COLORADO RIVER RECOVERY PROGRAM RECOVERY PROGRAM
FY 2005 ANNUAL REPORT PROJECT NUMBER 110

I. Project title: Development of a smallmouth bass and channel catfish control program in the lower Yampa River.

II. Principal Investigator(s):

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III. Product Summary:

Smallmouth bass and channel catfish in the lower Yampa River continue to negatively impact the four endangered fishes of the Colorado River drainage. Recent population increases, especially in smallmouth bass, implicate further demise and population decline. Predatory impacts by these nonnative riverine fishes have a negative impact on the efficacy of control and repress progressive responses to control. The focus of this study is to reduce the number of smallmouth bass and channel catfish to the point where they no longer impede endangered fish recovery.

The control strategy, recommended for centrarchids (Lentsch et al. 1996) and Ictalurids (Modde and Fuller 2000), is removal from the main river channel using mechanical techniques (i.e., electrofishing, trapping, angling etc.). In 2005, electrofishing was the only method used, however a substantial investment went into improving electrofishing strategies. Sampling improved with the use of smaller, lighter boats which enabled greater sampling maneuverability and access during flows less than 1000 cfs (the flow previously considered minimal for electrofishing). Improvements also resulted from field experience and implementation (e.g., extending shocking time in bass habitat, using temperature as a cue to interrupt spawning, and conditions of high turbidity to implicate higher catch rates).

IV. Study Schedule:

a: Initial year: FY01
b: Final year: FY07

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.

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.b.3. (Nonnative fish removal in Yampa Canyon).

VI. Accomplishment of FY05 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Study Area

The entire study area, river mile 46-0, is within the borders of Dinosaur National Monument. The upstream end, river mile 46, is adjacent to Deerlodge Park a National Park Service designated campground on the eastern border of the Monument. River mile 0 is at the Yampa's confluence with the Green River just upstream from Echo Park and Whirlpool Canyon.

Background

In 1998-99 a feasibility study was designed to reduce the channel catfish population, which was at the time the most prevalent, problematic nonnative fish in the lower Yampa River. Measurable levels of depletion and estimates of catfish abundance were demonstrated by regressive catch rates in reaches targeted for removal (Modde and Fuller 2000). Electrofishing and volunteer assisted angling were the two methods most efficient in collecting catfish. In 2000 this study was designed to reduce catfish from the study area in its entirety. This project began in 2001 and has continued to the present. Following the first year of sampling, population depletion was not demonstrated and it was not until 2004 when mark-recapture based population estimates were made that measures of depletion were measured. Since 2001 the smallmouth bass population

exploded; electrofishing catch rates that were 0.15 bass/hr in 2001 escalated to 35.84 bass/hour in 2004. Smallmouth bass are now the dominant threat. This year though channel catfish were targeted for removal; smallmouth bass removal was the primary study objective.

Study Design

The river was stratified into 10, 4-5 mile reaches that were equidistant to those used in the earlier study (1998-99). River reaches were used to monitor bass movement and to make statistical comparisons. The method used was electrofishing with one e-raft per shoreline using two chase boats. A mark-recapture design was used for both species to establish bench-mark population estimates from which depletion was measured. We estimated population size and then removed as many bass and catfish as possible. This year, one marking pass for smallmouth bass and two for channel catfish preceded the removal passes. During the 2005 field season, 2,671 smallmouth bass and 4,000 channel catfish were removed from the lower Yampa River (see Table 1).

