

- I. Project Title: Evaluating effects of non-native predator removal on native fishes in the Yampa River, Colorado
- II. Principal Investigator(s): Larval Fish Laboratory
Kevin Bestgen and John Hawkins
Department of Fishery and Wildlife
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
- III. Project Summary: 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. Therefore, the objective of this project is to document fish community changes in response to predaceous fish removals in a reach of the Yampa River, Colorado. A general hypothesis for this work might be whether non-native fishes affect native ones or not.
- IV. Study Schedule: *2004 to TBD*
- V. 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.A.1.b Control northern pike.
III.A.1.d Remove and translocate smallmouth bass.
- VI. Accomplishment of FY 2006 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

In 2006, we sampled 83 habitat areas in the Yampa River, 36 in the control reach and 47 in the treatment reach. Seven habitat areas were isolated pools. In all reaches and habitat types, 14,140 fish were sampled. Native fishes (n = 221) constituted 1.6% of that total, with most occurring in the control reach where adult and large juvenile smallmouth bass were removed but age-0 smallmouth bass removal was not conducted. However, most of those native fishes (n = 189, 86%) were taken in isolated pools where few or no smallmouth bass occurred regardless of whether the habitat area was in the control or

treatment reach; only 32 native fish were captured in the mainstem. Most native fishes captured in this study in years 2003–2005 were also captured in isolated pools, regardless of whether they were located in the control or treatment reach. These data are provisional because we only recently finished field work in the Yampa River and analysis and sample work are not yet complete. We plan to report results of 2006 sampling at the December 2006 nonnative fish workshop in Grand Junction. Because results of 2005 sampling were not available due to field commitments on this project through October, the FY 2005 results are discussed below. Relevant data from previous presentations are also placed at the end of this report so that comparisons can be made.

Project data collected in FY 05 were reported at the nonnative workshop conducted in Grand Junction, Colorado, in December 2005. We sampled a total of 88 habitat areas in autumn 2005, in both control (N = 45) and treatment (N = 43) reaches. Habitat types included backwaters, riffles, pools, shorelines, and isolated pools. These locations were sampled mostly with an electric seine, with emphasis on obtaining representative samples of small-bodied fishes.

A total of 13,190 fish were captured in samples in both control and treatment reaches in autumn. Samples were dominated by non-native fishes in both treatment and control reaches. Treatment reaches supported about < 0.3 % native fishes including roundtail chub and speckled dace. Control reaches supported 1.8 % native fishes of those same taxa, but only 0.3% of those were captured in the main channel. The rest were captured in an isolated pool that was free of smallmouth bass. Smallmouth bass relative abundance in 2005 was high initially but was reduced via removal sampling such that relative abundance in the treatment reach became about half of that in the control reach. Sand shiner and white sucker abundance was higher in the treatment reach compared to the control (38.1 vs 6.9 sand shiner, 19.1 vs. 13.6 white sucker, in treatment vs control areas respectively). Increased abundance of those small-bodied fishes, and reduced abundance of smallmouth bass, may be indicative of a treatment effect.

Similar to 2003 and 2004, isolated pool and main channel (all habitat types) fish communities differed in fish composition. In main channel habitat, 12,896 fish were captured and 1.0% were native fish. In comparison, 294 fish were captured in the single isolated pool and 44.9% were native. Smallmouth bass were 45% of the main channel fish community but none were found in the isolated pool. More native fish were captured in the single isolated pool sample than in all 87 other main channel samples in control or treatment areas.

A comparison of data collected in 1981 from the same Yampa River reach to that collected in 2003 to 2005 suggested a large influx in large-bodied predaceous fishes since then. Samples also showed a large decline in abundance of small-bodied native fishes. In 1981, small-bodied native fishes from 2 reaches within the study area were 20 and 33% of samples collected, compared to <10% in most years.

Data collected in autumn 2006 (September and October) are not yet available as we just finished field work in late October. Data slides associated with the December 2003 to

Portions of a Presentation at the 2003 Workshop on non-native fish predators are presented below

Response of the Native Fish Community of the Yampa River to
Removal of Non-native Piscivores: Preliminary Results From 2003

by

K. Bestgen, T. Sorensen, J. Hawkins, and C. Walford

Larval Fish Laboratory

Department of Fishery and Wildlife Biology

Colorado State University

Objective

Assess baseline fish community present in Yampa River study area after 2003 removal effort and prior to more extensive future efforts

Number of samples in treatment and control reaches in Little Yampa Canyon by habitat type, Yampa River 2003

	<u>Treatment</u>	<u>Control</u>
No. of samples	33	37
No. of samples with fish	26	35
Backwaters	8	9
Eddies	0	1
Embayments	5	7
Isolated pools	4	3
Pools	0	1
Riffles	6	8
Runs	2	1
Shorelines	8	7

