

**COLORADO RIVER RECOVERY PROGRAM  
FY 2010 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 (*Ptycheilus lucius*), razorback sucker (*Xyrauchen texanus*), humpback chub (*Gila cypha*), and bonytail (*Gila elegans*). 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.

Information was presented at the December 2003 Nonnative Fish Control Workshop (Grand Junction, CO) that smallmouth bass (*Micropterus dolomieu*) abundance has dramatically increased in the Green River since 2000. As a result, the Biology Committee recommended mechanical removal measures of smallmouth bass be enacted on the Green River. After analyzing three years of removal data (2004-2006), the Biology Committee determined that the removal effort needed to be further increased to be able to adequately suppress the middle Green River smallmouth bass population.

Northern pike (*Esox lucius*) are rated as one of the six nonnative species of greatest concern to the success of endangered species populations due to competition and predation (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 invaded the upper Yampa River and have expanded their numbers 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 2010 consisted of 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 were: 1) conduct one tagging pass and eleven removal passes for smallmouth bass in the middle Green River from Split Mountain boat ramp (RM 319.3) to Tabyago Riffle (RM 206.7), 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, and 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 by-catch include: black crappie, and walleye. White suckers and white sucker hybrids were also removed during these efforts.

IV. Study Schedule: Initial year - FY 2010; Final year - FY 2010

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 2010 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1. Capture and remove northern pike and white sucker (UDWR – Vernal; April 2010).

Crews spent 20 fyke net nights and 1.2 electrofishing hours sampling for northern pike between 6 April and 27 April 2010. Crews removed nine northern pike during this effort. Bluehead sucker was the only native species encountered during this effort. Fish species captured and the numbers of each are included in Table 1.

Table 1. Fish encountered during early spring fyke netting and electrofishing efforts. Species removed include black bullhead, green sunfish, northern pike, and white sucker. All natives and the remaining nonnatives were returned alive.

	Fyke-netting				Electrofishing			
	Number	Average Length (mm)	Range (mm)	Effort (#/fyke net night)	Number	Average Length (mm)	Range (mm)	Effort (#/hour)
<b>Black bullhead</b>	6	-	-	0.3	-	-	-	-
<b>Bluehead sucker</b>	1	160	160	0.05	-	-	-	-
<b>Channel catfish</b>	6	-	-	0.3	-	-	-	-
<b>Creek chub</b>	1	170	170	0.05	-	-	-	-
<b>Green sunfish</b>	2	114	113-115	0.1	-	-	-	-
<b>Northern pike</b>	-	-	-	-	9	539	415-613	7.5
<b>White sucker</b>	39	210	160-271	1.95	39	195	123-265	32.5

Other species observed include common carp.

Crews spent 39.34 hours electrofishing between Echo Park (RM 343.3) and Split Mountain boat ramp from 26 April to 18 July 2010. Three sampling passes were conducted to evaluate seasonal distribution of native catostomids (three species project) during which we removed white sucker and nonnative hybrids and determined hybridization rates for native and nonnative catostomids. Total catch and percent hybridization of fish captured is presented in Table 2. Catch-per-unit-effort (CPUE) for native and nonnative catostomids varied substantially between spring and summer sampling and is presented in Table 3.

Table 2. Total abundance and percent composition of native, nonnative, and hybrid catostomids collected from Echo Park – Split Mountain boat ramp 2010.

	Hybridization	
	Total #	% Composition
<b>Bluehead sucker</b>	227	45.04
<b>Flannelmouth sucker</b>	254	50.4
<b>Bluehead X Flannelmouth</b>	2	0.4
<b>Flannelmouth X Razorback</b>	2	0.4
<b>White Sucker</b>	11	2.18
<b>White X Flannelmouth</b>	6	1.19
<b>White X Bluehead</b>	2	0.4
<b>Total</b>	504	

Table 3. CPUE for catostomid captures during three separate electrofishing passes from Echo Park – Split Mountain boat ramp 2010.

