

COLORADO RIVER RECOVERY PROGRAM  
FY 2008 ANNUAL PROJECT REPORT

RECOVERY PROGRAM  
PROJECT NUMBER: 125

I. Project Title: **Evaluation of smallmouth bass and northern pike management in the middle Yampa River**

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III. Project Summary:

This study was an evaluation of whether smallmouth bass *Micropterus dolomieu* and northern pike *Esox lucius* numbers can be controlled through active removal from two sections of critical habitat for Colorado pikeminnow *Ptychocheilus lucius* in the Yampa River. There were two study sites: a 24-mile reach in Little Yampa Canyon downstream of Craig, Colorado and a 5-mile reach at Lily Park. Sampling occurred on nine occasions (passes) from April through July using two electrofishing boats sampling both shorelines. We marked smallmouth bass  $\geq 100$  mm total length (TL) and northern pike  $\geq 100$  mm TL with a Floy tag on the first pass and then removed both species from the river on subsequent passes. To evaluate removal success of smallmouth bass we estimated the number of adult bass  $\geq 200$  mm TL at each study site using capture-recapture methods. During removal passes 2–9, bass larger than 250 mm total length were transported to either the Justice Center pond in Craig or Elkhead Reservoir for the angling public. From July through October, we removed small, primarily Age-0 smallmouth bass from the lower 12-mile portion of the Little Yampa Canyon site using an electric seine. Northern pike of all sizes were transported to Loudy Simpson Ponds in Craig or State Parks Headquarter's pond near Hayden and data for northern pike is reported by Colorado Division of Wildlife (CDOW) Project # 98a.

IV. Study Schedule: Initial Year: 2003  
Final Year: ongoing

V. Relationship to RIPRAP : (April 2004 version @ <http://www.r6.fws.gov/crrip/rip.htm> )

Green River Action Plan: Yampa and Little Snake rivers

III Reduce negative impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).

III.A.1. Implement Yampa Basin aquatic wildlife management plan.

III.A.1.b. Remove and translocate northern pike from the Yampa River.

III.A. 1.d. Remove and translocate smallmouth bass.

VI. Accomplishment of FY 2008 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Preliminary results for 2008 are provided below. For comparison with previous results see Hawkins, J., C. Walford, and A. Hill. 2008. Smallmouth bass control in the middle Yampa River, 2003–2007. Draft Report for the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service.

*Smallmouth bass*

The goal was to remove as many smallmouth bass as possible from two sites on the Yampa River, one was a 24-mile reach in Little Yampa Canyon and the other was a 5-mile reach in Lily Park .

Objectives:

1. Obtain an estimate of the number of smallmouth bass in Little Yampa Canyon and Lily Park using a mark-recapture abundance estimator.

At the start of this study in 2008, fish were tagged with grey-colored Floy tags between April 15–20 and recaptured between April 29–May 6. We estimated that Little Yampa Canyon contained 3,173 and Lily Park contained 908 adult smallmouth bass  $\geq 200$  mm TL (Table 1). Density of adult smallmouth bass  $\geq 200$  mm TL was 180 fish/mile at Lily Park and higher than the 132 fish/mile at Little Yampa Canyon (Table 1).

In order to compare abundance in 2008 with previous years we also estimated abundance of smallmouth bass  $\geq 150$  mm TL because that was the size range used in previous years. Abundance of smallmouth bass  $\geq 150$  mm at Little Yampa Canyon increased from 2,394 (95% CI = 1,554–3,837) in 2007 to 3,414 (95% CI = 2,156–5,260) in 2008. Abundance for smallmouth bass  $\geq 150$  mm at Lily Park increased from 1,233 (95% CI = 846–1,932) in 2007 to 1,643 (95% CI = 948–3024) in 2008.

2. Conduct one marking pass and seven removal passes in Little Yampa Canyon and Lily Park.

We completed six removal passes with electrofishing boat at Little Yampa Canyon and eight removal passes at Lily Park from April 29 through July 15. On July 13, we also removed bass from the lower 3-mile section of South Beach which is connected to the upper end of Little Yampa Canyon. At Little Yampa Canyon, we increased the removal effort on each pass by sampling some sections twice. Sectioned sampled twice were based on high densities of bass observed earlier on that pass. We handled almost equal numbers adult smallmouth bass at each site: 4,593 at Little Yampa Canyon and 4,672 at Lily Park, but catch per unit effort (CPUE) of all size groups of smallmouth bass captured on each pass at Lily Park were 2–3 times higher than those observed at Little Yampa Canyon (Table 2; Figure 1).

We translocated 1,090 adult smallmouth bass to the Justice Center pond and 234 to Elkhead Reservoir (Table 3). Most of the translocated fish came from Little Yampa Canyon which had a much larger portion of bass  $\geq 250$  mm TL than Lily Park (Table 3;

Figures 2 and 3). Prior to translocation fish were tagged with purple Floy tags.

3. Calculate the proportion of smallmouth bass removed from each study area based on initial population size and compare capture rates on each sample pass over time.

In 2008, at Little Yampa Canyon, we handled 4,593 smallmouth bass of all sizes including 241 that were released and 4,352 that were removed (Table 3). At Little Yampa Canyon, we removed 1,462 adult smallmouth bass  $\geq 200$  mm or 46% of the estimated abundance. At Lily Park, we handled 4,672 adult smallmouth bass of all sizes including 103 that were released and 4,569 that were removed (Table 3). At Lily Park we removed 593 adult smallmouth bass  $\geq 200$  mm or 66% of the estimated abundance (Table 2). Removal rates would be lower if fish that recruited into the adult size group were removed from calculations.

Exploitation rate (recapture rate) of tagged fish was even lower than the percentage of fish removed. Of 240 smallmouth bass  $\geq 100$  mm TL tagged at Little Yampa Canyon, we recaptured 80 or 33% and of 103 bass tagged at Lily Park, we recaptured 23 or 22% (Table 4). Lower recapture rates suggest tag loss or emigration of tagged fish during the sampling season. We also calculated capture rate for each pass based on the number of tagged fish recaptured on each pass as a proportion of the tagged fish remaining from the initial marking on that pass. This accounted for declining numbers of tagged fish that remained as tagged fish were removed on each pass. Capture rates ranged 2–15% at Little Yampa Canyon and 0–8% at Lily Park (Table 4). We attribute lower capture rates at Lily Park to greater emigration from Lily Park compared to Little Yampa Canyon.

4. Remove large numbers of age-0 and age-1 smallmouth bass from a 12-mile treatment reach in Little Yampa Canyon.

From August 5 through October 19 we shocked 43 hours with an electric seine at Little Yampa Canyon and removed 7,043 (57 kg) of mostly Age-0 bass. From September 9 through October 20 we shocked 9 hours at Lily Park and removed 292 (4 kg) mostly Age-0 smallmouth bass (Table 6). Interestingly, CPUE of young smallmouth bass at Little Yampa Canyon ranged from 92 to 219 fish/hour and was much higher than the 9 to 60 fish/hour observed at Lily Park. This suggests higher production of bass at Little Yampa Canyon than at Lily Park even though Lily Park had a higher density of adult bass. In addition to young bass, we also removed young northern pike, black bullhead, black crappie, green sunfish and bluegill during the low-flow period (Table 6).

#### Other data:

Fish Community– Relative abundance of nonnative fish was higher than native species at both sites. Nonnative species comprised 97% of the fish collected during our 1-mile community sampling at Little Yampa Canyon (Table 7). At Lily Park, nonnative fish comprised 71% of the fish community with flannelmouth sucker being the most dominant native species at 23% (Table 7).

Movement of recaptured fish— At Lily Park, we tagged and released 103 smallmouth bass on the first (marking) pass. We recaptured four of those fish on the same day and two had moved 0.5 miles and two had moved 3.5 miles, indicating the potential distance that fish could be displaced due to capture or handling. No other fish were recaptured during the marking pass. During the remaining removal passes at Lily Park we recaptured 23 (22%) of the 103 tagged fish; 21 had moved downstream 0.5–4 miles, one had moved upstream 2.5 miles, and one remained at the mile of capture (Figure 4). At least two bass released on the marking pass moved downstream about 10 miles to Yampa Canyon where they were recaptured by FWS. One smallmouth bass released by CDOW in lower Juniper in 2008 moved 39 miles downstream through Cross Mountain Canyon to Lily Park. Fourteen smallmouth bass were recaptured in Lily Park after 1–2 years at large including six fish originally tagged in Lily Park, three fish tagged just upstream in Cross Mountain Canyon in 2007, four fish that moved 8–34 miles downstream from the Maybell reach, and one that moved 58 miles downstream from Little Yampa Canyon.

At Little Yampa Canyon, we tagged and released 240 smallmouth bass on the first (marking) pass in 2008. We recaptured 12 of those fish within nine days of release during the marking pass at distances of 0.5–13 miles, all were downstream from their release location. Three smallmouth bass moved out of the reach soon after release and were recaptured by CDOW before our 2<sup>nd</sup> pass. During the removal passes at Little Yampa Canyon, we recaptured 77 (32%) of the 240 tagged fish; 68 had moved downstream 0.1–22 miles, six had moved upstream 1.5–11.5 miles, and three remained at the same mile of capture (Figure 5).

We recaptured 35 smallmouth bass tagged by CDOW in 2008 that moved into our study reaches. Most of those fish were recaptured in Little Yampa Canyon and moved there from South Beach (n=1), lower Juniper (n=18), and Maybell (n=15). The DOW tagged 145 smallmouth bass in the Maybell reach in 2008 and slightly more of those fish that were recaptured had moved out of the Maybell reach into the Little Yampa Canyon reach (n=15) compared to the number that remained and were recaptured by CDOW in the Maybell reach (n=13).

The number of smallmouth bass that remained in the Little Yampa Canyon reach after 1–5 years at large was similar to the number that moved into the Little Yampa Canyon reach from other reaches. Thirty-nine smallmouth bass recaptured in Little Yampa Canyon in 2008 were originally tagged and released in that reach in prior years. They included seven fish released five years prior in 2003.

Smallmouth bass that moved into Little Yampa Canyon from other reaches included five smallmouth bass that moved 49–66 miles upstream from the Lily Park reach, 14 bass that moved 17–50 miles upstream from the Maybell reach, 11 bass that moved 4–30 miles upstream from the lower Juniper reach, six bass that moved 2–15 mile downstream from the South Beach reach, and one bass that moved 52 miles downstream from the Hayden to Craig reach.

We recaptured 12 smallmouth bass that escaped Elkhead Reservoir, including seven

translocated there in 2007, one translocated in 2006, and four translocated in 2005. Those fish were recaptured between 25 and 94 miles downstream of the Elkhead River confluence (RM 148.1). Smallmouth bass placed in Elkhead Reservoir in 2007 that escaped were captured between June 1 and July 14 after the 2008 peak runoff which occurred on May 23 on the Yampa River and May 20 on Elkhead Creek. Escapees from 2007 were all large fish with an average length of 367 mm TL (range (308–428 mm)).

#### *Northern pike*

The goal was to remove as many pike as possible from critical habitat and estimate the proportion of the population removed (Primarily accomplished by Project 98a and supplemented by this Project (#125)).

#### Objectives

1. Obtain an estimate of the number of northern pike that reside in the 91-mile study reach in the Yampa River using a mark-recapture abundance estimator. (In coordination with Project 98a).
2. Conduct one marking pass and seven removal passes for northern pike from the smallmouth bass study reaches to support Project 98a.
3. Calculate the proportion of northern pike removed based on initial population size. (In coordination with Project 98a).

Northern pike results were provided to Boyd Wright of CDOW and will be reported by him in the annual report for Project 98a.

#### VII. Recommendations for improving both total catch and catch rate:

We had several mechanical problems during the field season which required removing boats from the project for repair. But even with those issues we were able to complete almost all of our removal passes. This was due mainly to Dan Kowalski, Lori Martin, Sherman Hebein, and Boyd Wright, all of the CDOW who loaned us boats to continue sampling. We thank them. As suggested last year, we recommend adding an additional electrofishing boat to reduce down-time due to mechanical issues during the field season. We also suggest that we start earlier in the field season and add one or two additional passes in 2009. We also have observed higher catch rates with the VVP15 compared to the GPP 5.0 electrofisher and suggest updating the electrofishing boats to the VVP15b electrofisher.

#### VIII. Project Status: On going and on track

#### IX. FY 2008 Budget Status

- A. Funds Provided: \$222,900
- B. Funds Expended: \$193,400
- C. Difference: \$29,500
- D. Percent of the FY 2008 work completed, and projected costs to complete: 95%



Table 1. Abundance estimates for smallmouth bass at two study sites in the middle Yampa River, 2008. Abundance was estimated using a Huggins estimator which is similar to model  $M_t$ . Abundance was estimated for two length groups ( $\geq 150$  and  $\geq 200$  mm TL) to allow comparison with previous years or other researchers.

Length group (mm)	Abundance	95% CI	SE	CV	capture probability	Density #fish/mile	# fish marked pass 1	# fish handled pass 2	# recaps pass 2
<i>Little Yampa Canyon (24-miles long)</i>									
$\geq 150$	3414	2156 - 5260	770.9	23%	7%	142	213	249	15
$\geq 200$	3173	2036 - 5112	762.8	24%	7%	132	200	238	15
<i>Lily Park (5-miles long)</i>									
$\geq 150$	1643	948 - 3024	505.5	31%	8%	329	93	159	9
$\geq 200$	900	532 - 1643	269.8	30%	10%	180	81	100	9

Table 2. Sample dates, electrofishing (EL) effort, and number and CPUE (# fish/ hour EL) of smallmouth bass captured on each pass in the middle Yampa River, 2008.

Pass	Dates sampled	EL effort (hours)	Number of fish per lengthgroup (mm)				CPUE (#fish/hour EL) per length group			
			<149	150-199	>=200	all fish	<149	150-199	>=200	all fish
<u>Little Yampa Canyon (24-miles long)</u>										
1	April 15– 21	28	82	13	200	295	3	0	7	11
2	April 29– May 5	43	66	11	238	315	2	0	6	7
3	May 14–19	47	146	79	331	556	3	2	7	12
4	May 28– June 4	31	174	127	251	552	6	4	8	18
5	June 11–17	34	110	68	139	317	3	2	4	9
6	June 25–30	35	601	87	103	791	17	2	3	23
7	July 9–15	47	921	253	312	1486	20	5	7	32
extra	Aug 8- Sept 7	angling only	102	91	88	281				
	Total	265	2202	729	1662	4593	8	3	6	17
<u>Lily Park (5-miles long)</u>										
1	April 22	7	59	11	80	150	8	2	11	21
2	May 6	7	79	59	100	238	11	8	14	34
3	May 13	8	127	114	96	337	16	14	12	42
4	May 20	6	47	62	47	156	8	10	8	26
5	June 10	9	214	277	104	595	24	31	12	66
6	June 17	9	436	329	90	855	48	37	10	95
7	June 24	8	398	213	61	672	50	27	8	84
8	July 1	8	670	212	61	943	84	27	8	118
9	July 8	8	568	124	34	726	71	16	4	91
	Total	70	2598	1401	673	4672	37	20	10	67
<u>South Beach (3-miles long)</u>										
extra	July 13	5	128	27	61	216	28	6	14	48

Table 3. Number of smallmouth bass captured and their disposition in the middle Yampa River, 2008. Bass  $\geq 100$  mm were tagged on pass 1. Bass  $\geq 250$  mm were moved to Elkhead Reservoir or Justice Center pond on passes 2–9. Bass less than those lengths were euthanized.

Pass	Tagged and released	Justice Center pond	Elkhead Reservoir	Euthanized	Total
<i>Little Yampa Canyon</i>					
1	240	--	--	55	295
2	--	219	--	96	315
3	--	267	--	289	556
4	--	186	--	366	552
5	--	96	--	221	317
6	--	67	--	724	791
7	1	--	189	1296	1486
8	--	--	<u>33</u>	<u>248</u>	<u>281</u>
Total	<u>241</u>	<u>835</u>	<u>222</u>	<u>3295</u>	<u>4593</u>
<i>Lily Park</i>					
1	103	--	--	47	150
2	--	79	--	159	238
3	--	51	--	286	337
4	--	27	--	129	156
5	--	36	--	559	595
6	--	29	--	826	855
7	--	16	--	656	672
8	--	17	--	926	943
9	--	--	<u>12</u>	<u>714</u>	<u>726</u>
Total	<u>103</u>	<u>255</u>	<u>12</u>	<u>4302</u>	<u>4672</u>
<i>South Beach</i>					
1	--	--	46	170	216

Table 4. Recapture (exploitation) rates of tagged fish  $\geq 100$  mm TL at each study site in the middle Yampa River, 2008.

Pass	# tagged fish handled	Cumulative # tagged fish recaptured	# tagged fish remaining in the reach	Cumulative % tagged fish recaptured	capture rate on each pass <sup>a</sup>
<u>Little Yampa Canyon (24-mile long)</u>					
1	240-fish tagged		240		
2	16	16	224	7%	7%
3	33	49	191	20%	15%
4	14	63	177	26%	7%
5	8	71	169	30%	5%
6	5	76	164	32%	3%
7	4	80	160	33%	2%
8-angling	0	80	160	33%	
					mean = 6%
<u>Lily Park (5-miles long)</u>					
1	103-fish tagged		103		
2	8	8	95	8%	8%
3	6	14	89	14%	6%
4	4	18	85	17%	4%
5	1	19	84	18%	1%
6	1	20	83	19%	1%
7	0	20	83	19%	0%
8	1	21	82	20%	1%
9	2	23	80	22%	2%
					mean = 3%

<sup>a</sup> Capture rate on each pass = # tagged fish handled / # tagged fish remaining in the reach.

Table 5---Sample dates, seine electrofishing effort, and number and CPUE (# fish/ hour EL) of young smallmouth bass captured using electric seine on each pass in Little Yampa Canyon and Lily Park in the middle Yampa River, 2008

Little Yampa Canyon

Trip	Dates	Number of sites	Effort (hrs)	SMB removed	Mass (kg)	CPUE
1	Aug 5-12	11	4	366	3	92
2	Aug 19-25	37	14	2138	10	153
3	Sep 3-8	13	10	1917	11	192
4	Sep 17-23	13	5	750	3	150
5	Sep 30-Oct 7	17	4	556	3	139
6	Oct 14-19	9	6	1316	7	219
	Total	100	43	7043	37	164

Lily Park

Trip	Dates	Number of sites	Effort (hrs)	SMB removed	Mass (kg)	CPUE
1	Sep 9	6	2	119	2.4	60
2	Sep 16	8	2	18	0.3	9
3	Oct 3, 8	14	3	114	0.7	38
4	Oct 17, 20	9	2	41	0.2	21
	Total	37	9	292	3.6	32

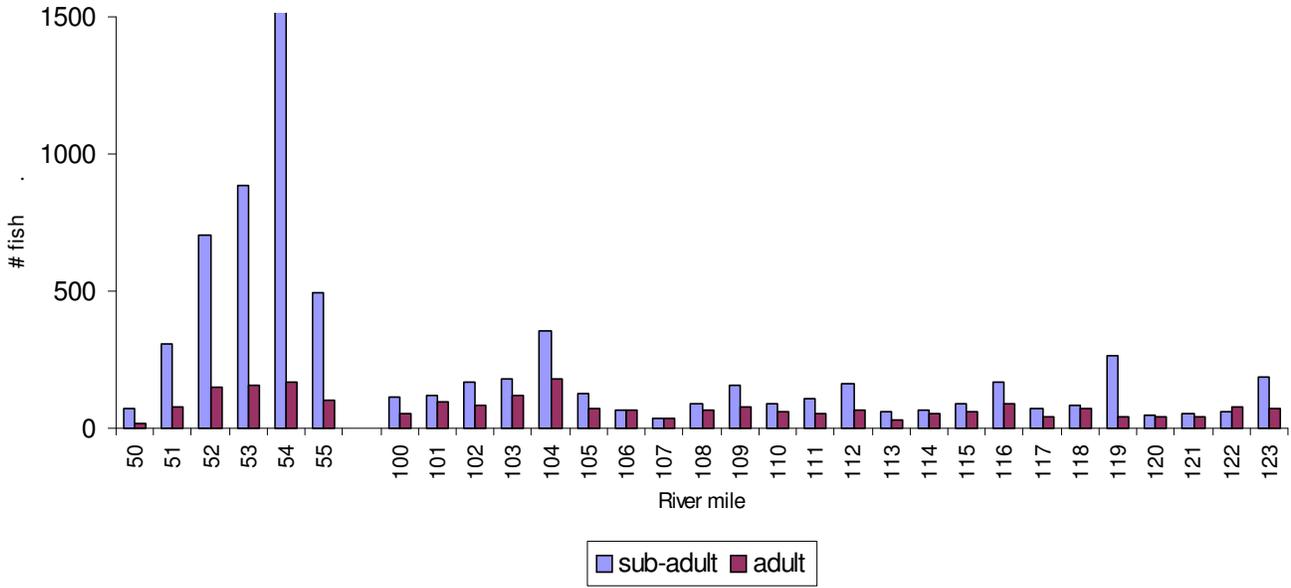
Table 6--- Number and biomass of fish removed with electric seine from two sites in the middle Yampa River, 2008

	LYC	Lily Park
SMB	7043 (56.9)	292 (3.5)
NP	35 (4.8)	2 (1.5)
BB	8891 (7.1)	- -
BC	171 (1.3)	6 (0.5)
GS	24 (0.2)	2 (0.02)
BG	124 (1.3)	50 (0.5)
Total	16288 (71.6)	352 (6.0)

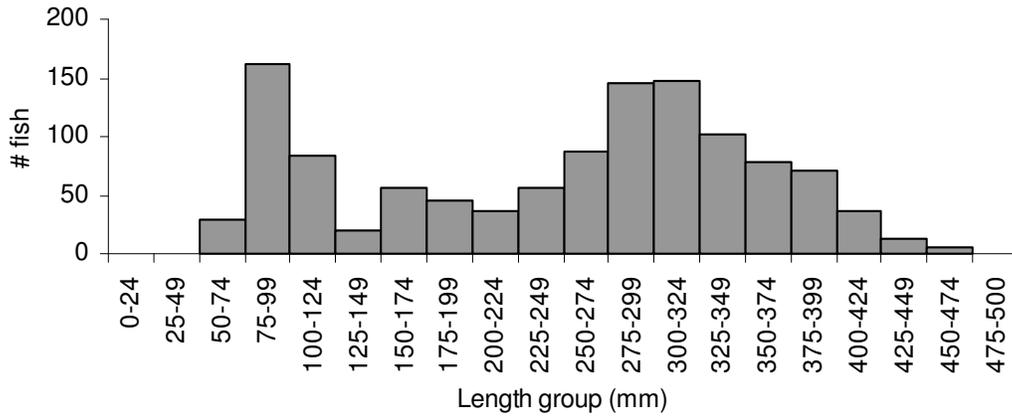
Table 7---Relative Abundance of fish collected in the 1-mile study sites by boat electrofishing, Yampa 2008

	LYC	Lily Park
<i>nonnative species</i>		
smallmouth bass	41.1	42.5
white sucker	39.3	10.8
whitexflannelmouth sucker	6.0	1.8
creek chub	2.7	-
sand shiner	1.4	0.4
black bullhead	1.3	-
northern pike	1.2	0.4
common carp	0.8	6.1
black crappie	0.6	0.3
bluegill	0.6	0.3
rainbow trout	0.6	0.1
channel catfish	0.5	7.8
whitexbluehead sucker	0.4	0.2
green sunfish	0.2	-
brook stickleback	0.2	-
whitexflannelxbluehead sucker	0.1	-
red shiner	-	0.4
brown trout	-	0.2
fathead minnow	-	0.1
<i>native species</i>		
flannelmouth sucker	1.1	23.2
rountail chub	0.8	0.4
bluehead sucker	0.8	4.3
Colorado pikeminnow	0.3	-
mountain whitefish	0.1	-
flannelmouthxbluehead sucker	-	0.4
speckled dace	-	0.2
<i>% nonnative fish</i>	96.9	71.4
<i>% native fish</i>	3.1	28.6
Total number of fish	1259	1145

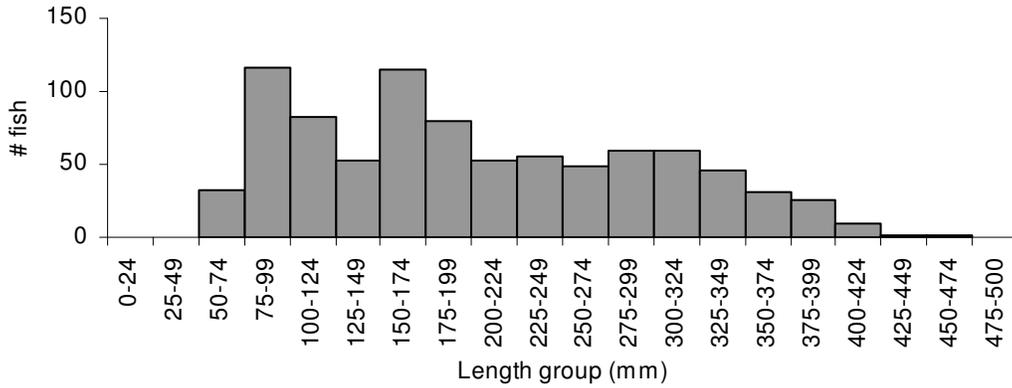
Figure 1--Number of smallmouth bass captured in Lily Park (RM50.5-55.5) and Little Yampa Canyon (RM 100-124), 2008. All passes combined.



Little Yampa Canyon-Passes 1-3 April 15-May 5



Little Yampa Canyon-Passes 4-5 May 14 - June 4



Little Yampa Canyon-Passes 6-8 June 25- Sept 7

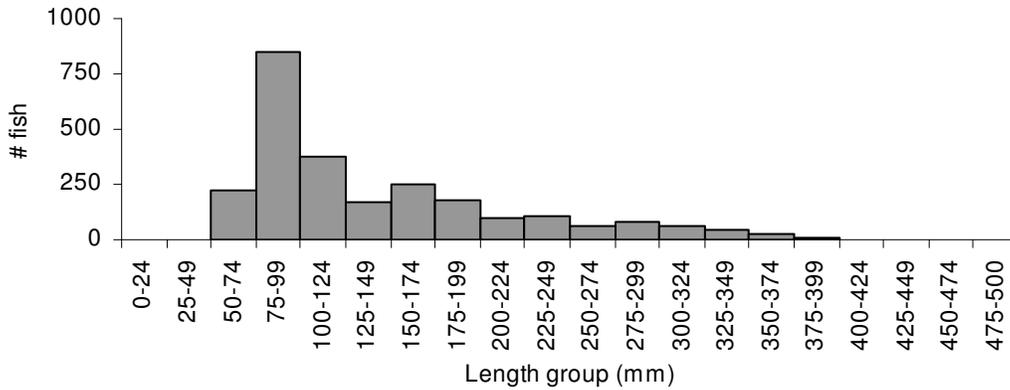
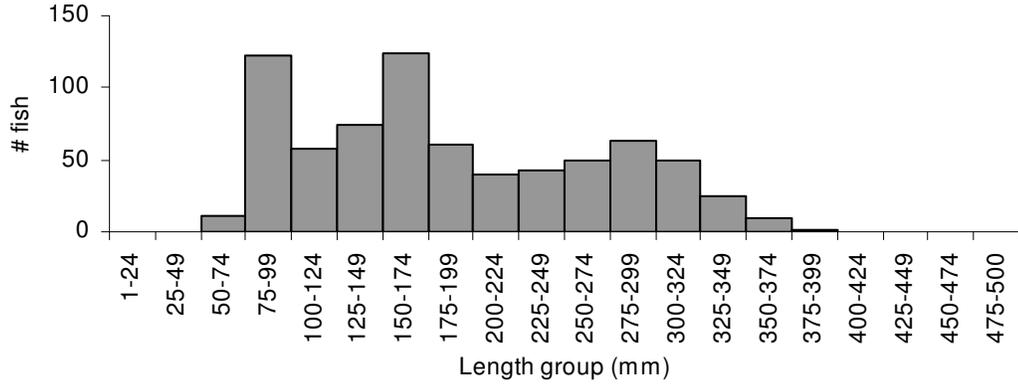
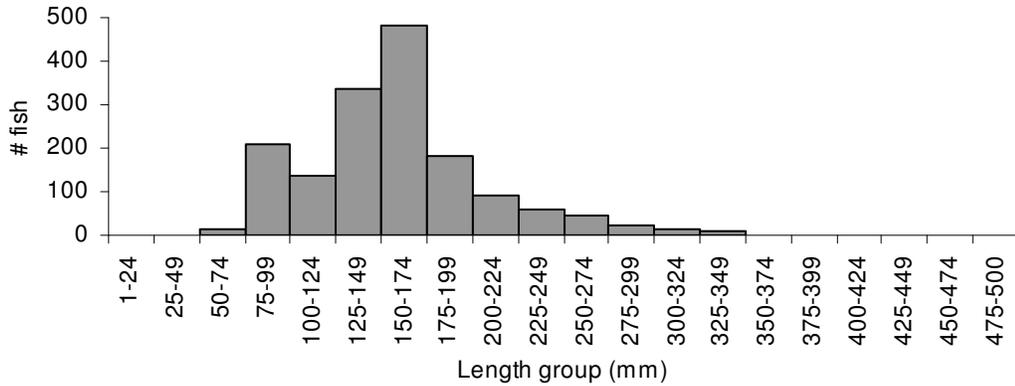


Figure 2– Length-frequency of smallmouth bass captured in Little Yampa Canyon, 2008.

Lily Park-Passes 1-3 April 22-May 13



Lily Park-Passes 4-6 May 20- June 17



Lily Park-Passes 7-9 June 24-July 8

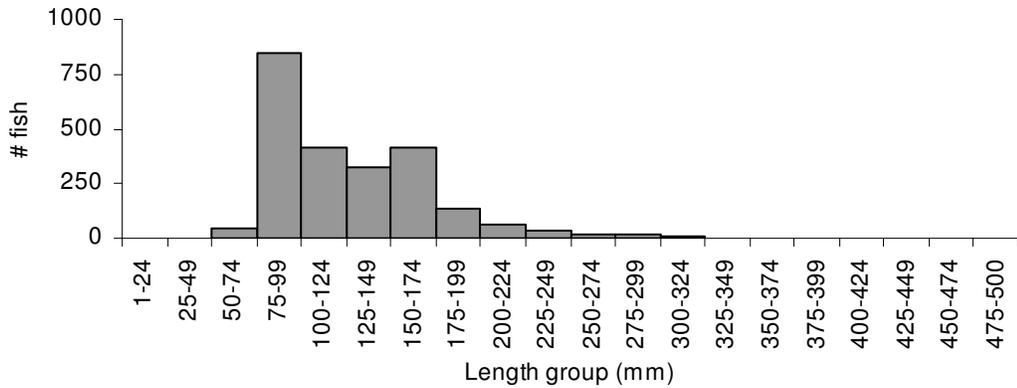


Figure 3– Length-frequency of smallmouth bass captured in Little Yampa Canyon, 2008.

Figure 4--- Movement distance of smallmouth bass as a function of days at large between tagging and recapture at Lily Park, 2008.

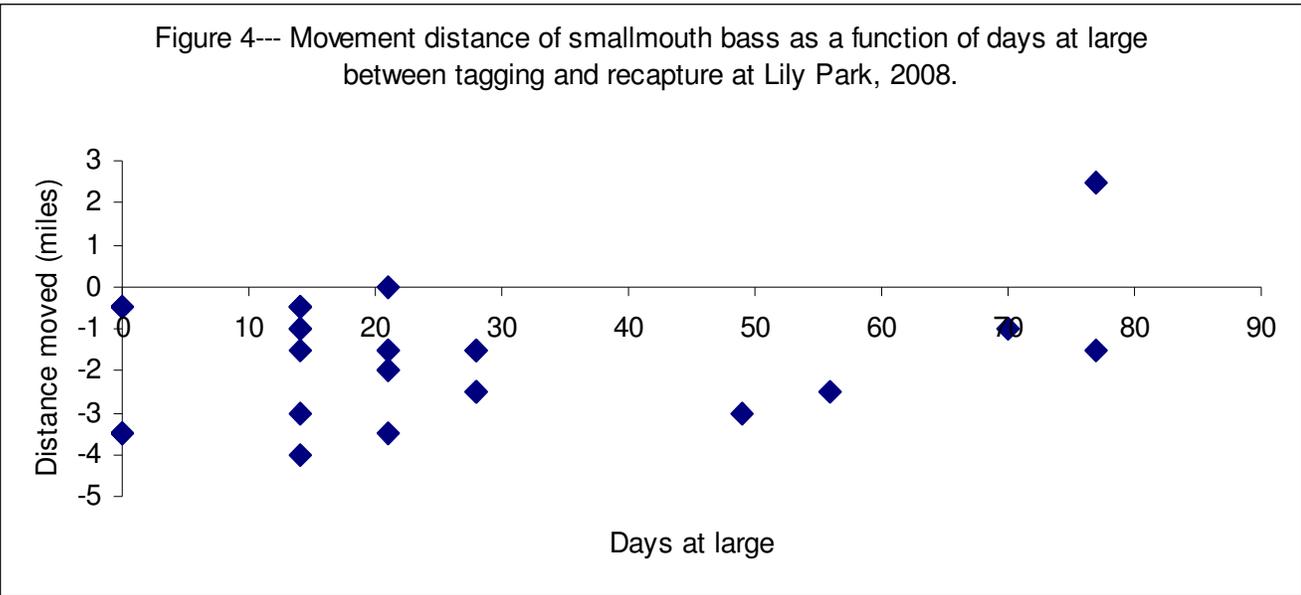
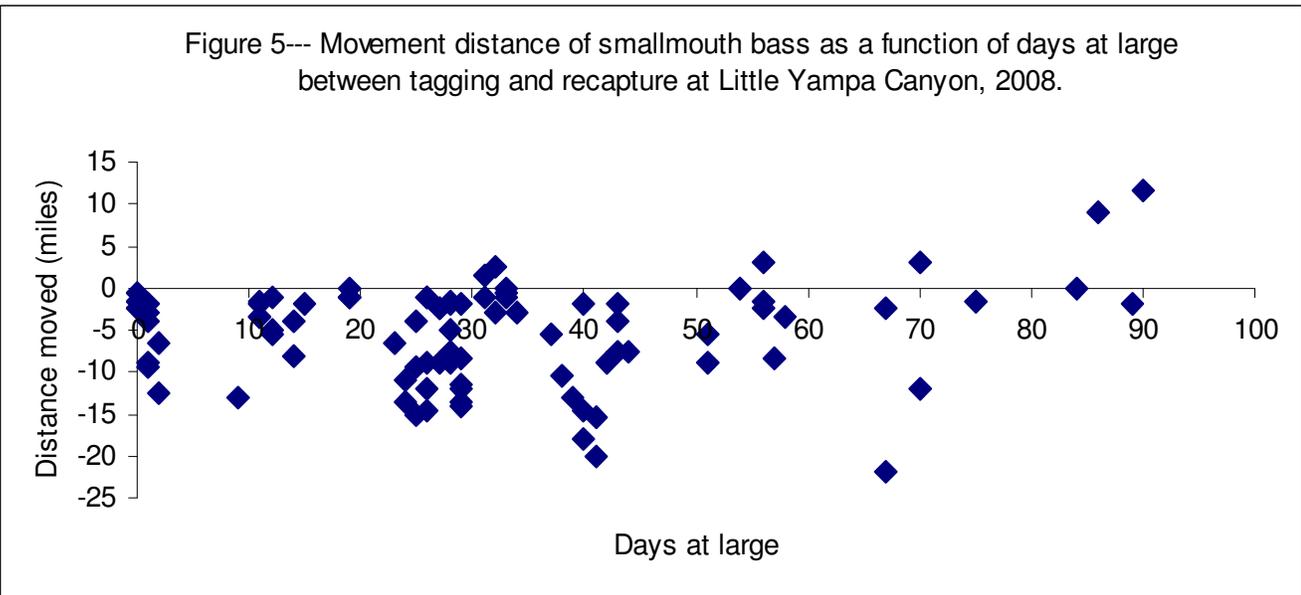


Figure 5--- Movement distance of smallmouth bass as a function of days at large between tagging and recapture at Little Yampa Canyon, 2008.



Movement distance = river mile of release - river mile of recapture.  
 Upstream movement = positive miles  
 Downstream movement = negative miles