COLORADO RIVER RECOVERY PROGRAM Project No.: 140
FY-2008–2009 PROPOSED SCOPE OF WORK for:

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

Lead Agency: Larval Fish Laboratory
Submitted by: Kevin Bestgen
Department of Fish, Wildlife, and Conservation Biology
Colorado State University
Ft. Collins, CO 80523
voice: KRB (970) 491-1848, JAH (970) 491-2777
fax: (970) 491-5091
email: *kbestgen@picea.cnr.colostate.edu*

Date: 28 April 2005 (revised 6/15/05 by Pat Nelson; 2/23/06 by Kevin Bestgen; 3/14/06 by Pat Nelson), 23 March 2007, 17 and 25 April 2007 by K. Bestgen, 21 Feb by K. Bestgen

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

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. 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 unknown. 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 water or lower temperatures may lower predator abundance in the study reach and elicit a native fish response (Bestgen et al. 2007).

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 a different study).
3. Assess abundance of predators in treatment and reference reaches to determine removal effects.
4. Conduct additional removals prior to summer if removals were not sufficient or if the removal effect was transitory.
5. Analyze smallmouth bass otolith microincrements to understand timing and intensity of reproduction in the Yampa River (new in 2007).
6. Estimate response of native fishes in autumn after spring-summer predator removal, including increased emphasis on the Lily Park section of the Yampa River.

End Product: RIP annual reports submitted following the 2007 and following field seasons. We completed a four-year data summary and evaluation (Bestgen et al. 2007) in March 2007. We also anticipate a three-year field evaluation followed by a portion of the following year for data analysis and reporting in 2010.

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 (RM 125-101) beginning upstream of Morgan Gulch and ending downstream of Little Yampa

Canyon. One 12 mile reach has been designated the removal reach, and the other 12 miles 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, Colorado Division of Wildlife) that will be valuable to assessing trends in fish abundance over time. The other treatment-reference area is a 12-mile river reach upstream of Cross Mountain Canyon, half as treatment and half as reference.

Study reach length is a potential weakness of this study design because the relatively short reaches may promote enough movement into the reach so that the treatment is confounded. Nonnative predator fish movement data should be gathered and analyzed to determine this and study reach lengths increased to accommodate this eventuality. We also plan to increase effort in the Lily Park reach of the Yampa River. This is consistent with increased nonnative fish predator removal effort planned under associated project 98a. Sampling in this area will also allow assessment of fish removal effects on a broader geographic scale and in a reach where a reasonably substantial native fish population still resides (Hawkins draft synthesis report, project 98a, spring 2008).

VI. Study Methods/Approach:

Study reaches have been designated in spring 2003 following discussions with personnel from the Colorado Division of 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.

The plan at present is to mark predator fish on one or more passes in all reaches to assess their distribution, abundance, and size-structure. Removal efforts in treatment reaches will likely commence later in spring and will add to the data available to estimate abundance of predator fishes in reference and treatment reaches. A final pass will be conducted post-runoff to assess fish abundance and enhance removal efforts. Recapture data will also be used to assess movement of fishes between reference and control reaches over time. We anticipate that a total of 3-5 sampling passes will be completed in the sampling area; the number of marking and removal passes is yet unknown.

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 removals may be conducted if feasible.

Beginning 1 October 2003 (the beginning of the new FY-2004 fiscal year), we began to assess the response of native fishes to removal of non-native predators. This work will attempt to evaluate two main components of the native fish community, small-bodied fish

in backwaters and large-bodied fishes in the main channel. Success of much of this component depends on accessibility of the reach by our various sampling gears, which is primarily dependent upon water levels.

