

**COLORADO RIVER RECOVERY PROGRAM
FY 2007 ANNUAL PROJECT REPORT**

**RECOVERY PROGRAM
PROJECT NUMBER: 123b**

I. Project Title: Nonnative fish control in the middle Green River

II. Principal Investigator(s):

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III. Project Summary:

The Upper Colorado River Endangered Fish Recovery Program has determined that control of nonnative fish in the upper Colorado River basin is essential to the recovery of the four endangered fish species: Colorado pikeminnow, razorback sucker, humpback chub, and bonytail. This determination has been documented specifically for Colorado pikeminnow, razorback sucker, and bonytail in nursery habitats and in the mainstem middle Green River in Section 4.3.2 of each species' Recovery Goals (USFWS 2002) document.

Smallmouth bass abundance has dramatically increased in the Green River since 2000. This increase resulted in a recommendation from the December 2003 Nonnative Fish Control Workshop (Grand Junction, CO) to attempt control of this species in the Green River. Three years of removal, from 2004-2006 and annual Nonnative Fish Control Workshops have added to the knowledge base of the effort required to successfully remove smallmouth bass from the Green River. During the December 2006 workshop, participants discussed the importance of increasing this removal effort and discussed the need for a dramatic increase to be able to adequately suppress the middle Green River smallmouth bass population.

Northern pike are a significant predatory and competitive threat to the endangered fishes and were rated as one of the six nonnative species of greatest concern by experts on the Colorado River native fish assemblage (Hawkins and Nesler 1991). Northern pike became established in the Yampa River in the early 1980's. Originally introduced as game fish in Elkhead Reservoir in 1977, the species escaped and invaded the upper Yampa River and have expanded their number and range within the Yampa and Green rivers; in previous years, there has been evidence of successful spawning in Stewart Lake near Jensen, Utah and in Old Charlie Wash on the Ouray National Wildlife Refuge. A control program for northern pike in the Yampa River was initiated in 1999 and removal of northern pike in the middle Green River was initiated in 2001. Based on trends in

catch rates of subsequent years, removal efforts have been successful at significantly reducing the number of northern pike in the middle Green River. Control efforts since 2003 have resulted in the capture of less than 40 northern pike and as a result, total effort was reduced to only a maintenance level beginning in 2005. Effort in 2007 is expected to be the minimal effort needed to keep their numbers under control. Northern pike populations will be monitored (and captured individuals removed) to locate ripe adults and to determine if this lower level of effort is sufficient to minimize threats to endangered and other native fishes.

The purpose of this project is to minimize the expansion of all predatory nonnative fishes, especially smallmouth bass, in the Green River. The objectives to meet this goal are 1) conduct one tagging pass and nine removal passes for smallmouth bass in the middle Green River from Split Mountain boat ramp (RM 319.3) to the Duchesne River confluence (RM 247.9); 2) maintain low occurrence of adult northern pike in the middle Green River; 3) determine efficiency of smallmouth bass and northern pike removal efforts; 4) calculate an annual population estimate of smallmouth bass in the middle Green River; 5) identify the means and levels of smallmouth bass and northern pike control necessary to minimize the threat of predation/competition on endangered and other native fishes. Additional predatory nonnative fishes removed as bycatch include: green sunfish, black crappie, and walleye. White sucker, which hybridize with native suckers, was also removed during these efforts.

IV. Study Schedule: Initial year - FY - 2007 Final year - FY 2007

V. Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

- III. Reduce negative impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).
- III.A. Reduce negative interactions between nonnative and endangered fishes.
- III.A.2. Identify and implement viable active control measures.
- III.A.2.c. Implement and evaluate the effectiveness of viable active control measures.

GREEN RIVER ACTION PLAN: MAINSTEM

- III. Reduce impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).
- III.A. Reduce negative impacts to endangered fishes from sportfish management activities.
- III.A.4. Develop and implement control programs for nonnative fishes in river reaches occupied by the endangered fishes to identify required levels of control. Each control activity will be evaluated for effectiveness, and then continued as needed.

III.A.4.a. Northern pike in the middle Green River.