	CPUE (fish/hour)			
	April 26-28	May 3-5	July 16-18	3 pass total
<b>Effort (hrs)</b>	11.16	13.53	14.65	39.34
<b>Bluehead sucker</b>	1.79	0.59	13.58	5.77
<b>Flannelmouth sucker</b>	4.75	5.03	9.08	6.46
<b>Bluehead X Flannelmouth</b>	0.09	0.07	0	0.05
<b>Flannelmouth X Razorback</b>	0	0.15	0	0.05
<b>White sucker</b>	0.09	0.07	0.61	0.28
<b>White X Flannelmouth</b>	0.18	0.15	0.14	0.15
<b>White X Bluehead</b>	0.09	0	0.07	0.05

Crews spent 127.5 hours electrofishing during three species passes on the middle Green River (Split Mountain boat ramp – Sand Wash). The first pass began on 10 May and ended on 26 May 2010 and the second began 21 July and ended on 4 August 2010. The purpose of these passes was to determine seasonal three species distribution. Nonnative fish removed during this project, their average lengths, and the ranges of their lengths are included in Table 4.

Table 4. Nonnative fish removed during the three species passes in 2010.

	Number	Average length (mm)	Range (mm)	Effort (#fish/hour)
<b>Black crappie</b>	5	174	157-188	0.039
<b>Brown trout</b>	16	200	147-290	0.125
<b>Green sunfish</b>	132	81	11-141	1.035
<b>Northern pike</b>	3	546	433-628	0.024
<b>Rainbow trout</b>	1	382	-	0.008
<b>Smallmouth bass</b>	613	193	66-428	4.808
<b>Walleye</b>	22	395	192-525	0.173
<b>White sucker</b>	103	209	73-400	0.808
<b>White/bluehead</b>	1	365	-	0.008
<b>White/flannelmouth</b>	6	390	220-500	0.047

Task 2. Ten smallmouth bass removal passes from Split Mountain boat ramp to Tabyago Riffle (UDWR – Vernal; June – October 2010).

Electrofishing was the gear type used to collect smallmouth bass for the mark recapture abundance estimate. Eleven complete shoreline electrofishing passes were completed. On the third electrofishing pass, smallmouth bass were marked with red Floy® tags. On the remaining ten passes, smallmouth bass were examined for tags and removed from the river (the eleventh removal pass was not completed due to a funding shortage). Crews spent 474.6 hours electrofishing for smallmouth bass between 1 June and 28 October 2010. Nonnative fish totals excluding bass, average lengths for each species, and CPUE for these species are included in Table 5.

Table 5. Nonnative fish removed during the SMB removal project 2010.

	Number	Average Length (mm)	Range (mm)	Effort (# fish/hour)
<b>Black crappie</b>	20	212	189-266	0.042
<b>Brown trout</b>	13	202	91-313	0.027
<b>Green sunfish</b>	114	88	42-156	0.24
<b>Plains killifish</b>	1	71	-	0.002
<b>Northern pike</b>	6	548	350-790	0.013
<b>Walleye</b>	52	418	201-592	0.11
<b>White sucker</b>	193	202	62-410	0.407

An initial population estimate for both juvenile and adult bass was obtained by calculating a two-pass Lincoln Peterson estimate (Table 6). A total of 413 smallmouth bass were tagged using red Floy® tags on the third electrofishing pass. A total of 363 smallmouth bass were captured on the fourth pass and examined for marks, 10 of these were recaptures.

Table 6. Population estimate for juvenile and adult SMB in 2010. \*Juvenile population estimate does not include SMB less than 100 mm.\*

	Juvenile Bass (<200 mm)	Adult Bass (≥ 200 mm)
<b>M=</b>	305	108
<b>C=</b>	254	109
<b>R=</b>	7	3
<b>N=</b>	9754	2998
<b>95% Upper</b>	16153.44	5629.35
<b>95% Lower</b>	3354.06	365.65
<b>Standard Error</b>	3199.844	1315.924
<b>CV</b>	32.81%	43.9%
<b>Variance V(N)=</b>	10238999	1731656
<b>+/-2*(SE)</b>	6399.687	2631.848

A population estimate corrected for recruitment into the adult size class is included in Table 7. A growth rate of 0.73 mm/day was used to account for this recruitment. Growth rate was figured from an average of growth from recaptures. Using this growth rate, 15 tagged juvenile bass would have recruited into the adult size category between our mark and recapture passes.