Small-bodied fishes evaluation.–In each of the reference and treatment reaches, we will identify suitable low-velocity channel margin areas for sampling. Depending on the number available, we will randomly select up to six areas in each reach for assessment of small-bodied fish abundance. Backwaters would be the most suitable areas to sample because they can be isolated with block nets for closed-capture abundance estimation sampling. We may also choose areas that appear like they will be available from year to year for sampling if similar areas can be found in each of the reference and treatment reaches. An effort will also be made to choose sampling areas in treatment and reference reaches that are similar in size and habitat characteristics. Each sampling area will be isolated with a block-net, and we will attempt three-pass removal sampling with seines, bank electrofishing, or some combination of gears. Areas with low habitat complexity will be seine sampled, areas with higher habitat complexity will be sampled with seines and electrofishing. This approach was successfully used in the Colorado River to accurately and precisely estimate abundance of resident fishes in backwaters (Bundy and Bestgen 2001). During that sampling, an average of 90% of fish in backwaters were captured. Samples of each species captured would be measured and weighed so that comparisons of size structure could be made. Non-native predators captured in treatment areas would be removed, fish captured in reference areas would be returned to backwaters. We would attempt to generate abundance 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, abundance estimates, density estimates (for those species that were too rare to obtain abundance estimates), and community size-structure.

Large-bodied fishes.–In autumn in each reference and treatment areas, we would attempt 2-3 pass capture-recapture sampling of the adult fish community. Sampling gear would be either boat or raft-electrofishing, depending on water levels. Other sampling gears may be used as conditions permit. Target species would include flannelmouth and bluehead suckers, roundtail chubs, and non-native white suckers and their hybrids. Fish captured on each sampling pass would be batch marked with an external mark (likely a fin punch), measured, and released. We would attempt to capture and estimate abundance of relatively small fish 150 mm TL or larger. We view this as important because that size fish may be the most responsive to removal of fish predators. Effort will be estimated for each sampling pass. Data available for comparison among treatment and reference areas would be fish community composition, abundance estimates, density estimates (for those species that were too rare to obtain abundance estimates), and community size-structure. We should also be able to generate estimates

of abundance of non-native fish predators with this sampling. Comparison of spring and autumn data will allow us to assess whether spring removal sampling has had a lasting effect. Fish predators captured in the treatment reach will be removed, those captured in the reference reach will be returned to the water.

We will also begin to conduct analyses to understand timing and intensity of smallmouth bass reproduction in the Yampa River. This will be accomplished by analyzing otolith daily increments of smallmouth bass collected and preserved in ethanol during past years (2002-2006 as available) and in 2007. This will require analysis of several years of samples to understand effects of different flow and temperature regimes on timing and intensity of spawning. This budget increment will initiate this multi-year effort.

This effort will be conducted concurrent with synthesis report preparation in the first half of 2007. Recall that we conducted an extra season of field sampling in 2006 with only a small increase in budget. Additional funds will be required to conduct additional field sampling in autumn 2007 (FY08).

VII. Task Description and Schedule

Task 1. Prepare sampling equipment, obtain landowner permissions, scout sample sites.
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. FY-2008/2009 Work

– Annual report /early December each year.

Larval Fish Laboratory, 2008 Budget. Salaries include 20.8 % fringe rate. Overhead is calculated on all items (including salary plus fringe rate) at 15%, except for equipment > $5,000 which is zero. Overhead amount may increase slightly in 2009.

Budget notes: A final report was written and submitted in March 2007. That report consisted of four years of data when we were budgeted for only three full years and some report preparation money in FY 2007. We will be able to begin field work in autumn 2007 with a small amount of remaining money in the FY 2007 budget, plus the amount budgeted for FY 2008. The amounts in this budget are higher than anticipated because the $46,500 budgeted by the Recovery Program was only for a partial year of field sampling in FY 2008, not the full year that we have sufficient funds remaining to cover. Note that previous years budgets were about 64K/yr. Also, an additional $10,500/yr was budgeted beginning in FY 2007 to begin smallmouth bass and we anticipate that will need to continue that work through 2008 and 2009. Thus, budgets in FY 08 and 09

reflect costs similar to that incurred in previous years, plus the amount budgeted for additional smallmouth bass otolith analysis. We also budget for additional work in Lily Park, increased fuel costs, and increased labor costs.