2005 Sampling Results

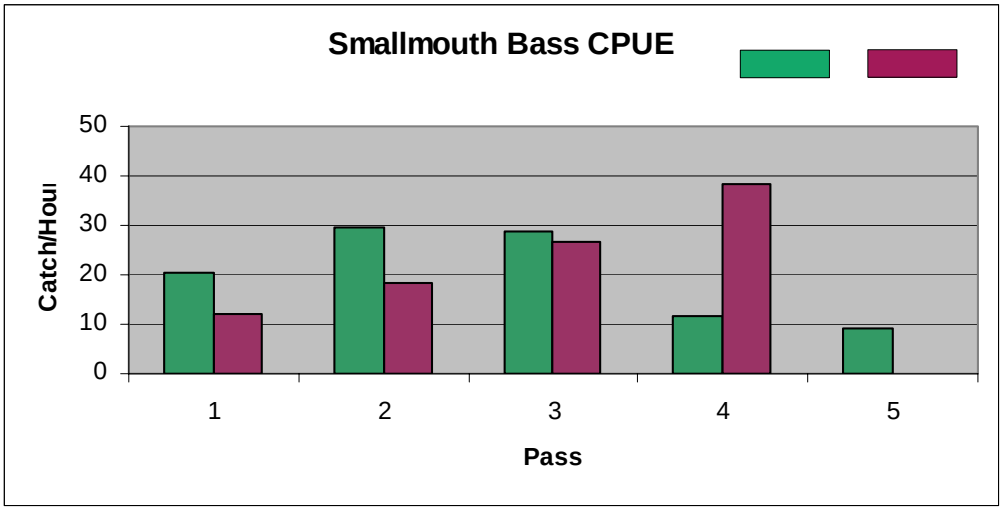
The 2005 effort began with a four-day mark and release pass during which 498 smallmouth and 86 channel catfish were measured, weighed, marked (blue floy-tags), and released back to the river alive. Though sufficient numbers of bass were marked, 535 more catfish were marked and released during the second pass (see Table 1).

Last year the mean length for bass was 185 mm as compared to 164 mm this year; a difference that might have been caused by age-3 and younger bass displaced by higher than normal water levels at the time of sampling. Higher than normal flows are known to displace bass (Cleary 1956). Flows believed responsible for moving low age class bass into the canyon were sustained above 7000 cfs later than June 24, at which time the median daily streamflow (based on 20 years of record) was under 4000 cfs.. This year, 9 bass that had been tagged with yellow floy-tags upstream and outside of the study area, were caught during routine sampling; seven of the nine were caught during the first two passes. Bass tagged upstream from the study reach were also collected downstream in the Green River later in the year (personal communication, Ron Brunson).

Table 1. Smallmouth bass and channel catfish collected from the lower Yampa River study area in 2005.

Pass	Date	Bass Marked	Bass Removed – includes Recaptures	Bass Recaptured	Catfish Marked	Catfish Removed	Catfish Recaptures
1	June 13-17	498	59	0	86	3	0
2	June 26-30	0	823	17	535	16	2
3	July 11-15	0	912	2>200mm	0	1340	8
4	July 18-22	0	487	5>200mm	0	1426	6
5	July 25-29	0	390	4.>200mm	0	1215	5
Total	25	498	2671	28	621	4000	21

Catch Rates Early catch rate increases between sampling events were



likely due to increased fish vulnerability to electrofishing with rising water temperatures and lower flows. For both species in 2005, once catch rates peaked, they decreased each subsequent pass (Figure 1). This is the first measured rate reduction to occur for smallmouth bass in the lower Yampa River. This year's catch was highest during the second pass at 29.7 bass/hour and then it plummeted to 9.09 bass/hour by the last pass. The channel catfish catch per effort peaked during the third pass and decreased during the next two passes. Decreases were in-part caused by a change in electrofishing technique. During pass four and five we used smaller e-boats (catarafts) equipped with smaller generators. Despite this change the catch rate continued to taper off between the last two passes, the catarafts improved maneuverability and provided canyon access during flows less than 1000 cfs.

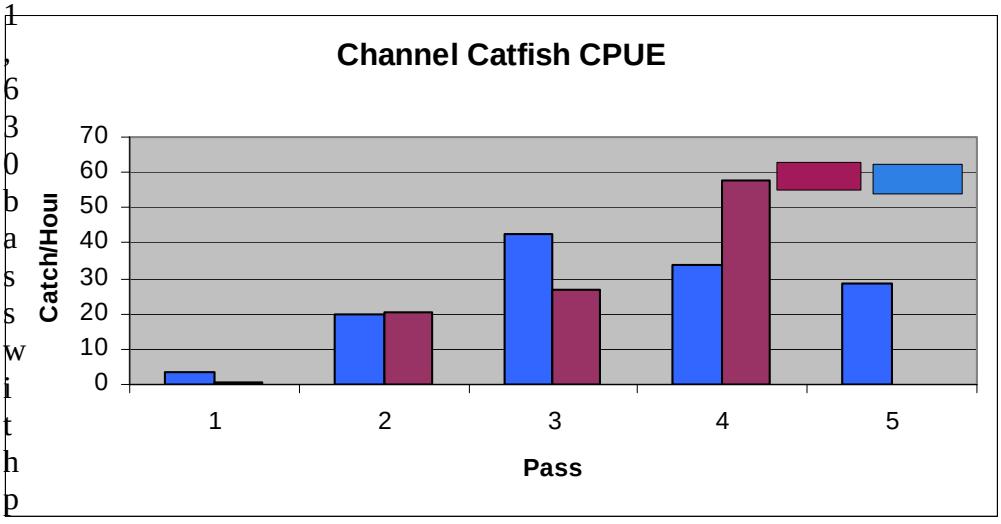
2005 2004

2004 2005

Figure 1. 2004 and 2005 bass and channel catfish catch/hour electrofishing.

Smallmouth bass Population Estimate

Smallmouth bass population size in Yampa Canyon was estimated using the program MARK. In 2004 a population estimate with constant probability of capture M(o) was used for pass 1 and 2. This estimate was recalculated to standardize estimates per year using M(t). The adjusted point estimate for 2004 is 2



1,630 bass with the probability of capture, (p-hat) 0.025 (Table 2).

The 2005 two-pass population estimate is 24,893 bass with standard error 5,875, and p-hat 0.0200. Fish density estimates ranged from 345-858 bass/rmi. The total number of smallmouth bass removed (n=2,671) equals 58 bass/rmi. Using this estimate 10.7% of the population was removed. Though this point estimate is higher than reported last year, it is believed that the first two electrofishing passes corresponded with flows that were displacing bass from upstream into the study area.

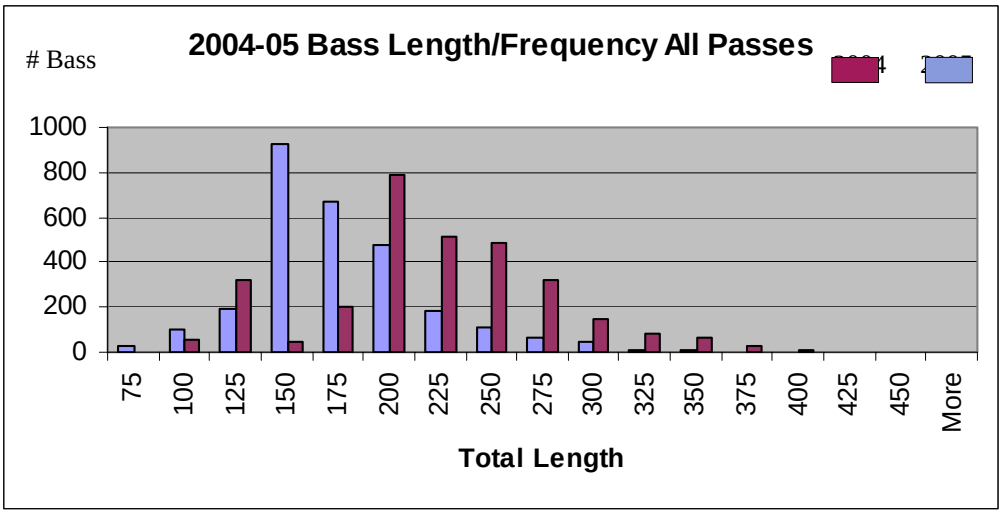
Table 2. 2004-2005 smallmouth bass population estimates.

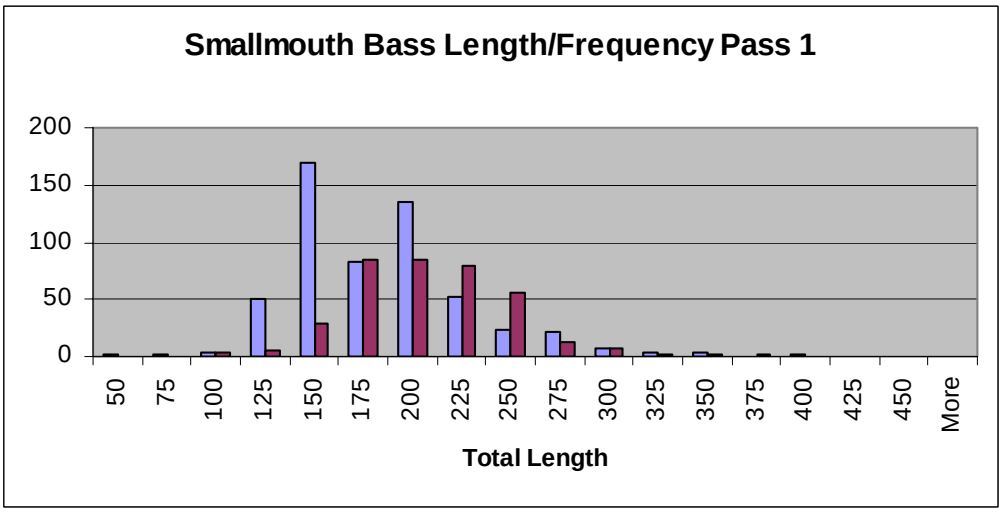
Year	Type	Model	Sp	N	C.I.	SE	P-hat	CV	Rem	%
2004	MARK	M(t)	SM	21,630	11,729-40,579	7,060	.025	.33	2,989	**14**
2005	MARK	M(t)	SM	24,893	15,890-39,460	5,875	.020	.24	2,671	**11**
									5,660	

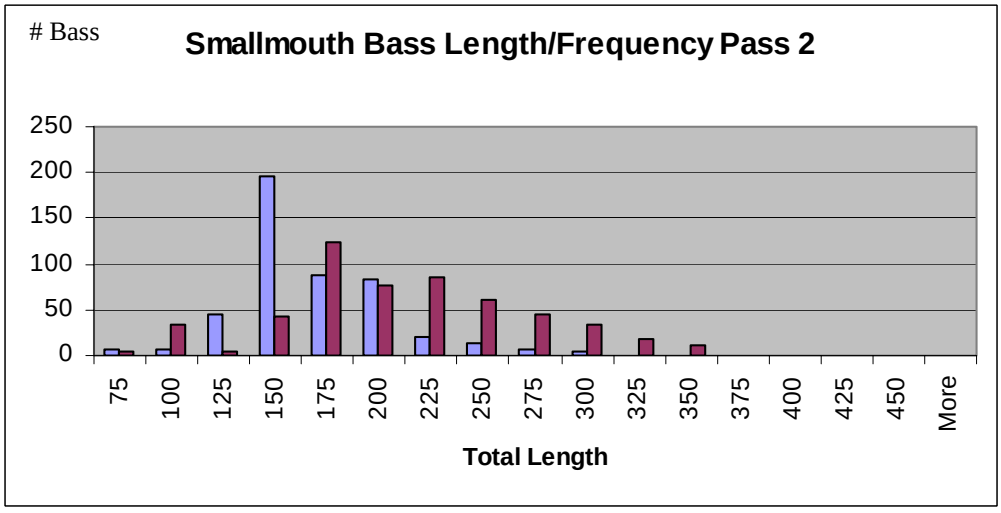
Smallmouth Bass Size

Mean total length (TL) of smallmouth bass collected for all passes was 164mm, 33mm smaller than in 2004. The bass most frequently caught in 2005 was150-175 mm (figure 2). Comparatively, very few bass in the150-175 mm size-class were collected in 2004. This may be indicative of poor recruitment in 2002 and 2003. This year's distribution of size implies age class consistency and steady recruitment since at least 1998.

Sequential differences in mean length between passes occurred. During the first pass the size most frequently collected was 150mm which continued until pass five. The distribution went from skewed to the side of smaller fish to the side of larger bass with each successive pass. By the last pass the most frequently collected size class was 175 mm, the age-4 cohort (Carlander 1977). This shift in catch frequency is likely the result of removing many 125-150 mm bass.


Bass
2004-05 Bass Length/Frequency All Passes
1000
800
600
400
200
0
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
More
Total Length


Smallmouth Bass Length/Frequency Pass 1
200
150
100
50
0
50
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
More
Total Length


Bass
Smallmouth Bass Length/Frequency Pass 2
250
200
150
100
50
0
75
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
More
Total Length

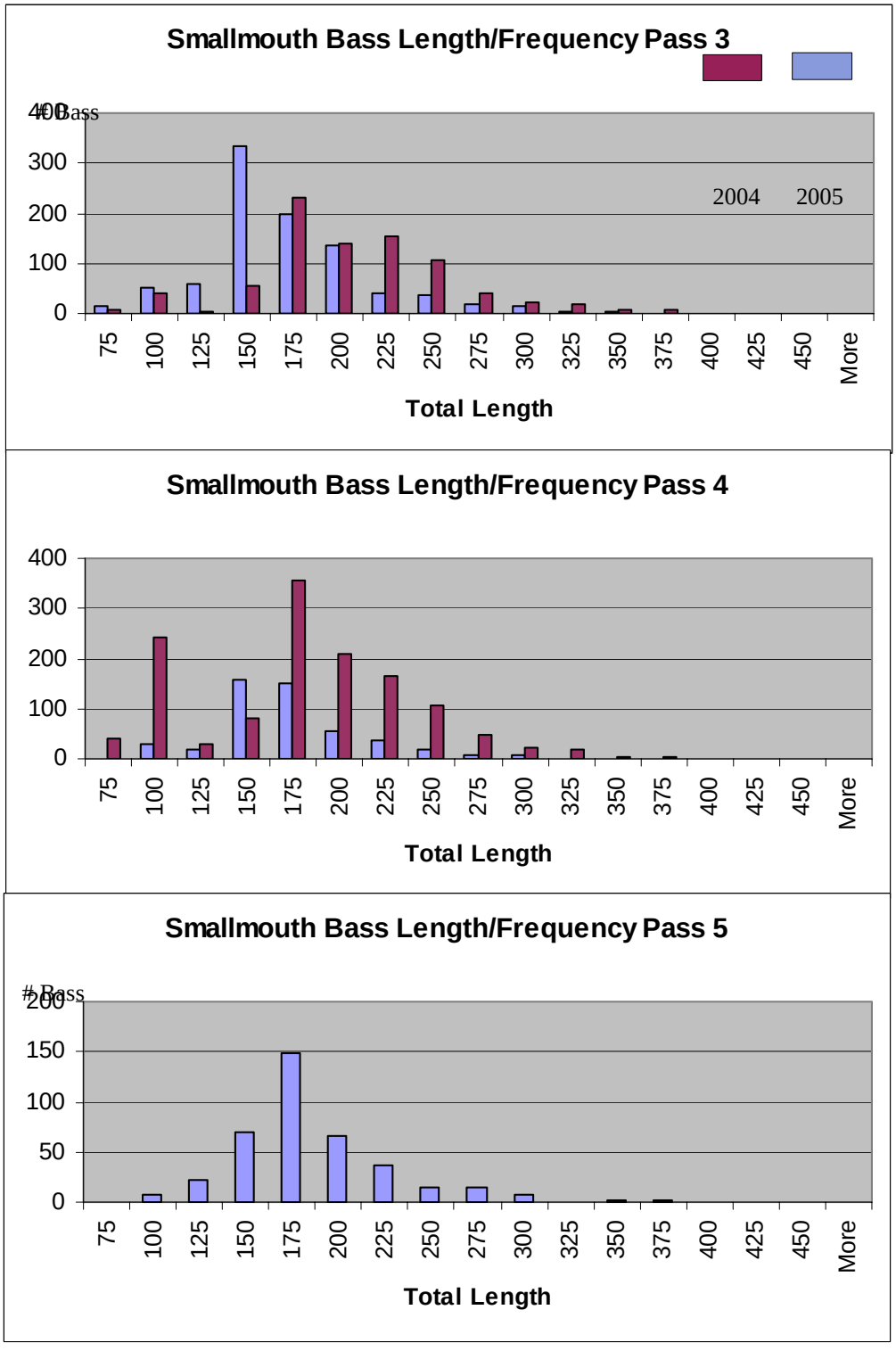


Figure 2.
2004-05 smallmouth bass electrofishing length/frequencies.

Smallmouth Bass Movement

The study area was stratified into 10 reaches of similar length (average distance/reach = 4.85 miles). Of 16 trackable recaptured bass, 5 or 31% did not leave the reach wherein they were originally caught. From the 11 that moved, 4 moved upstream and 7 moved downstream; however only 3 moved more than one reach downstream. Mean distance moved upstream was 19.4 rmi compared to 8.3 rmi downstream. Total distance separating first and second captures was 77.6 miles upstream and 58.2 miles downstream. Though fewer individuals moved upstream, there was 14.29% more upstream movement.

Channel Catfish Population Estimate

The 2005 three-pass channel catfish population estimate is 86,076 with standard error 26,922, coefficient of variation .31,and p-hat 0.0217. Fish density estimates ranged from 1034-3415 catfish/rmi. The total number of catfish removed (n=4,000) is 87 catfish/rmi, a 4.6% population reduction. Larger numbers were calculated in the four-pass estimate (261,587) which is indicative of either a large migration of catfish into the study area, an increase in catfish accessibility to sampling, or both.

Channel Catfish Size

Mean total length (TL) of channel catfish collected for all passes was 274 mm and the median was 259 mm. The most frequently collected size interval was 275 mm (Figure 3). Comparatively, the mean and median was very similar in 2004, 282 and 265 mm respectfully, and the size class most frequently collected was the same. Sequential changes in mean length between passes were towards smaller fish. During the first pass the size interval most frequently collected was 375 - 400mm.

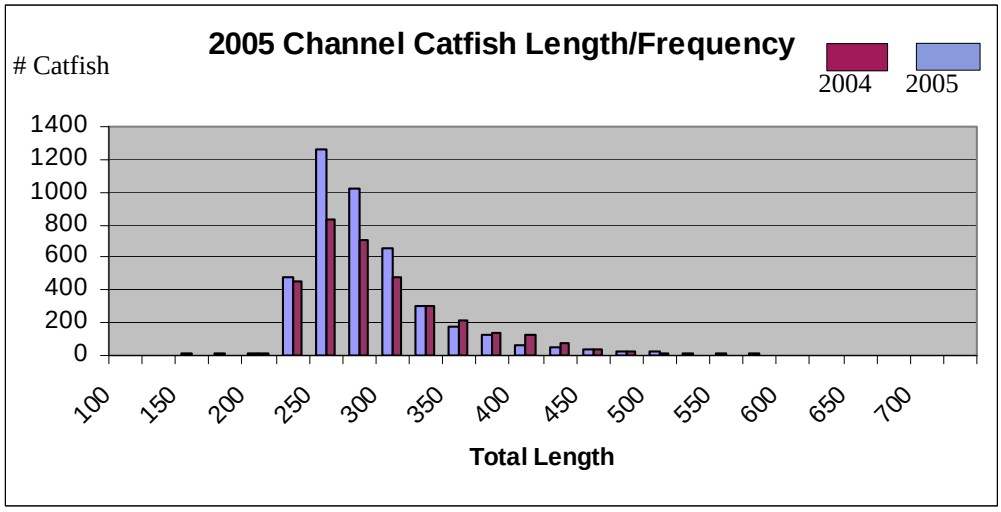
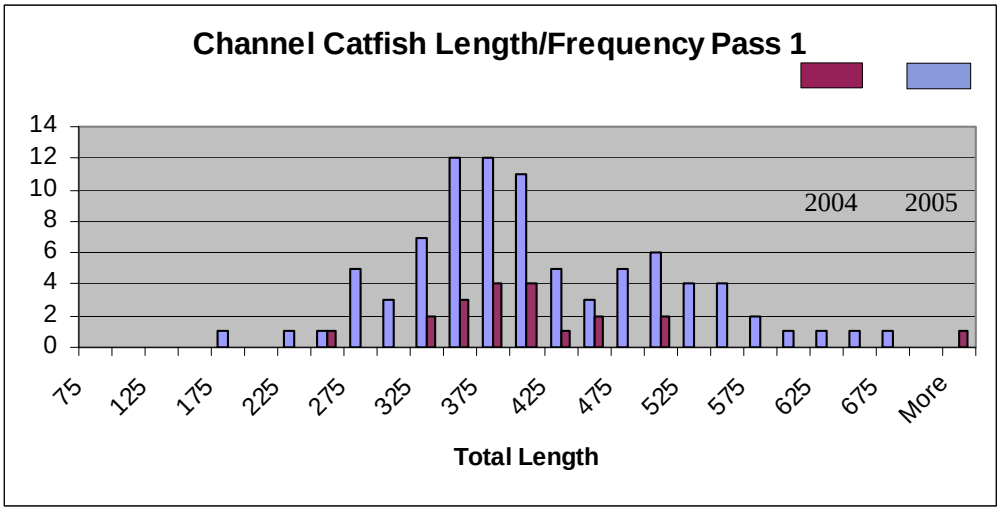
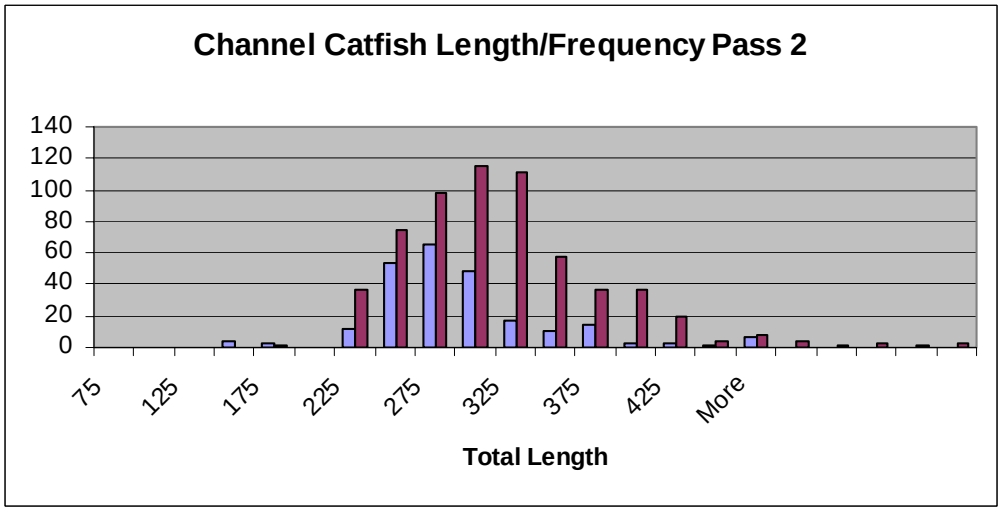
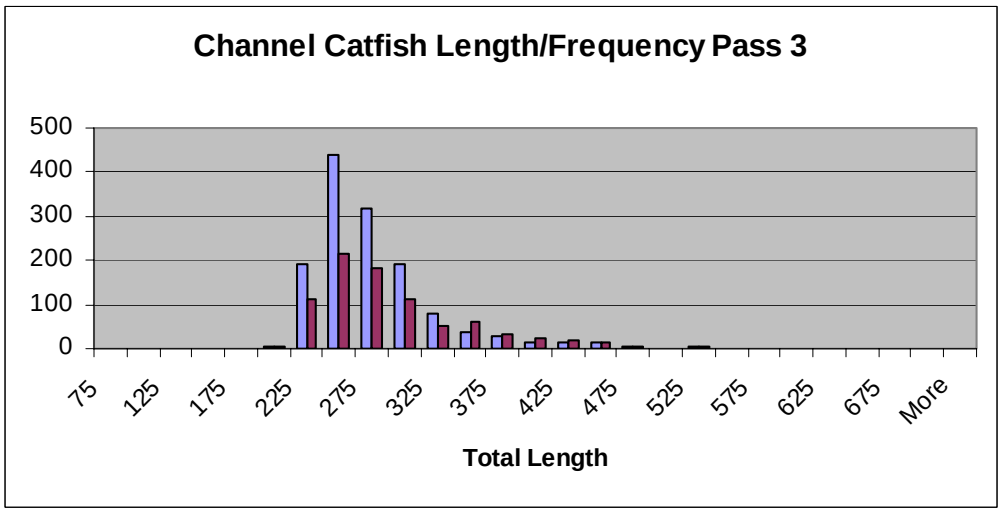
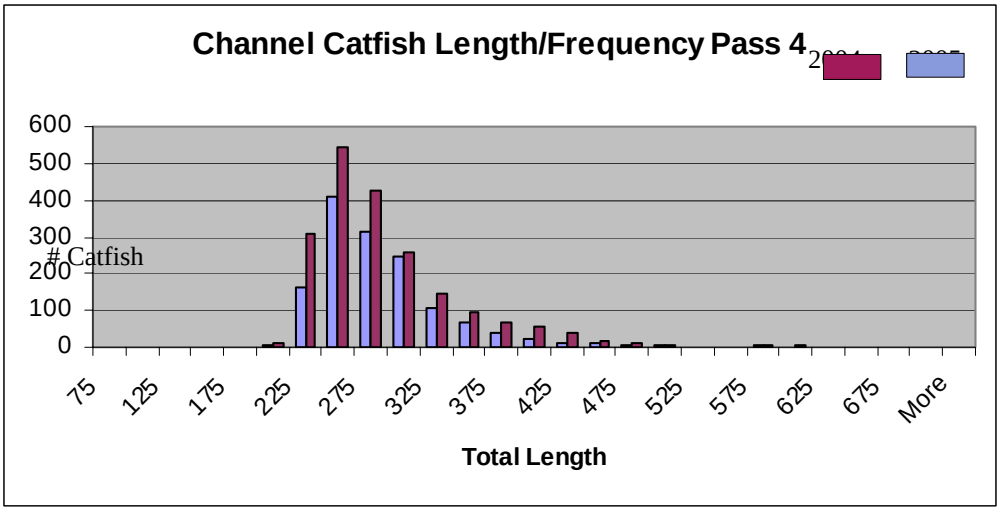


Figure 3. 2004-05 channel catfish electrofishing length/frequencies, all passes.


Channel Catfish Length/Frequency Pass 1
2004
2005
14
12
10
8
6
4
2
0
75
125
175
225
275
325
375
425
475
525
575
625
675
More
Total Length


Channel Catfish Length/Frequency Pass 2
140
120
100
80
60
40
20
0
75
125
175
225
275
325
375
425
More
Total Length


Channel Catfish Length/Frequency Pass 3
500
400
300
200
100
0
75
125
175
225
275
325
375
425
475
525
575
625
675
More
Total Length



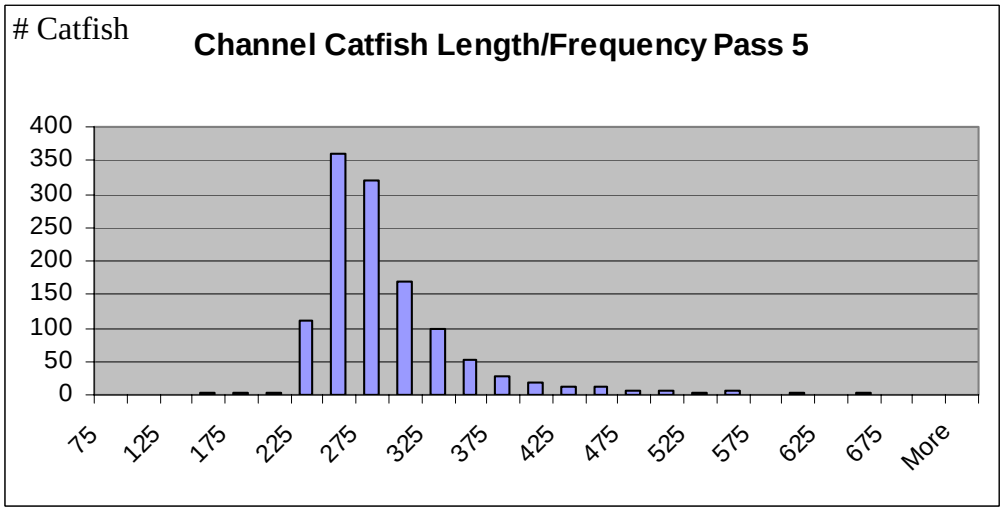


Figure 4. 2004-05 channel catfish electrofishing length/frequencies.

Size reduction with sequential passes ended with the most common size interval being 250 mm. Events causing this shift include; increased sampling vulnerability that develops for smaller catfish as sampling progresses into summer (as flows recede and temperatures rise); by possible fish migration in and out of the study area and by physical removal and mortality. Large catfish are believed to migrate into the canyon in the spring to spawn; and small catfish may be migrating into the canyon as spring flows descend.

VII. Recommendations:

1. We recommend that removal efforts of smallmouth bass and channel catfish from the Yampa River in DNM be continued.

2. Because electrofishing continues to be the best known sampling method, we recommend it's continuance which would include low water level shocking techniques i.e. catarafts and electric seines.

3.We recommend collecting and processing all fish in several one-mile reaches to determine fish composition and the native fish response to mechanical removal.

VIII. Project Status:

This project continues through 2007.

IX. FY 06 Budget Status:

		Total
A.	Funds Provided:	120,435
B.	Funds Expended:	120,435
C.	Difference:	0
D.	Recovery Program funds spent for publication charges:	$0

X: Status of Data Submission:

Data is being entered in dBASE files and will be submitted to the program data base manager upon completion of the study.

XI. Signed: *Mark H. Fuller* November 9, 2005

Principal Investigator Date

XII. References:

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