Table 7. Corrected population estimate for juvenile and adult SMB in 2010. \*Juvenile population estimate does not include SMB less than 100 mm.\*

	Juvenile Bass (<200 mm)		Adult Bass (≥ 200 mm)
<b>M=</b>	305		108
<b>C=</b>	219		94
<b>R=</b>	7		3
<b>N=</b>	8415		2588.75
<b>95% Upper</b>	13922.06		4854.93
<b>95% Lower</b>	2907.94		322.57
<b>Standard Error</b>	2753.528		1133.089
<b>CV</b>	32.72%		43.77%
<b>Variance V (N)=</b>	7581915		1283890.563
<b>+/-2*(SE)</b>	5507.055		2266.178

The original and corrected exploitation rates were calculated for 2010. Table 8 includes the original population estimate and exploitation rates not corrected for recruitment. Table 9 includes the population estimate and exploitation rates that have been corrected for recruitment using daily growth rates.

Table 8. Original exploitation rates in 2010 \*Total does not include tagging pass 3\*

PASS	Juvenile Bass (<200mm) Pop Est = 9753		Adult Bass (≥200mm) Pop Est = 2998	
	# Tagged/Removed	% of Estimate	# Tagged/Removed	% of Estimate
<b>1</b>	30	0.3	42	1.4
<b>2</b>	117	1.2	72	2.4
<b>3</b>	305	3.1	108	3.6
<b>4</b>	254	2.6	109	3.6
<b>5</b>	749	7.7	202	6.7
<b>6</b>	268	2.7	171	5.7
<b>7</b>	374	3.8	183	6.1
<b>8</b>	65	0.7	52	1.7
<b>9</b>	221	2.3	104	3.5
<b>10</b>	268	2.7	117	3.9
<b>11</b>	58	0.6	38	1.3
<b>TOTAL</b>	2404	24.6	1090	36.3

Table 9. Corrected exploitation rates in 2010 \*Total does not include tagging pass 3\*

PASS	Juvenile Bass (<200mm) Pop Est = 8415		Adult Bass (≥200mm) Pop Est = 2588	
	# Tagged/Removed	% of Estimate	# Tagged/Removed	% of Estimate
<b>1</b>	30	0.4	42	1.6
<b>2</b>	117	1.4	72	2.8
<b>3</b>	305	3.6	108	4.2
<b>4</b>	269	3.2	94	3.6

5	256	3.0	134	5.2
6	283	3.4	139	5.4
7	407	4.8	134	5.2
8	70	0.8	43	1.7
9	242	2.9	78	3.0
10	268	3.2	87	3.4
11	62	0.7	27	1.0
<b>Total</b>	2004	23.2	850	32.9

A population estimate for 2009 corrected for recruitment into the adult size class for both juvenile and adult bass was obtained by calculating a two-pass Lincoln-Petersen estimate (Table 9). A total of 265 smallmouth bass were tagged using red Floy® tags on the third electrofishing pass. A total of 423 smallmouth bass were captured during the fourth pass and examined for marks, 19 of these were recaptures.

Table 9. Corrected population estimate for juvenile and adult SMB in 2009. \*Juvenile population estimate does not include SMB less than 100 mm\*

	Juvenile Bass (<200 mm)		Adult Bass (≥ 200 mm)
<b>M=</b>	188		77
<b>C=</b>	250		173
<b>R=</b>	13		6
<b>N=</b>	3388.5		1938.857
<b>95% Upper</b>	5088.814		3281.976
<b>95% Lower</b>	1688.186		595.7384
<b>Standard Error</b>	850.1571		671.5594
<b>CV</b>	25.08948		34.63687
<b>Variance V (N)=</b>	722767.1		450992
<b>+/-2*(SE)</b>	1700.314		1343.119

The corrected exploitation rates were calculated for 2009. Table 10 includes the population estimate and exploitation rates that have been corrected for recruitment.

Table 10. Corrected exploitation rates 2009 \*Total does not include tagging pass 3 or the Sandwash pass\*

PASS	Juvenile Bass (<200mm) Pop Est = 3389		Adult Bass (≥200mm) Pop Est = 1939	
	# Tagged/Removed	% of Estimate	# Tagged/Removed	% of Estimate
1	154	4.5	105	5.4
2	246	7.3	115	5.9
3	188	5.5	77	4.0
4	308	9.1	173	8.9
5	168	5.0	95	4.9
6	115	3.4	131	6.8
7	75	2.2	134	6.9
8	61	1.8	93	4.8
9	75	2.2	120	6.2
10	116	3.4	128	6.6
11	95	2.8	81	4.1

<b>12</b>	60	1.8	112	5.8
<b>Sandwash</b>	263	7.8	195	10.1
<b>Total</b>	1473	43.7%	1287	66.3%

A population estimate for 2008 corrected for recruitment into the adult size class for both juvenile and adult bass was obtained by calculating a two-pass Lincoln-Peterson estimate (Table 11). A total of 91 smallmouth bass were tagged using red Floy® tags on the first electrofishing pass. A total of 508 smallmouth bass were captured on the second pass and examined for marks, five of these were recaptures.

