COLORADO RIVER RECOVERY PROGRAM
FY 2004 ANNUAL REPORT

RECOVERYPROGRAM
PROJECT NUMBER 110

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

Note: Synthesis report of 2004, 2005, and 2006 due in March 2007.

II. Principal Investigator(s):

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Product Summary: The recent proliferation and expansion of smallmouth bass in the middle Green River and its tributaries threatens native fishes and the recovery of four endangered fishes (humpback chub, Colorado pikeminnow, bonytail chub and razorback sucker). The potential impacts of smallmouth bass predation has caused the emphasis of nonnative fish control to shift from the more abundant channel catfish to this more voracious centrarchid. The goal of this project is to reduce the number of smallmouth bass and channel catfish to the point where they no longer are an impediment to recovery in the lower Yampa River. The control strategy, as related to the strategic plan for nonnative fish control (Tyus and Saunders 1996), and as recommended for controlling centrarchids (Lentsch et al. 1996), is removal from the main river channel using mechanical techniques (e.g., electrofishing, trapping, angling etc.). To accomplish this task the two most efficient methods of removal, as identified in Yampa Canyon (Modde and Fuller 2000), were used (electrofishing and volunteer assisted angling). This year 2989 smallmouth bass and 7256 channel catfish were removed from the lower Yampa River (see table 1).

IV. Study Schedule:
a: Initial year: FY01
b: Final year: FY06

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).

IV Accomplishment of FY04 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Study Area

The entire study area, river mile 46-0, is within the Dinosaur National Monument. The upstream end, rivermile 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 Yampas' confluence with the Green River just upstream from Echo Park.

Background

In 1998-99 a feasibility study was designed to reduce channel catfish, which, at that time, was the most abundant, problematic nonnative fish in the Yampa River. During the pilot study 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. One year later this study was designed to reduce channel catfish from the study area in its entirety. Since 2001 smallmouth bass proliferation throughout the canyon has exploded; electrofishing catch rates that were .15 bass/hr in 2001 escalated to 35.84 bass/hour in 2004. Brought on by conditions of drought, smallmouth are now believed to be the predominant threat. This year though catfish were removed; smallmouth bass control was the primary study objective.

Study Design

The river was stratified into 10, 4-5 mile reaches that were equidistant to those stratified in the earlier study (1998-99). River reaches were used to monitor bass movement and to make statistical comparisons. Once again, the methods used were electrofishing and volunteer angling. To measure smallmouth bass depletion, a mark-recapture design was implemented. The task was to estimate smallmouth bass abundance and then remove as many bass and catfish as possible; catfish depletion would be measured if a regressive catch rate was accomplished. This year, one electrofishing smallmouth marking pass preceded three electrofishing and two angling removal passes (it took two trips to complete one angling pass).

2004 Sampling Results

The 2004 Deerlodge Park to Echo Park smallmouth bass/channel catfish control effort started with an early spring smallmouth bass mark-release and channel catfish removal pass April 14-17. Two electroshocking rafts were used to sample both shores of the Yampa's lower 46 miles. 360 smallmouth were measured, weighed, marked (with blue floy-tags), and released back to the river alive. Though the bass catch was successful, few channel catfish were captured and removed (n=19), (see Table 1).

All six passes (four electrofishing and two angling) were completed this year. During the four electrofishing passes, 3066 smallmouth bass (mean length 185mm), and 3433 channel catfish (mean length 282mm) were collected. Electrofishing was the most efficient method for collecting bass. The volunteer angling effort began June 21st and continued through July 22nd. During these two passes (four trips) 285 bass and 3790 catfish were collected. Low angling catch rates for bass were evidenced especially when turbidity was high and visibility was low. Bass catch rates increased with angler experience and as water clarity and temperatures increased. Angling for catfish continued to be the best method by number/pass; during the first angling pass 2606 catfish were collected. In the aggregate 2989 bass and 7256 catfish were removed and disposed of in accordance to National Park Service recommendations (See Table 1).

Table 1. Smallmouth bass and channel catfish collected from the lower Yampa River study area in 2004.

Pass	Smallmouth bass Marked and Released	Smallmouth Bass Removed – includes Recaptures	Smallmouth Bass Recaptured	Channel Catfish Removed
1	360	3	0	20
2	0	542	9	612
3	0	834	16	841
4	0	1327	20	1991
5	0	70	0	2606
6	0	213	6	1186
Total	360	2989	51	7256

Catch Rates

Catch rates were not sufficient to demonstrate reductions in catch per effort within reaches. Catch rates for both species increased during all electrofishing passes (see figures 4 & 9). Increases between passes were likely due to differences in vulnerability resulting from changes in flow (5,000 cfs vs 1,000 cfs), and/or increased water temperatures between collections. Angling catch rates for bass increased each trip and is likely explained by angler experience and improved water clarity and temperatures brought over the sampling period. The only occasion when catch rates decreased was from pass 5 to 6 when catfish/hr angling decreased by .18/hr.