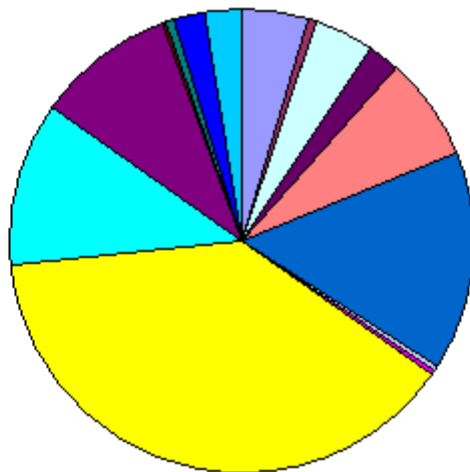
% Composition of the fish community of the Yampa River study area, 2003

Species	TREATMENT	CONTROL
Native suckers	3	2
Roundtail chub	1	<1
Speckled dace	3	<1
Black bullhead	<1	12
Brook stickleback	6	<1
Common carp	3	<1
Creek chub	7	8
Fathead minnow	18	11
Smallmouth bass	38	39
Sand shiner	8	18
White sucker	12	6

% Composition of the Fish Community of the Yampa River Study Area, 2003

BB
 BC
 BG
 BS
 CP
 CR
 FH
 PK
 RD
 NP

SM
 SS
 WS
 ID
 RT
 SD
 NS



% Species Composition by Sampling Gear, Yampa River, 2003

<u>Species</u>	<u>T-EL</u>	<u>C-EL</u>	<u>T-SE</u>	<u>C-SE</u>
Native suckers	3	2	0	0
Roundtail chub	1	<1	0	0
Speckled dace	3	<1	0	0
Black bullhead	<1	13	0	<1
Black crappie	<1	1	0	0
Brook stickleback	6	1	0	<1
Common carp	3	1	9	<1
Creek chub	7	9	0	0
Fathead minnow	18	11	9	4
Smallmouth bass	38	42	0	4
Sand shiner	7	11	82	88
White sucker	12	6	0	0

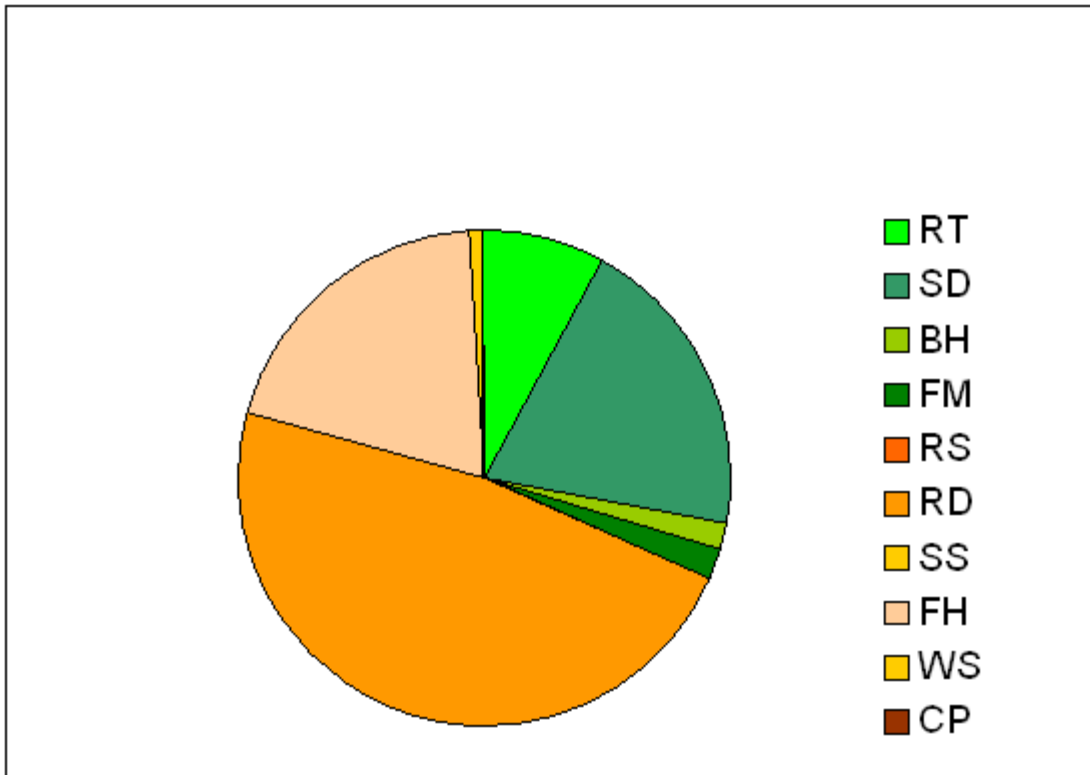
Main Channel and Isolated Pool Fish Communities, Yampa River, 2003

