in the study area are

collected during spring sampling in Project 125 in selected 1-mile reaches.
We will also continue to conduct analyses to understand timing and intensity of smallmouth bass reproduction in the Yampa River. This is accomplished by analyzing otolith daily increments of age-0 smallmouth bass collected and preserved in ethanol during past years including 2018. A key to this aspect of the study is to obtain data in several different hydrologic years with differing water temperatures to understand those effects on smallmouth bass life history, reproduction, and extensions to recruitment. We have also learned much about growth and recruitment patterns of smallmouth bass and incorporated this information into stock assessments and a population dynamics model (project 161). This information was valuable to describe smallmouth bass life history and this work should continue as we gather additional information with each type of runoff year and thermal regime.

VII. Task Description and Schedule

Task 1. Prepare sampling equipment.
Task 2. Small-bodied fish sampling.
Task 3. Large-bodied fish sampling.
Task 4. Data entry and analysis.
Task 5. Otolith analysis.
Task 6. Annual reporting.

VIII. Deliverables, Due Dates, and Budget by Fiscal Year:

Annual report, early November each year.

Travel: Travel costs for field work based on estimated per diem rates for Colorado State University for the area we are working in. Mileage is based on the standard rate for Motor Pool vehicles, which varies depending on age and size of the vehicle. We will use $ 0.50 per mile for 2020-2021. Meeting costs include three nights of hotel, per diem, and mileage to travel to meetings. These include costs for two people. Gasoline costs reflect purchase for generators in rural locations which are high.

Personnel: Salaries include 28.2% fringe rate, an estimate for 2019, plus overhead. Overhead is calculated on all items (including salary plus fringe rate) at 17.5%, per our agreement with BOR.

Supplies: Supplies are used in the conduct of field sampling. Estimated costs based on current prices procured from various online sources (NRS rafting supplies, gas and oil, Mercury Outboard Corp. for motor props, Christiansen Inc, for net supplies, Fischer Scientific for preservatives).

Budget notes: We recognize the need to keep costs low, and have only minimally increased the budget for this project. Increases needed to support mandated raises for personnel. Costs were reduced from projected in the Program spreadsheet by $10,744 in FY 2018.

Budget FY 2020-2024

IX. Budget Summary

See also the detailed Excel spreadsheet using the USBR Cost Estimating Tool.

Summary Year	LFL
FY2020	$67,515
FY2021	$68,278
FY2022	$100,059
FY2023	$101,842
FY2024	$103,661
	$441,355

X. Reviewers

XI. References

Bundy, J. M., and K. R. Bestgen. 2001. Evaluation of the Interagency Standardized Monitoring Program Sampling Technique in Backwaters of the Colorado River in the Grand Valley, Colorado. Unpublished report to the Recovery Implementation Program for Endangered Fishes in the Upper Colorado River Basin. Larval Fish Laboratory Contribution 119.

Bestgen, K. R., C. D. Walford, and A. A. Hill. 2007. Native fish response to removal of non-native predator fish in the Yampa River, Colorado. Final report to the Recovery Implementation Program for Endangered Fishes in the Upper Colorado River Basin. U. S. Fish and Wildlife Service, Denver, CO. Larval Fish Laboratory Contribution 150.