VI. Accomplishment of FY 2007 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1. Capture and remove northern pike (UDWR – Vernal; March – April 2007).

Crews spent 11 fyke net nights and 2.85 electrofishing hours sampling for northern pike between 26 March and 6 April 2007. This sampling occurred predominantly in the mouths of Brush Creek, Cliff Creek, Stewart Lake drain, and Ashley Creek; however, a side channel below the White River was also sampled in early spring. All of the smallmouth bass during this effort were encountered in that side channel, while the northern pike were located primarily in Ashley Creek and Brush Creek. The majority of white sucker were found in the Stewart Lake drain. Only a handful of natives, namely flannelmouth sucker, were observed during this effort.

In addition, crews spent 127.08 hours electrofishing for the Colorado pikeminnow abundance estimates between 11 April and 24 May 2007 and 34.5 hours electrofishing during the White Sucker Removal project (white sucker numbers will be reported here and in the annual report for project 150 and thus should not be counted twice). The white sucker removal pass began on 18 June and ended 27 June 2007. Nonnative numbers, average lengths for each species, and effort expended to collect these species by project are included in Tables 1, 2, and 3.

Table 1. Fish encountered during early spring fyke netting and electrofishing efforts. Species removed include black crappie, green sunfish, northern pike, smallmouth bass, and white sucker. All natives and the remaining nonnatives (listed below this table) were returned to the water alive.

	Fyke-netting				Electrofishing/Trammel netting			
	Number	Average Length (mm)	Range (mm)	Effort (#/fyke-net night)	Number	Average Length (mm)	Range (mm)	Effort (#/hour)
Black crappie	6	63.3	57-70	0.54	1	137	-	0.35
Creek chub	2	209.5	190-229	0.18	2	159	137-181	0.7
Flannelmouth sucker	6	184.5	129-386	0.54	3	316	289-346	1.05
Green sunfish	31	78.3	52-111	2.82	11	68.8	42-100	3.86
Longnose dace	3	72.7	63-83	0.27	0	-	-	-
Northern pike	4	559.3	550-606	0.36	0	-	-	-
Smallmouth bass	0	-	-	-	7	306.6	208-420	2.46
White sucker	95	167.1	60-369	8.64	123	147.2	56-265	43.2

Other species collected, but not measured include numerous channel catfish, red shiner, and fathead minnow, and common carp, black bullhead, redbside shiner, and brook stickleback.

Table 2. Nonnative fish removed during the Colorado pikeminnow abundance estimates in 2007.

	Number	Average Length (mm)	Range (mm)	Effort (# fish/hour)
Black crappie	1	170	-	0.01
Brown trout	5	218	117-390	0.04
Creek chub	1	140	-	0.01
Green sunfish	22	88.5	54-123	0.17
Northern pike	10	584.1	415-800	0.08
Smallmouth bass	188	286.1	80-431	1.48
Walleye	31	516.2	381-714	0.24
White sucker	167	215.3	82-430	1.31

Table 3. Nonnative fish removed during the white sucker removal project in 2007.

	Number	Average Length (mm)	Range (mm)	Effort (# fish/hour)
Brown trout	1	153	-	0.029
Green sunfish	15	61	28-104	0.435
Smallmouth bass	73	211	36-425	2.116
Walleye	1	504	-	0.029
White sucker	29	225	111-396	0.841

Task 2. Ten smallmouth bass collecting passes from Split Mountain boat ramp to Duchesne River (UDWR – Vernal; July – November 2007).

Electrofishing was the primary gear type used to collect smallmouth bass for a mark-recapture abundance estimate. Nine complete shoreline electrofishing passes were completed. On the first electrofishing pass, smallmouth bass were marked with red Floy® tags as well as with pit tags for a tag retention study. On the remaining eight passes, smallmouth bass were examined for marks and scanned for pit tags and removed from the river. Pass 10 was canceled due to low capture rates on pass 9.

Crews spent 258.21 hours electrofishing for smallmouth bass between 2 July and 30 October 2007. Nonnative numbers excluding bass, average lengths for each species, and effort expended to collect these species are included in Table 4.

Table 4. Nonnative fish removed during the SMB removal project 2007.