<u>Species</u>	<u>Main channel</u>	<u>Isolated pool</u>
Native suckers	0.0	5.0
Roundtail chub	0.0	1.5
Speckled dace	0.4	3.8
Black bullhead	1.7	7.7
Brook stickleback	0.8	7.3
Common carp	0.3	4.2
Creek chub	6.7	7.7
Fathead minnow	5.3	25.3
Smallmouth bass	65.2	12.2
Sand shiner	16.7	5.9
White sucker	1.2	18.6

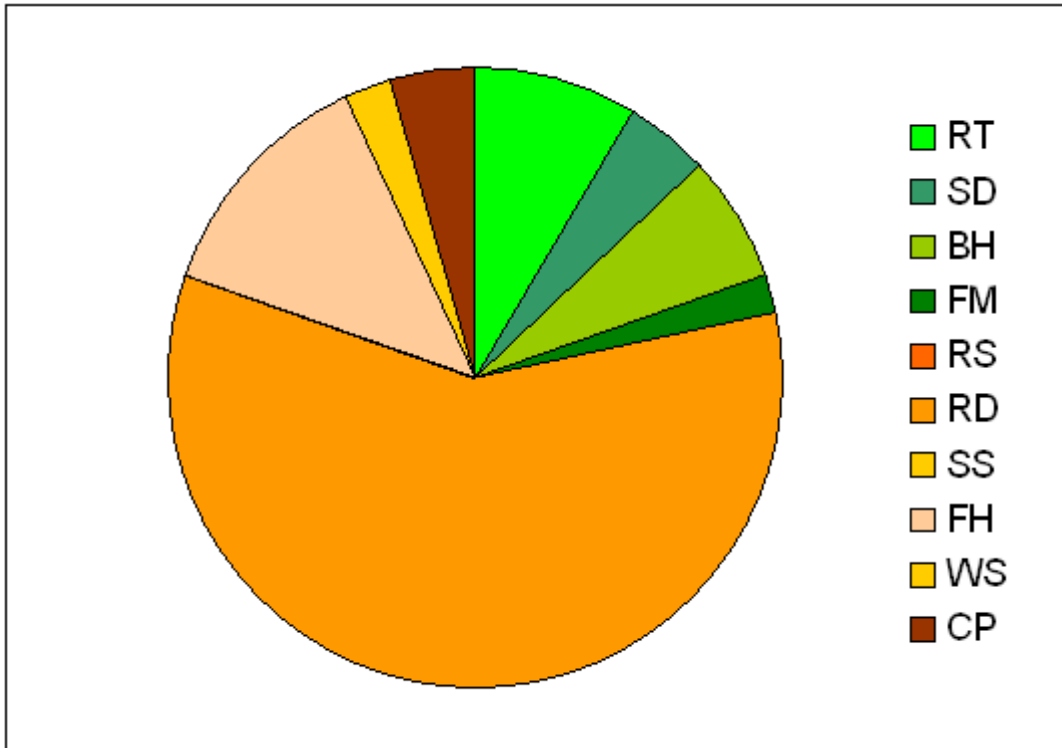
Species Composition, 1981 and 2003

Species	1981	2003
flannelmouth sucker	X	X
bluehead sucker	X	X
roundtail chub	X	X
speckled dace	X	X
black bullhead		X
black crappie		X
bluegill		X
brook stickleback		X
common carp	X	X
creek chub		X
fathead minnow	X	X
Iowa darter		X
plains killifish		X
reidside shiner	X	X
red shiner	X	
smallmouth bass		X
sand shiner	X	X
white sucker	X	X
northern pike		X

% composition of the fish community, Yampa River,
RM 116-111, 1981



% Composition of the Fish Community, Yampa River,
RM 111-106, 1981



These data are considered preliminary and should not be dispersed until a final report is prepared and approved.