FY 2008 budget

Larval Fish Laboratory, FY2008

Task 1, Prepare sampling equipment

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	10	450		$4,500
Senior technician (d)	7	190		$1,330
Technician (d)	5	140		$700
			subtotal	$6,530
Travel				
Per diem (d)	4	25		$100
Mileage (miles)	750	0.4		$300
			subtotal	$400
			Total	$6,930

Task 2 and 3, sample fishes

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	15	450		$6,750
Senior technician (d)	80	190		$15,200
Technician (d)	120	140		$16,800
			subtotal	$38,750
Travel				
Per diem (d)	140	25		$3,500
Mileage (miles)	7000	0.42		$2,940
			subtotal	$6,440
Supplies				
gas	200	2.5		$500
oil	20	2.5		$50
props	2	200		$400

nets, seines, pens	4	52		$208
preservative	1	33		33
misc camp gear	1	175		175
Misc sampling gear	1	200		200
			subtotal	$1,566
			Total	$46,756

Task 4, data entry and analysis

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	8	450		$3,600
Senior technician (d)	24	190		$4,560
Technician (d)	10	140		$1,400
			subtotal	$9,560

Task 5, otolith analysis

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	8	450		$3,600
Senior technician (d)	20	190		$3,800
Technician (d)	25	140		$3,500
			subtotal	$10,900

Task 6, annual report preparation

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	6	450		$2,700
Senior technician (d)	5	190		$950
Technician (d)	6	140		$840
			subtotal	$4,490
Travel				
planning mtg	1	620		$620
			subtotal	$620
			Total	$5,110
			Total tasks 1-5	$79,256

Larval Fish Laboratory, FY2009

Task 1, Prepare sampling equipment

Item	Cost

Labor	Units	Cost/unit		
Principal investigator (d)	10	470		$4,700
Senior technician (d)	7	195		$1,365
Technician (d)	5	145		$725
			subtotal	$6,790
Travel				
Per diem (d)	5	25		$125
Mileage (miles)	750	0.4		$300
			subtotal	$425
			Total	$7,215

Task 2 and 3, sample fishes

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	15	470		$7,050
Senior technician (d)	80	195		$15,600
Technician (d)	120	145		$17,400
			subtotal	$40,050
Travel				
Per diem (d)	140	25		$3,500
Mileage (miles)	7000	0.4		$2,800
			subtotal	$6,300
Supplies				
gas	200	3		$600
oil	20	2.5		$50
props	2	200		$400
nets, seines, pens	4	52		$208
preservative	1	33		33
misc camp gear	1	175		175
Misc sampling gear	1	200		200
			subtotal	$1,666
			Total	$48,016

Task 4, data entry and analysis

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	8	470		$3,760
Senior technician (d)	24	195		$4,680
Technician (d)	10	145		$1,450
			subtotal	$9,890

Task 5, otolith analysis

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	8	470		$3,760
Senior technician (d)	20	195		$3,900
Technician (d)	25	145		$3,625
			subtotal	$11,285

Task 6, annual report preparation

Item				Cost
Labor	Units	Cost/unit		
Principal investigator (d)	9	470		$4,230
Senior technician (d)	7	195		$1,365
Technician (d)	5	145		$725
			subtotal	$6,320
Travel				
planning mtg	2	500		$1,000
			subtotal	$1,000
			Total	$7,320
			Total tasks 1-5	$83,726

IX. Budget Summary *[Provide total AND break-out by funding target (e.g. station)]*[*]

FY-2008 $79,256
FY-2009 $83,726
Total: $162,982

X. Reviewers *[For new projects or ongoing-revised projects, list name, affiliation, phone, and address of people who have reviewed this proposal.]*

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.