Smallmouth Bass Population Estimation

Smallmouth bass population in Yampa Canyon was estimated using the program Capture. A population estimation with constant probability of capture was used M(o) for pass 1 and 2. The total number of captures, n, was 902. The number of bass captured, M(t+1), was 893. The population estimate for this section of the Yampa River is 14,861 with standard error 3894.89, and estimated probability of capture, p-hat 0.0303. Fish density estimates ranged from 197 to 538 bass/rmi. The total number of smallmouth bass removed (n=2989) relates to 65 bass/rmi.. From this estimate a 20.1 % reduction in population was attained, or according to a 95% confidence level 33-59% of the population was removed. The percent of the population removed per pass and a theoretical removal projection are illustrated in figures 5 & 6. This estimate represents a measure useful in defining limitations and goals for control.

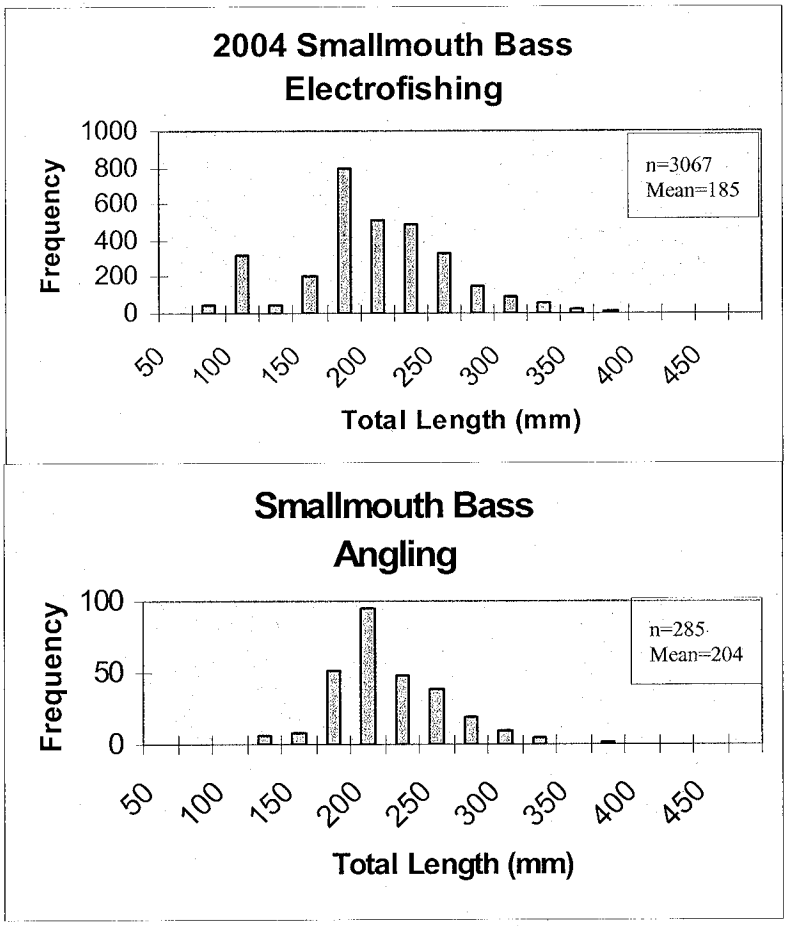
Smallmouth Bass Movement

The Yampa Canyon study area was stratified into 10 reaches of similar length (average distance/reach = 4.85 miles). Of the 360 bass that were marked and released during the first electrofishing pass, 51 were recaptured. Of these, 26 did not leave the reach wherein they were originally caught. From the 25 that did move, 18 or 72% moved upstream. 83 % of the fish that moved upstream moved a distance of 2 or more reaches. The maximum distance moved (2 individuals) recorded within the study area was 7 reaches upstream, approximately 31.36 miles. Of the 7 that moved downstream only 2 moved more than 1 reach; the maximum distance moved downstream was 8.96 miles (see figure 7).

Smallmouth Bass Size and Age

Mean smallmouth bass length collected by electrofishing was 185 mm, and by angling 204 mm. Bass caught electrofishing were smaller than those caught angling because smaller bass were less vulnerable to angling, (see Figure 1). Bass in Yampa Canyon experience slow growth yet years with lower flows yielded more otolith growth and larger first-year fish (B.J. Weibell 2004). Catch frequencies indicate large age-class cohorts in 1998, 2000 and 2001 (see figure 8).

Figure 1. 2004 length frequency of smallmouth bass caught electofishing and angling in the lower Yampa River.



Channel Catfish Catch Rates

Catch rates were not sufficient to demonstrate reductions in catch per effort within reaches. Catch rates for catfish increased during all electrofishing passes (see figure 9). Increases between passes were likely due to differences in vulnerability resulting from changes in flow (5,000 cfs vs 1,000 cfs), and/or increased water temperatures between collections. The only occasion when catch rates decreased was from pass 5 to 6 when catfish/hr angling decreased by .18/hr.