Portions of a Presentation at the 2004 Workshop on non-native fish predators are presented below

Response of the Native Fish Community of the Yampa River to
Removal of Non-native Piscivores: Preliminary Results From 2004

by
K. Bestgen, C. Walford, and J. Hawkins

% composition of the fish community of the Yampa River study area, 2004

<u>Species</u>	<u>Treatment</u>	<u>Control</u>
Black bullhead	5.4	0.0
Brook Stickleback	0.6	1.4
Creek chub	9.8	3.3
Fathead minnow	1.5	0.4
Flannelmouth sucker	3.4	1.2
Iowa darter	0.8	1.1
Roundtail chub	5.5	1.7
Speckled dace	0.1	5.1
Smallmouth bass	15.5	27.2
Sand shiner	40.8	49.5
White sucker	16.2	8.2

Main Channel and Isolated Pool Fish Communities, Yampa River, 2004

<u>Species</u>	<u>Main channel</u>	<u>Isolated pool</u>
Flannemouth sucker	1.2	1.7
Roundtail chub	0.0	5.4
Speckled dace	0.1	3.5
Black bullhead	0.2	4.1
Brook stickleback	0.3	1.2
Creek chub	17.4	2.1
Fathead minnow	0.2	1.4
Iowa darter	2.8	0.1
Smallmouth bass	63.4	2.5
Sand shiner	4.0	63.5
White sucker	8.6	14.3

N = 898, 1.3 % Native N = 2,033, 10.6 % Native

Species Composition, Yampa River 1981,2003-2004

<u>Species</u>	<u>1981</u>	<u>2003</u>	<u>2004</u>
flannemouth sucker	X	X	X
bluehead sucker	X	X	
roundtail chub	X	X	X
speckled dace	X	X	X
black bullhead		X	X
black crappie		X	
bluegill		X	
brook stickleback		X	X
common carp	X	X	X
creek chub	X	X	
fathead minnow	X	X	X
Iowa darter	X	X	
plains killifish		X	X
redu side shiner	X	X	
red shiner	X		
smallmouth bass		X	X
sand shiner	X	X	X
white sucker	X	X	X
northern pike		X	X

Portions of a Presentation at the 2005 Workshop on non-native fish predators are presented below

Response of the Native Fish Community of the Yampa River to Removal of Non-native Piscivores: Preliminary Results From 2005

by

K. Bestgen, C. Walford, and J. Hawkins

Slide--Number of samples in treatment and control reaches in Little Yampa Canyon by habitat type, Yampa River, autumn 2005

	<u>Treatment</u>	<u>Control</u>
No. of samples	43	45
No. of samples with fish	43	45
Backwaters	7	7
Eddies	3	5
Embayments	13	9
Isolated pools	0	1
Riffles	1	2
Shorelines	19	17
Runs	1	1
Pools	0	1

Slide– % species composition in treatment and control reaches, Yampa River, 2005

<u>Species</u>	<u>Treatment</u>	<u>Control</u>
Roundtail chub	0.2	1.1 (0.1)
Speckled dace	< 0.1	0.7 (0.2)
Black crappie	0.7	3.7
Creek chub	0.8	0.3
Fathead minnow	8.0	6.2
Green sunfish	0.1	1.7
Iowa darter	0.7	1.5
Smallmouth bass	30.4	58.4
Sand shiner	38.1	6.9
White sucker	19.1	13.6

Slide-- % composition of main channel and isolated pool fish communities, Yampa River, 2005.

<u>Species</u>	<u>Main channel</u>	<u>Isolated pool</u>
Bluehead sucker	0.1	3.7
Flannemouth sucker	0.2	5.4
Roundtail chub	0.7	23.1
Speckled dace	0.4	11.2
Black crappie	2.2	0.0
Fathead minnow	7.1	11.6
Green sunfish	0.9	0.0
Iowa darter	2.8	0.1
Smallmouth bass	44.9	0.0
Sand shiner	22.0	2.0
White sucker	16.3	34.0
	N = 12,896, 0.4 % Native	N = 294, 44.9 % Native

Slide–Composition of fishes in the Yampa River, 1981, 2003-2005

<u>Species</u>	<u>1981</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>
flannemouth sucker	X	X	X	X
bluehead sucker	X	X		X
roundtail chub	X	X	X	X
speckled dace	X	X	X	X
black bullhead		X	X	X
black crappie		X		X
bluegill		X		X
brook stickleback		X	X	X
common carp	X	X	X	X
creek chub	X	X	X	
fathead minnow	X	X	X	X
Iowa darter	X	X	X	
plains killifish		X	X	X
redside shiner	X	X		X
red shiner	X			
smallmouth bass		X	X	X
sand shiner	X	X	X	X
white sucker	X	X	X	X
northern pike		X	X	X

Concluding comments

Significant reduction (5x) of age-0 smallmouth bass achieved in treatment reach, still abundant

Small-bodied native fishes still very rare in mainstem

Few large-bodied native fishes remain, perhaps insufficient to repopulate study area

Abundant non-native sand shiners and white suckers more common in treatment reach may indicate removal effect

Small-bodied natives that persist mostly in isolated pools may indicate a substantial mainstem predation effect

Continue the 2005 sampling regime in 2006