Table 11. Corrected population estimate for juvenile and adult SMB in 2008.

	<b>Juvenile Bass (&lt;200 mm)</b>		<b>Adult Bass (≥ 200 mm)</b>
<b>M=</b>	37		54
<b>C=</b>	387		121
<b>R=</b>	2		3
<b>N=</b>	4915		1678
<b>95% Upper</b>	9810.296		3153.1
<b>95% Lower</b>	19.03687		201.9001
<b>Standard Error</b>	2447.815		737.7999
<b>CV</b>	49.80633		43.98211
<b>Variance V (N)=</b>	5991798		544348.8
<b>+/-2*(SE)</b>	4895.63		1475.6

The corrected exploitation rates were calculated for 2008. Table 12 includes the population estimate and exploitation rates that have been corrected for recruitment.

Table 12. Corrected exploitation rates 2008 \*Total does not include tagging pass 1\*

<b>PASS</b>	<b>Juvenile Bass (&lt;200mm) Pop Est = 4915</b>		<b>Adult Bass (≥200mm) Pop Est = 1678</b>	
	<b># Tagged/Removed</b>	<b>% of Estimate</b>	<b># Tagged/Removed</b>	<b>% of Estimate</b>
<b>1</b>	40	.81	54	3.2
<b>2</b>	387	7.9	121	7.2
<b>3</b>	291	5.9	54	3.2
<b>4</b>	163	3.3	54	3.2
<b>5</b>	210	4.3	58	3.5
<b>6</b>	382	7.8	58	3.5
<b>7</b>	329	6.7	79	4.7
<b>8</b>	440	9.0	81	4.8
<b>9</b>	287	5.8	43	2.6
<b>10</b>	124	2.5	29	1.7
<b>11</b>	170	3.5	43	2.6
<b>12</b>	71	1.4	29	1.7
<b>Total</b>	2854	58.1%	649	38.7%

A population estimate was calculated in 2007 for the smallmouth bass removal effort. This effort consisted of 9 passes from Split Mountain boat ramp to the mouth of the

Duchesne River (Table 13).

Table 13. Population estimate for juvenile and adult SMB in 2007.

	Juvenile Bass (<200 mm)	Adult Bass (≥ 200 mm)
<b>M=</b>	68	54
<b>C=</b>	583	151
<b>R=</b>	1	4
<b>N=</b>	20,148	1,672
<b>95% Upper</b>	43,373	3,014
<b>95% Lower</b>	3,077	329
<b>Standard Error</b>	11612.518	671.27044
<b>CV</b>	57.64	40.15
<b>Variance V (N)=</b>	134,850.564	450,604
<b>+/-2*(SE)</b>	23,225.035	1,342.5409

The corrected exploitation rates for 2007 are shown in Table 14.

Table 14. Corrected exploitation rates in 2007 \*Total does not include tagging pass 1\*

PASS	Juvenile Bass (<200mm) Pop Est = 20,873		Adult Bass (≥200mm) Pop Est = 1411	
	# Tagged/Removed	% of Estimate	# Tagged/Removed	% of Estimate
<b>1</b>	68	.33	54	3.8
<b>2</b>	604	2.9	130	9.2
<b>3</b>	427	2.0	76	5.4
<b>4</b>	833	4.0	81	5.7
<b>5</b>	1179	5.6	140	9.9
<b>6</b>	961	4.6	97	6.9
<b>7</b>	1080	5.2	44	3.1
<b>8</b>	926	4.4	33	2.3
<b>9</b>	22	.10	7	.50
<b>Total</b>	6032	28.8%	608	43%

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 Sand Wash (Table 15).

Table 15. Population estimate for juvenile and adult SMB in 2004.