Channel Catfish Size

2004 mean channel catfish length by electrofishing was 282mm and by angling 204mm. Though a level of significant reduction has not been shown since 1999 a decreasing trend of mean catfish length is evident. Channel catfish collected by electrofishing have been consistently larger than those caught angling. This may be a result of our electrofishing schedule and catfish movement into Yampa canyon during the spring spawn (Rick Anderson personal communication), or due to smaller catfish migrating into the canyon during the summer.

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 is more efficient than angling for smallmouth, we recommend increasing the electrofishing effort and improving low water level shocking techniques.

3. To better measure channel catfish depletion, we recommend implementing a mark-recapture study design for catfish.

VIII. Project Status:
This project continues through 2006.

IX. FY 04 Budget Status:

		Total
A.	Funds Provided:	127,700
B.	Funds Expended:	127,700
C.	Difference:	0
D.	Program 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, 2004
Principal Investigator Date

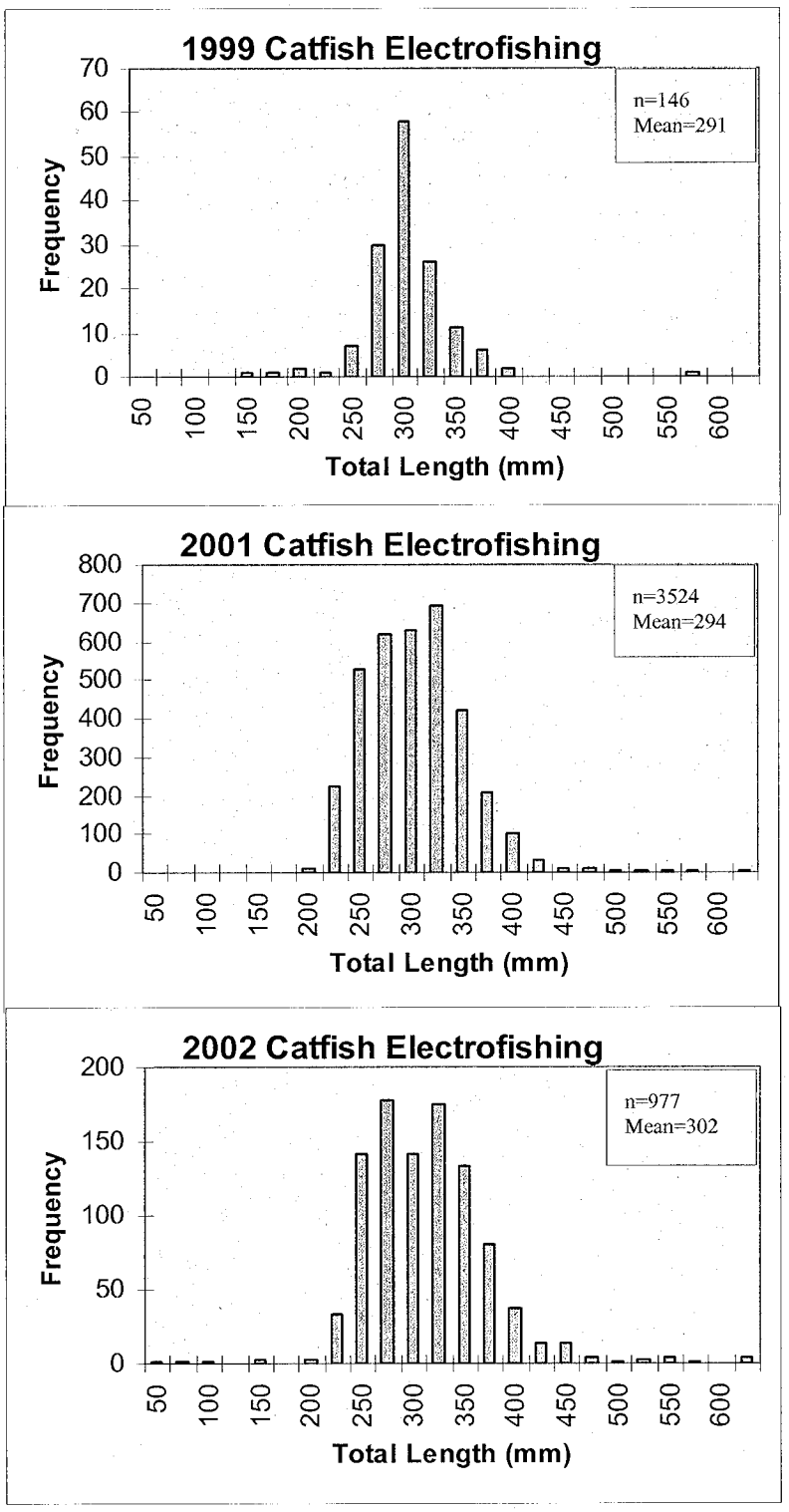
XII. References:

Modde, T., and M. