

COLORADO RIVER RECOVERY PROGRAM
FY 2007 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 125

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

II. Principal Investigator(s):

John Hawkins

John.Hawkins@ColoState.EDU

Larval Fish Laboratory

(970) 491-2777

Dept. Fishery and Wildlife Biology

(970) 491-5091 fax

1474 Campus Mail

Colorado State University

Ft Collins, CO 80523

Assistant: Cameron Walford

III. Project Summary:

This study was an evaluation of whether smallmouth bass and northern pike numbers can be controlled through active removal from a 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 between Cross Mountain Canyon and the Little Snake River confluence. We sampled the river using two electrofishing boats sampling both shorelines on up to eight different occasions. To evaluate removal success, we calculated the size of the population using capture-recapture methods by tagging all bass and pike ≥ 150 mm TL and releasing them back in the river on the first sample occasions and then using recaptured fish caught on the second sample occasion to estimate the number of fish within each study site. Starting with the second sampling occasion all smallmouth bass and pike were removed from the river and if large enough fish were transported to other waters for the angling public. During removal sampling occasions (2–8) bass larger than 250 mm were transported to either the Justice Center pond in Craig or Elkhead Reservoir and those smaller were euthanized. All sizes of northern pike were removed and transported to Loudy Simpson Ponds in Craig and data for northern pike was coordinated with Colorado Division of Wildlife (CDOW) and project # 98a. Most northern pike results were reported by the CDOW. An additional objective was to remove large numbers of small (young-of-year and yearling) smallmouth bass from the lower 12-mile portion of the Little Yampa Canyon site using an electric seine. Objectives listed below were met.

IV. Study Schedule: Initial Year: 1999
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 2006 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Objectives from the Scope of Work are presented below followed by results from a Draft 5-year synthesis report (Hawkins et al. 2008). These data are considered preliminary until the draft report is peer reviewed and approved by the Recovery Program.

Smallmouth bass

The goal is to remove as many smallmouth bass as possible from a 24-mile treatment reach and a 5-mile concentration reach and estimate the proportion of the population removed from each reach.

Objectives:

1. Obtain an estimate of the number of smallmouth bass in the 24-mile treatment reach in Little Yampa Canyon and a 5-mile reach in Lily Park using a mark-recapture abundance estimator.

We obtained an estimate of the number of smallmouth bass at each study site and smallmouth bass numbers at the start of 2007 were lower after intensive removal in 2006 and have declined about 33% since 2005 (Table 1). Catch rates of fish generally tracked abundance estimates, with a declining trend since 2005 (Figure 1).

2. Remove a large portion of the estimated population of smallmouth bass from the 24-mile treatment reach in Little Yampa Canyon and the 5-mile concentration area in Lily Park.

In 2007, 2,722 smallmouth bass (biomass 524 kg) were removed from Little Yampa Canyon and 1,730 smallmouth bass (150 kg) were removed from Lily Park (Table 2). Size structure of smallmouth bass differed at Lily Park contains few fish over 250 mm TL compared to Little Yampa Canyon (Figures 2 and 3). Lily Park had higher concentrations (~400 fish/mile) of adult smallmouth bass than Little Yampa Canyon (~ 200 fish/mile) and there were 1-mile sections within both sites that contained high concentrations of smallmouth bass (Figure 4).

3. Calculate the proportion of smallmouth bass removed from each study area based on initial population size.

In 2007, we removed 62% (n=1,492) of the estimated abundance of smallmouth bass ≥ 150 mm TL at Little Yampa Canyon and 83% (n=1,024) of the estimated smallmouth bass ≥ 150 mm TL at Lily Park (Table 3). We removed a smaller proportion of fish that were initially tagged on the first sample pass. In Little Yampa Canyon only 34% of smallmouth bass tagged on the first pass were recaptured in the same year and at Lily Park only 29% of smallmouth bass tagged on the first pass were recaptured (Table 3). Catch per unit effort (CPUE) of smallmouth bass captured on each pass was much higher at Lily Park than Little Yampa Canyon and increased as yearling bass grew into the targeted size of 150 mm (Figure 5). Fish captured during early passes tended

to be larger than those captured on later passes because on later passes larger fish apparently moved into deeper water where they were less vulnerable to electrofishing. Large fish probably moved to deeper water to seek cover as flows declined and water clarity improved. These same conditions likely improved our catch rates of smaller bass on later passes.

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

We removed a total of 9,606 (44 kg) primarily YOY and yearling smallmouth bass with 26 hours of electric seine effort in 78 samples from 10 July through 14 August 2007 at the lower 12-miles of Little Yampa Canyon (Table 4)

5. Understand movement of recaptured smallmouth bass tagged in previous years or during the first (tagging) pass each year.

Movement data for smallmouth bass tagged and recaptured from 2003 to 2007 was reported in detail in the 5-year synthesis report (Hawkins et al 2008).

Northern pike

The goal is to remove as many pike as possible from critical habitat and estimate the fraction 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 95-mile study reach in the Yampa River using a mark-recapture abundance estimator. (This will be done by Project 98a).
2. Remove a large portion of the estimated population of northern pike from the smallmouth bass study reaches and from other reaches opportunistically as needed to support Project # 98a.
3. Calculate the proportion of northern pike removed based on initial population size. (We will assist the PI of Project 98a to accomplish this objective).

Northern pike results were reported by Lori Martin in the Northern pike 4-year synthesis report which is currently in review.

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

Current catch rates (capture probability) are about 15% and are fairly good considering river conditions. Based on this catch rate, we suggest continuing current intensive removal on at least seven or more occasions to achieve a measurable reduction in bass numbers. Movement data provided in the Synthesis report shows movement of bass between Little Yampa Canyon and South Beach and we believe that a measurable reduction will be observed if at least seven removal passes are completed within those two reaches. Smallmouth bass at Lily Park occur at high density although their size structure is composed mostly of fish smaller than 250 mm. There appears to be movement of bass between Lily Park and Yampa Canyon and we suggest

increasing the number of removal passes in Lily Park from five to seven. One of the most important actions to accomplish the goal of seven removal passes is to have fully operational electrofishing boats and equipment and suggest encouraging the purchase of backup equipment and boats in annual budgets to allow for continuation in the event of equipment failure. We will implement techniques to improve electrofishing efficiency suggested by Martinez and Koltz at the 2008 Researcher's Meeting in an attempt to increase catch rates in 2008 .

VIII. Project Status: On going and on track

IX. FY 2007 Budget Status

- A. Funds Provided: \$215,980
- B. Funds Expended: \$215,980
- C. Difference: 0
- D. Percent of the FY 2007 work completed, and projected costs to complete: 99% completed, cost to complete \$0
- E. Recovery Program funds spent for publication charges: \$0

X. Status of Data Submission (Where applicable): Endangered fish capture data has been submitted and nonnative fish data is currently being formatted for consistency and submission to the database administrator in March.

Reports Submitted for Program peer review:

Hawkins, J., C. Walford, and A. Hill. 2008. Smallmouth bass control in the middle Yampa River, a 5-year synthesis report for 2003–2007. Draft report to the Recovery Implementation Program for endangered fishes in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Denver. Contribution 154 of the Larval Fish Laboratory, Colorado State University.

XI. Signed: John Hawkins 2/28/08
Principal Investigator Date
Submitted electronically.

Version control:
submitted 2/28/08 by JAH

Table 1— Abundance estimates for smallmouth bass \geq 150 mm TL at two study sites in the middle Yampa River, 2004–2007. Abundance estimates derived from the Huggins estimator which is similar to model M(t).

Little Yampa Canyon (24-miles long)

Length	Year	Abundance	95% CI	SE	CV (%)	Sample occasions	Capture probability (%)
24 miles	2004	2888	1977–4375	597	21	2-pass	4 , 15
24 miles	2005	3422	2683–4446	445	13	2-pass	10, 14
24 miles	2006	2718	2372–3148	197	7	3-pass	9, 11, 20
24 miles	2007	2394	1554–3837	566	24	2-pass	5, 11

Lily Park (5-miles long))

Length	Year	Abundance	95% CI	SE	CV (%)	Sample occasions	Capture probability (%)
5 miles	2004	1519	352–7678	1479	97	2-pass	2 , 3
5 miles	2005	1963	1235–3262	500	25	2-pass	8, 9
5 miles	2006	1778	1386–2333	239	13	3-pass	8, 9, 10
5 miles	2007	1233	846–1932	268	22	2-pass	5, 26

Table 2— Number and (biomass) of smallmouth bass captured and their disposition in the middle Yampa River, 2003–2007. JCP=Justice Center Pond

Little Yampa Canyon (24-miles long)							
Year	Released	Translocated to			# removed		Total # removed
	in river	Elkhead	JCP	Euthanized	< 150mm	≥ 150mm	
2003	1226 (443)	263 (61)	0	4 (1)	39	228	267 (63)
2004	796 (418)	1480 (353)	0	97 (12)	408	1169	1577 (365)
2005	1070 (471)	567 (274)	0	1683 (134)	848	1402	2250 (408)
2006	511 (320)	291 (174)	462 (270)	1210 (95)	655	1308	1973 (541)
2007	132 (81)	576 (292)	199 (123)	1947 (109)	1230	1492	2722 (524)
Total	3735 (1723)	3177 (1157)	661 (393)	4941 (351)	3180	5599	8779 (1901)

Lily Park (5-miles long)							
Year	Released	Translocated to			# removed		Total # removed
	in river	Elkhead.	JCP	Euthanized	< 150mm	≥ 150mm	
2004	32 (9)	1285 (138)	0	39 (1)	343	981	1324 (139)
2005	256 (23)	80 (29)	0	1771 (96)	1065	786	1851 (125)
2006	295 (43)	0	67 (24)	1335 (80)	624	778	1402 (104)
2007	65 (14)	104 (34)	63 (21)	1563 (94)	706	1024	1730 (150)
	648 (89)	1469 (202)	130 (45)	4708 (272)	2738	3569	6308 (518)

Table 3— Capture efficiency of smallmouth bass \geq 150 mm TL at two study sites in the middle Yampa River, 2004–2007. Tag return is proportion of tagged fish recaptured within each year.

Little Yampa Canyon

Year	Abundance for 24-mile reach	Length of removal passes	# removal passes	# bass removed	% bass removed	% of tag returns
2004	2888	12 miles	9	1169	40	47
2005	3422	12 miles	8	1402	41	38
2006	2718	24 miles	6	1308	48	31
2007	2394	24 miles	7	1492	62	34

Lily Park

Year	Abundance for 5-mile reach	Length of removal passes	# removal passes	# bass removed	% bass removed	% of tag returns
2004	1519	5 miles	5	981	65	23
2005	1963	5 miles	5	786	40	18
2006	1776	5 miles	5	778	44	16
2007	1233	5 miles	5	1024	83	29

Table 4— Sampling effort, number, and biomass of fishes removed during low-flow in the middle Yampa River, 2005–2007.

	Little Yampa Canyon				Lily Park
	2005	2006	2007	Total	2007
Dates sampled	20 Jul- 30 Aug	25 Jul– 17 Aug	10 Jul– 14 Aug		27 Jul
# samples	105	50	78	233	5
EL Seine Effort (hrs)	41.6	20.9	25.5	88.9	1.5
CPUE (bass/ hr)	209	293	377		159
	# fish removed and biomass (kg)				
smallmouth bass	8705 (14.1)	6134 (29.3)	9606 (44.2)	19,437 (87.6)	239 (5.2)
northern pike	63 (5.4)	37 (3.1)	12 (4.3)	112 (12.9)	
black bullhead	7 (0.4)	331 (0.5)	1848 (0.7)	2187 (1.6)	
black crappie	75 (0.02)	3 (0.1)	4 (0.1)	82 (0.1)	
bluegill	53 0.6	32 0.3	17 (0.5)	102 (1.4)	
green sunfish	9 0.1	14 0.2	3 (0.05)	26 (0.3)	
green sunfish x bluegill	--	6 (0.1)	--	6 (0.1)	
iowa darter	1	--	--	1	
largemouth bass	2	--	--	2	

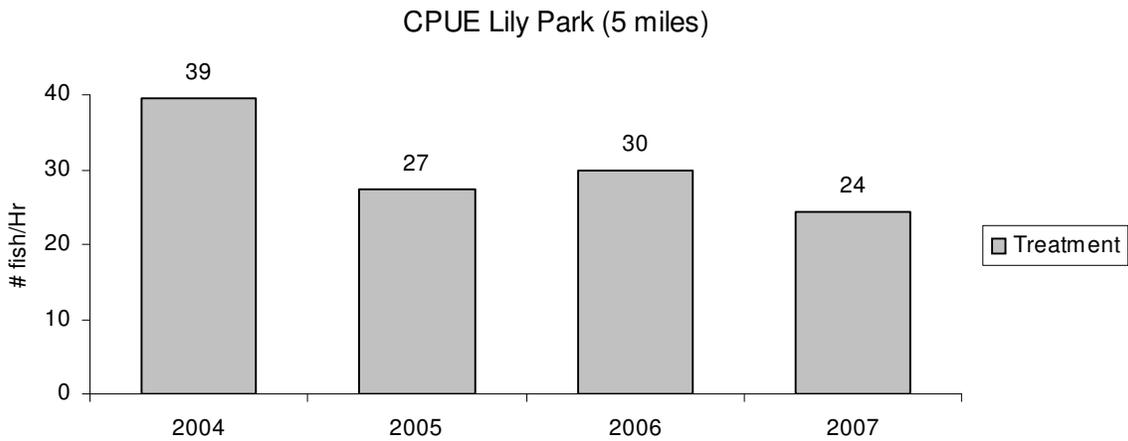
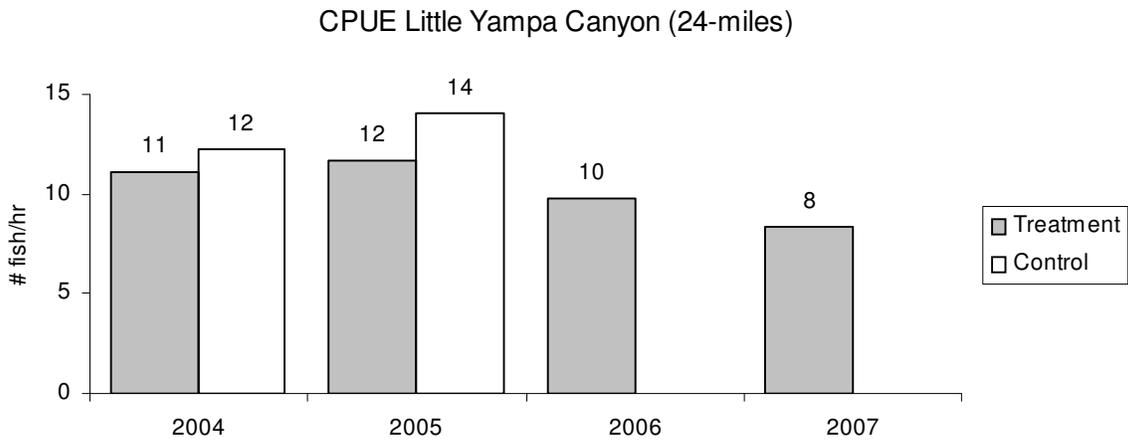


Figure 1- Number of smallmouth bass ≥ 150 mm captured per hour (CPUE) on all passes each year in the Yampa River, 2004--2007. Fish were removed from Treatment reaches and were not removed from the Control reach.

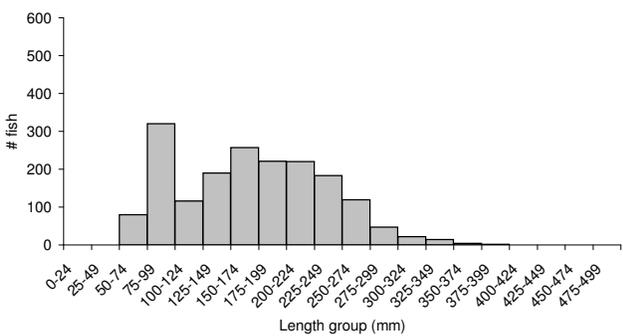
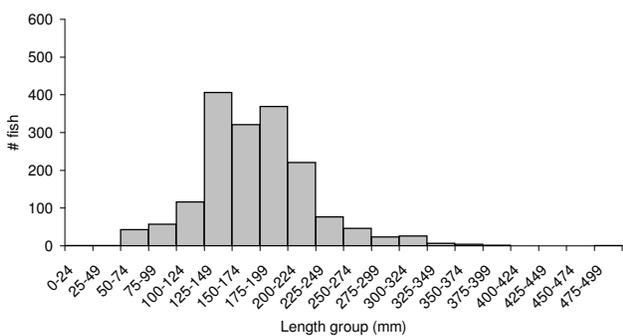
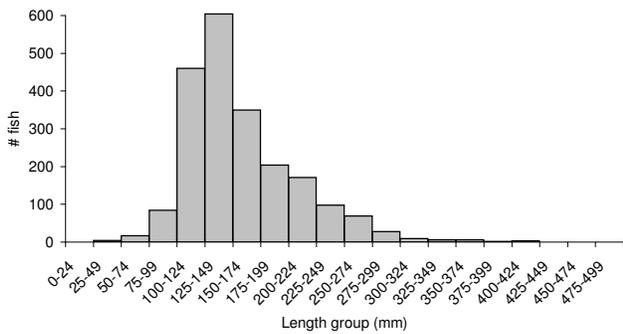
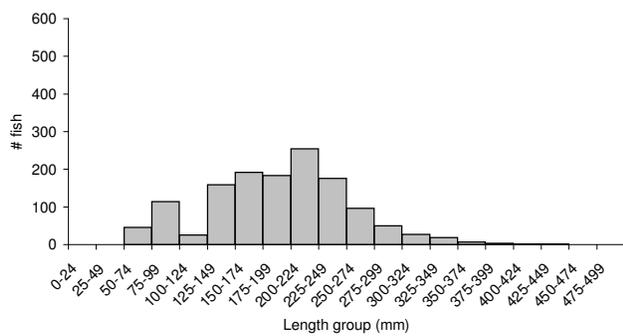


Figure 2---Length-frequency of smallmouth bass captured each year at Lily Park study site in the Yampa River, Colorado, 2004--2007.

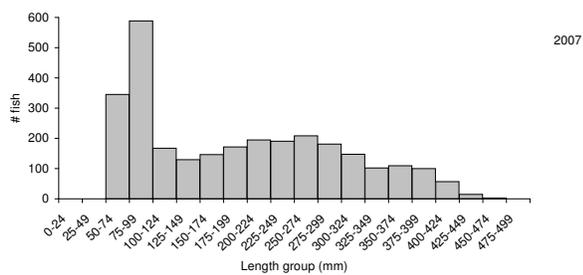
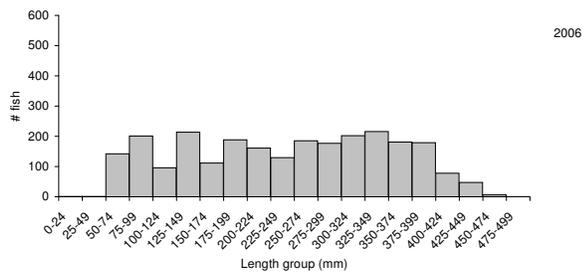
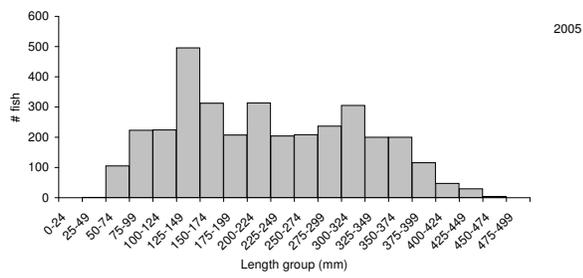
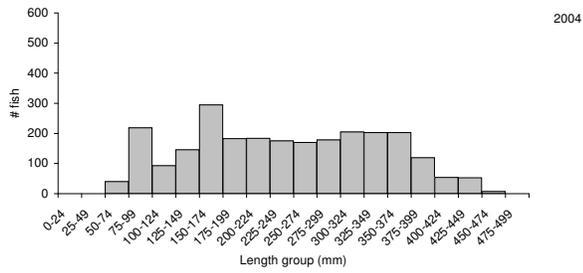
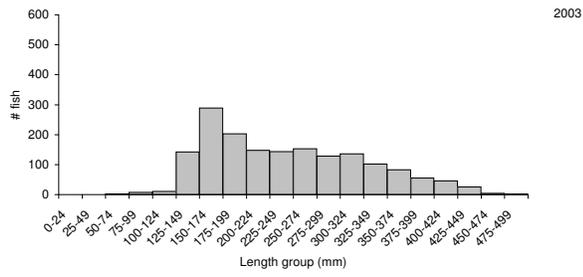


Figure3---Length-frequency of smallmouth bass captured each year in Little Yampa Canyon study site in the Yampa River, Colorado, 2003--2007.

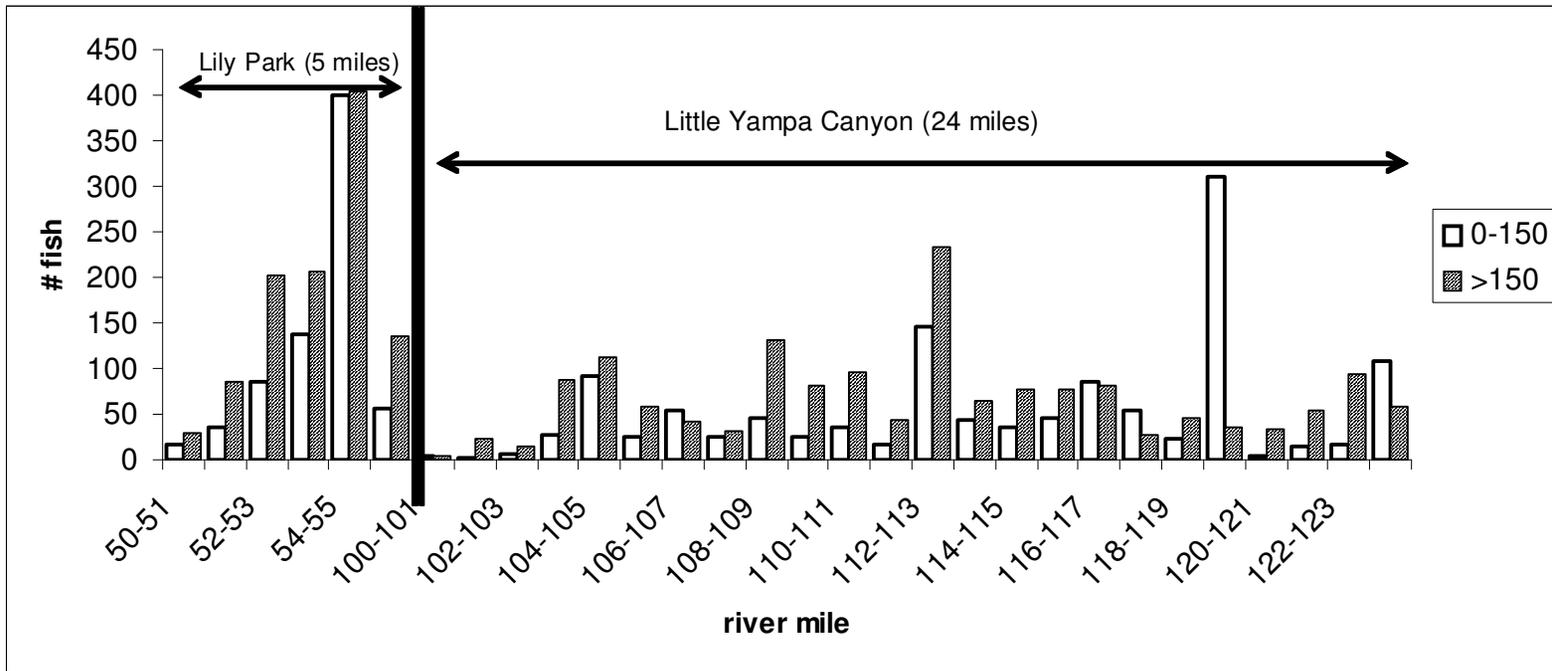
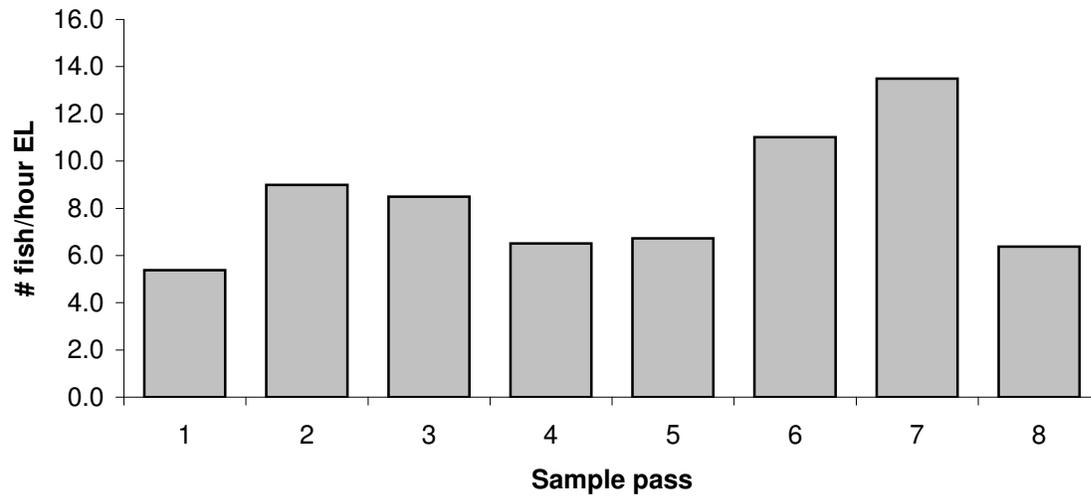


Figure 4—Number of smallmouth bass captured in each mile on all sample occasions in the Yampa River 2007. There were six sample occasions at Lily Park and eight sample occasions at Little Yampa Canyon. Open bars are smallmouth bass < 150 mm and solid bars are smallmouth bass > 150 mm total length.

CPUE of smallmouth bass ≥ 150 mm TL in Little Yampa Canyon-2007



CPUE of smallmouth bass ≥ 150 mm TL in Lily Park-2007

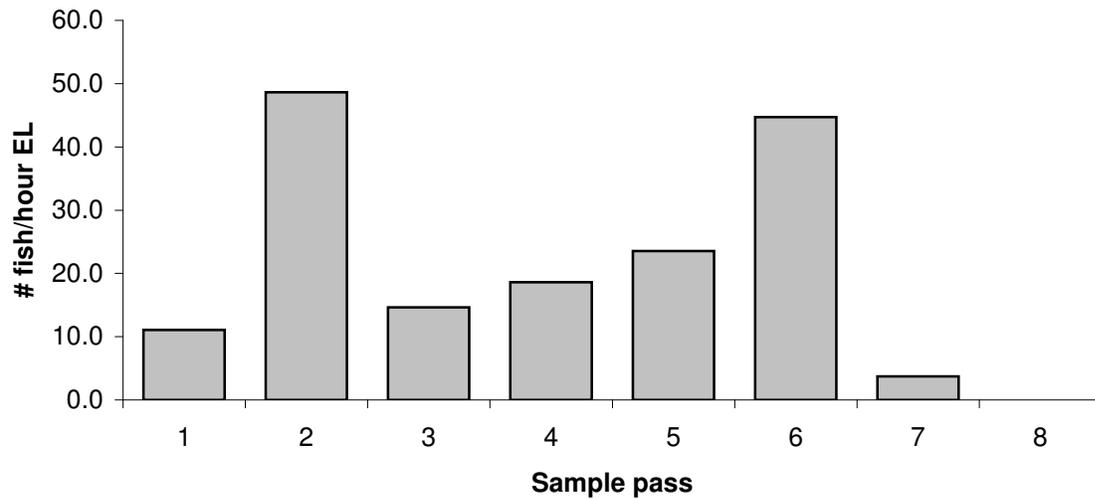


Figure 5. Number of smallmouth bass ≥ 150 mm TL captured per hour of electrofishing in 2007.