	Juvenile Bass (<200 mm)	Adult Bass (≥ 200 mm)
<b>M=</b>	114	181
<b>C=</b>	241	215
<b>R=</b>	2	3
<b>N=</b>	9277	9828
<b>95% Upper</b>	18495	18536
<b>95% Lower</b>	57	1119
<b>Standard Error</b>	4609.494	4354.329
<b>CV</b>	49.69	44.31

<b>Variance V (N)=</b>	21247432		18960178
<b>+/-2*(SE)</b>	9218.987		8708.657

Based on population estimates the number of smallmouth bass per river was calculated (Table 16). No population estimates were calculated in 2005 or 2006 due to a lack of recaptures.

Table 16 Smallmouth bass per river mile.

	Juvenile (<200 mm)	Adult (≥200 mm)
2004	130	138
2007	282.2	23.4
2008	66	25
2009	47	27
2010	86.6	26.6

Catch rates for the entire reach, all passes combined, were calculated for 2004-2010 smallmouth bass removal efforts (Table 17). 2004-2006 included four passes from Split Mountain boat ramp to Sand Wash, 2007 included nine passes, 2008 included 12 passes from Split Mountain boat ramp to the Duchesne River, and 2009 included 12 passes from Split Mountain boat ramp to the Duchesne River and one trip down to Sand Wash boat ramp. In 2010, 11 passes were completed from Split Mountain boat ramp to Tabyago Riffle.

Table 17. Catch rates for SMB in the middle Green River.

<b>Year</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>CPUE (fish/hour)</b>	9.33	4.02	4.71	26.04	8.56	7.96	9.6

Catch rates during each pass along with the number of smallmouth bass caught during each pass and the total caught for all passes for 2010 are shown in Table 18.

Table 18. Catch rates for SMB during each pass for 2010.

<b>Pass</b>	<b>Effort (hours)</b>	<b>Captures</b>	<b>CPUE (fish/hour)</b>
	<b>2010</b>	<b>2010</b>	<b>2010</b>
<b>1</b>	61.1	75	1.2
<b>2</b>	59.1	197	3.3
<b>3</b>	55.1	500	9.1
<b>4</b>	44.3	407	9.2
<b>5</b>	43.8	981	22.4
<b>6</b>	41.4	448	10.8
<b>7</b>	42.2	587	13.9
<b>8</b>	28.7	146	5.1
<b>9</b>	36.3	404	11.1
<b>10</b>	44	605	13.8
<b>11</b>	18.4	205	11.1
<b>Total</b>	<b>474.4</b>	<b>4555</b>	

The number of marked and recaptured smallmouth bass for each pass for 2004-2010 is shown in Table 19. In the tag retention study in 2007, six out of the 22 recaptured

smallmouth bass had a PIT tag but no Floy® tag, demonstrating some issues with tag retention.

Table 19. Number of tagged and recaptured SMB per pass in 2004-2010.

Pass	Number Tagged							Recaptures						
	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
1	295	315	98	122	91	-	-	0	0	0	0	0	0	0
2	-	-	-	-	-	-	-	5	0	1	5	5	0	0
3	-	-	-	-	-	265	413	23	0	0	1	4	0	0
4	-	-	-	-	-	-	-	19	0	0	0	1	19	10
5											9	1	7	18
6											3	2	4	5
7											2	0	3	11
8											2	0	6	0
9											0	2	3	0
10												1	3	2
11												0	0	0
12												0	0	-
<b>Total</b>	295	315	98	122	91	265	413	47	0	1	22	16	45	46

Movement of marked smallmouth bass was observed both upstream and downstream from the Ouray section. In 2004, two marked bass from the Ouray reach were found in the Desolation reach of the Green River and in 2005, three marked bass from the Yampa River were caught in the Ouray section. In 2006, three marked bass from the Ouray reach were found in the Yampa River and in 2008, three smallmouth bass from the Echo Park area were recaptured in the Ouray reach. Seven smallmouth bass tagged in the Ouray reach were found in the Echo Park area in 2009 and four bass tagged by the USFWS in the Echo Park reach were found in the Ouray reach. In 2010, there was one tagged fish from the Echo Park reach captured in the Ouray reach and seven tagged fish from the Ouray reach captured in the Echo Park area.

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 than any other year of the removal project. (Figure 1).