	Number	Average Length (mm)	Range (mm)	Effort (#fish/hour)
Black crappie	10	151.5	85-250	0.04
Bluegill	1	130	-	0.004
Brown trout	5	313.6	100-483	0.02
Gizzard shad	8	389.4	100-450	0.03
Green sunfish	973	100.2	45-193	3.77
Northern pike	5	647	423-770	0.02
Walleye	6	446.2	241-603	0.02
White sucker	150	188.4	95-351	0.58

An initial population estimate for both juvenile and adult bass was obtained by calculating a two-pass Lincoln-Peterson estimate (Table 5). A total of 122 smallmouth

bass were tagged using red Floy flag tags on the first electrofishing pass. A total of 739 smallmouth bass were captured on the second pass and examined for marks, five of these were recaptures.

Table 5. Population estimate for juvenile and adult SMB 2007.

Juvenile Bass (< 200 mm)		Adult Bass (≥ 200 mm)
M=	68	54
C=	583	151
R=	1	4
N=	20,148	1,672
95% upper	43,373	3,014
95% lower	3,077	329
Standard Error	11612.518	671.27044
CV	57.64%	40.15%
Variance		
V(N)=	134,850.564	450,604
+/- 2*(SE)	23225.035	1342.5409

A population estimate was calculated in 2004 for the smallmouth bass removal effort. This effort consisted of 4 passes from Split Mountain boat ramp to the Sandwash boat ramp (Table 6).

Table 6. Population estimate for SMB 2004.

2004 Middle Green River (Split Mountain – Sand Wash)			
Two-pass			
Lincoln-Peterson		M =	320
	$N_{\text{hat}} = (C+1)(M+1)/(R+1)$	C =	468
		R =	5
	=		24,960

No population estimates were calculated in 2005 or 2006 due to a lack of recaptures.

Based on the population estimates for 2004 and 2007, the number of individuals per river mile was calculated. In 2004, 241.6 smallmouth bass per mile was estimated and in 2007, 282.2 juvenile smallmouth bass per river mile and 23.4 adult smallmouth bass per river mile were estimated.

Catch rates for the entire reach, all passes combined, were calculated for 2004-2007 smallmouth bass removal effort (Table 7). Years 04-06 include 4 passes from Split Mountain boat ramp to the Sandwash boat ramp and year 07 includes 9 passes from Split Mountain boat ramp to the Duchesne River.

Table 7. Catch rates for SMB.

Year	04	05	06	07
CPUE (fish/hour)	9.33	4.02	4.71	26.04

Catch rates during each pass along with the number of smallmouth bass caught during each pass and the total caught for all passes for 2007 are shown in table 8.

Table 8. Catch rates for SMB during each pass for 2007.

Pass	Effort (hours)	Captures	CPUE (fish/hour)
	07	07	07
1	30.62	150	4.89
2	29.67	739	24.91
3	29.1	503	17.3
4	29.05	906	31.2
5	28.62	1300	45.42
6	30.23	1057	34.97
7	27.64	1097	39.69
8	29.18	940	32.21
9	24.1	29	1.20
Total	258.21	6721	

The number of marked and recaptured smallmouth bass for each pass for 04-07 is shown in table 9. In the tag retention study in 2007, 6 out of the 22 recaptured smallmouth bass had a pit tag but no Floy® tag, demonstrating some issues with tag retention.

Table 9. Number of tagged and recaptured SMB per pass 2004-2007.

Pass	Number tagged				Recaptures			
	04	05	06	07	04	05	06	07
1	320	315	98	122	0	0	0	0
2	-	-	-	-	5	0	1	5
3	-	-	-	-	23	0	0	1
4	-	-	-	-	19	0	0	0
5				-				9
6				-				3
7				-				2
8				-				2
9				-				0
Total	320	315	98	122	47	0	1	22

Length frequency distribution shows the presence of multiple year classes including young-of-the-year throughout the study reach. A larger proportion of juvenile smallmouth bass were collected during 2007 (Figure 1).

2004, 2005, 2006 & 2007 All Passes
 Split Mountain - Sand Wash 04-06
 Split Mountain - Duchesne 07

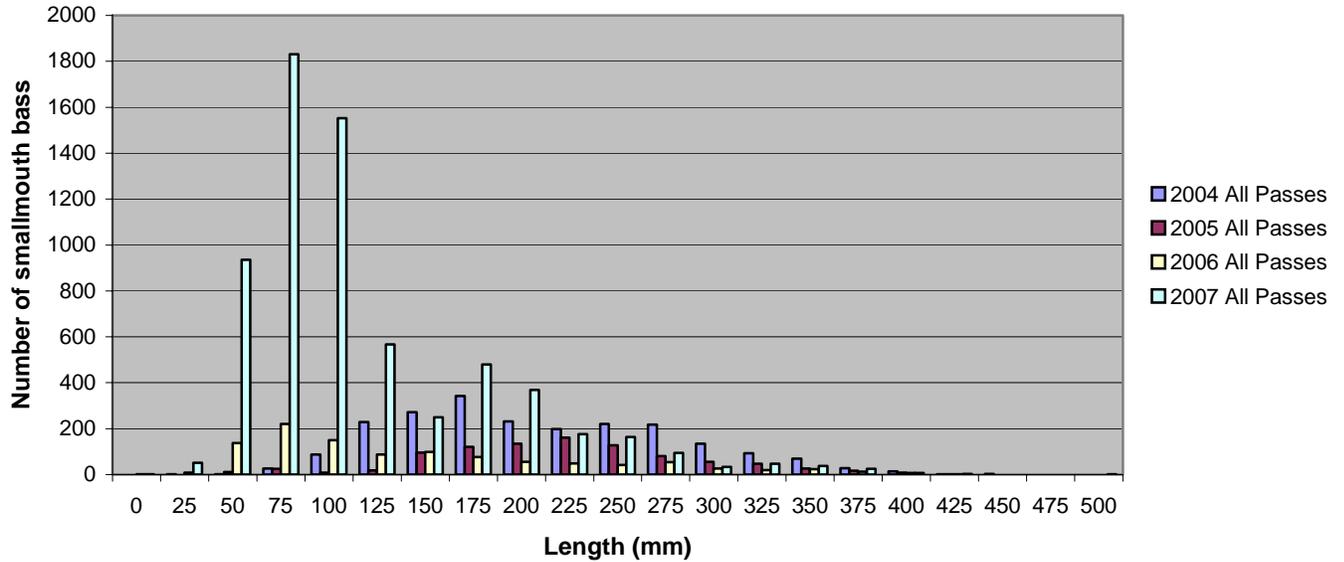


Figure 1. Length frequency distribution of smallmouth bass collected on all passes in the middle Green River: 2004, 2005, 2006 & 2007.

Concentration areas were determined by plotting the GPS coordinates of where each smallmouth bass was captured (Figure 2). Obvious concentration areas exist around the Split Mountain boat ramp, the Horseshoe bend area and Johnson Bottom and by the Ouray Bridge.

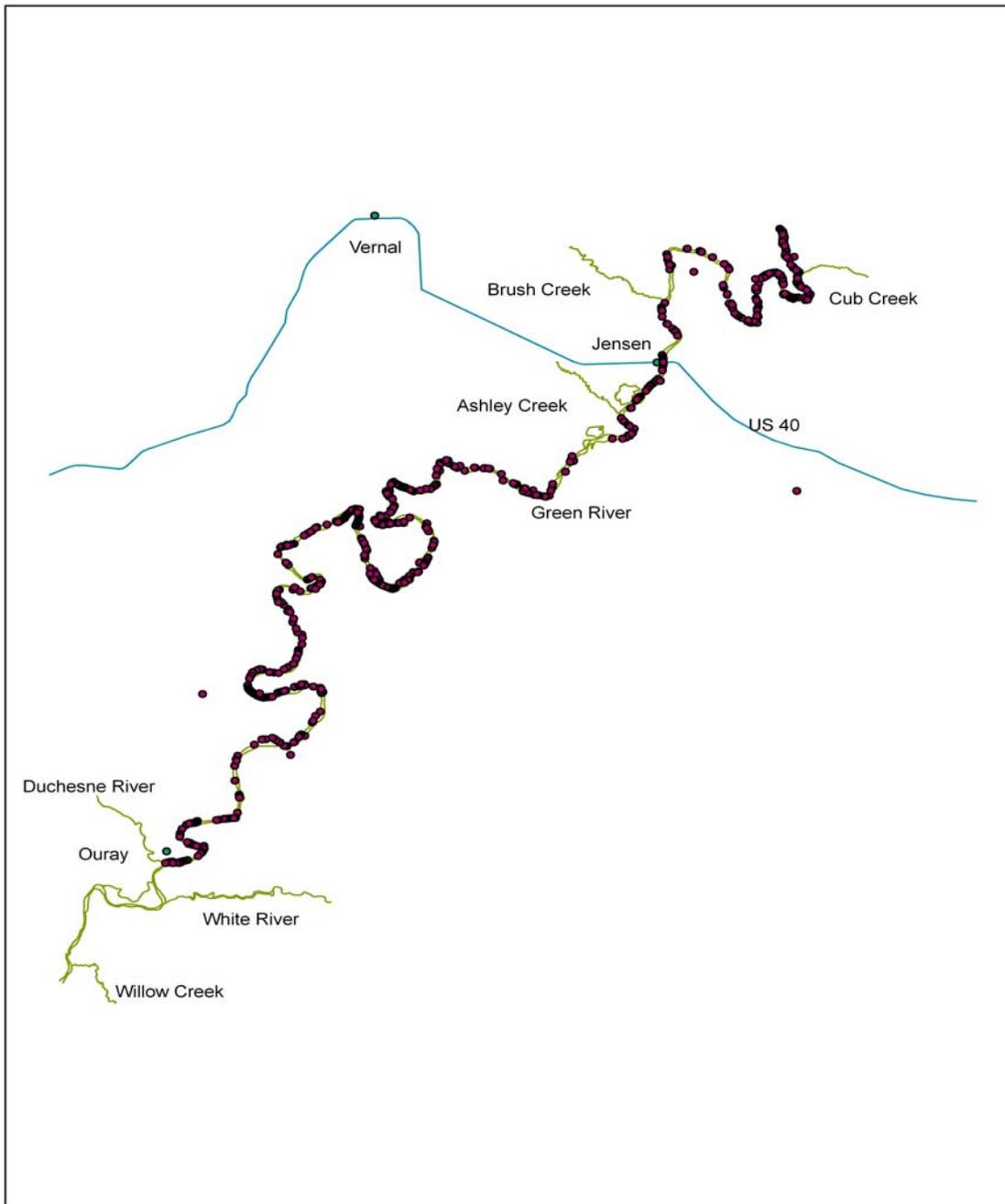


Figure 2. Concentration areas of smallmouth bass 2007.

Task 3: Data Management, Analysis, and Reporting

Annual RIP Report (Nov 2007) –

VII. Recommendations:

- Focus effort on concentration areas
- Limit time spent to complete each SMB removal pass so the goal of 10 complete passes can be reached

VIII. Project Status:

Ongoing

IX. FY 2007 Budget Status

- A. Funds Provided: \$137,624
- B. Funds Expended: \$0
- C. Difference: \$0
- D. Percent of the FY 2007 work completed, and projected costs to complete: 100%
- E. Recovery Program funds spent for publication charges: \$0

XI. Signed:

Principal Investigator

Date

XII. Literature Cited

Hawkins, J.A., and T.P. Nesler. 1991. Nonnative fishes of the upper Colorado River Basin: an issue paper. Final Report of Colorado State University Larval Fish Laboratory

To Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

U.S. Fish and Wildlife Service. 2002. Colorado pikeminnow (*Ptychocheilus lucius*) recovery goals: amendment and supplement to the humpback chub recovery plan. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, Colorado.

U.S. Fish and Wildlife Service. 2002. Razorback sucker (*Xyrauchen texanus*) recovery goals: amendment and supplement to the humpback chub recovery plan. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, Colorado.

U.S. Fish and Wildlife Service. 2002. Bonytail (*Gila elegans*) recovery goals: amendment and supplement to the humpback chub recovery plan. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, Colorado.