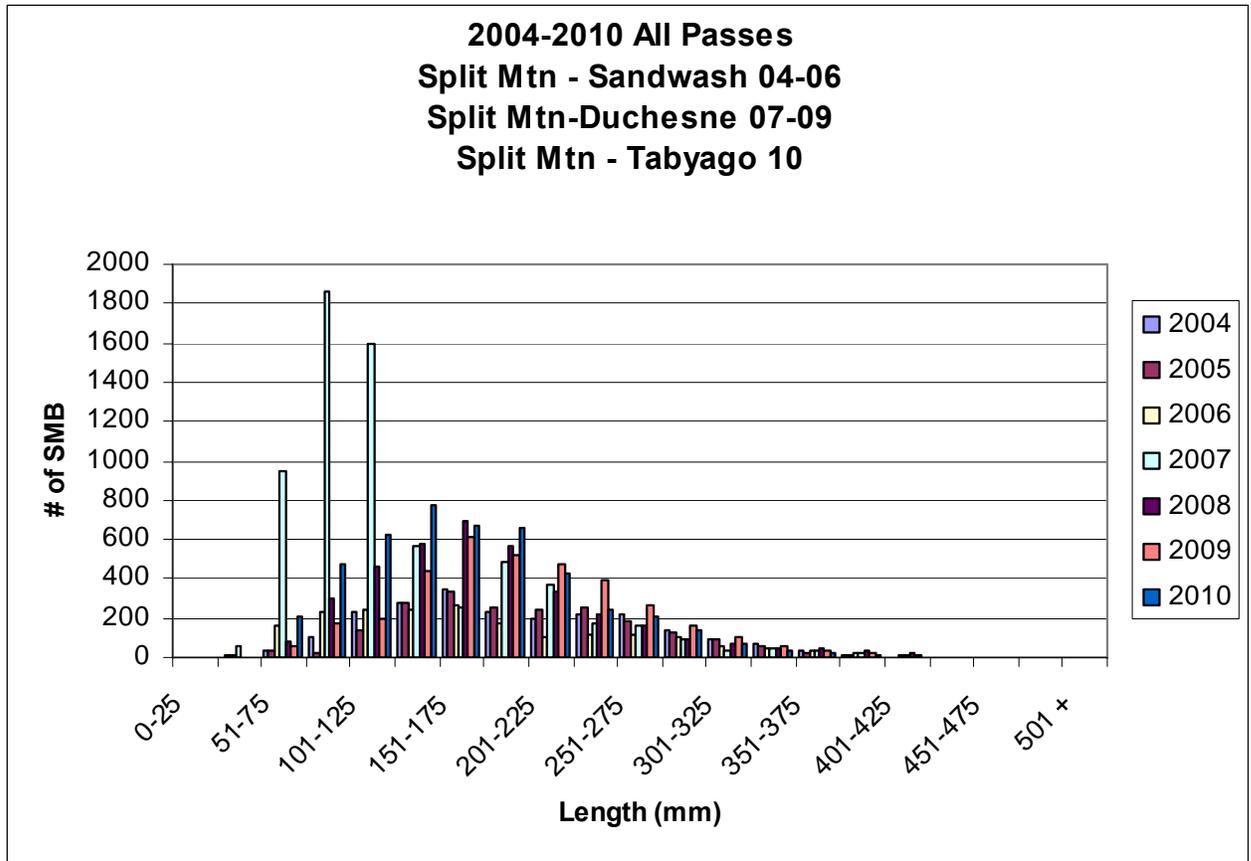


Figure 1. Length frequency distribution of smallmouth bass collected on all passes in the middle Green River: 2004-2010.

Task 3: Data Management, Analysis, and Reporting

Annual RIP Report (Nov 2010)

VII. Recommendations:

- Continue marking on pass 3 and use pass 4 as recapture pass
- Continue with 11 removal passes
- Focus effort on concentration areas (areas to be determined after data analysis)
- Continue to remove smallmouth bass from Duchesne River to Sandwash

VIII. Project Status:

Ongoing

IX. FY 2010 Budget Status

A. Funds Provided: \$199,930

B. Funds Expended: \$199,930

C. Difference: \$0

D. Percent of the FY 2010 work completed, and projected costs to complete:  
93%

E. Recovery Program funds spent for publication charges: \$0

XI. Signed: Michele S. Hodge 11/9/2010  
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.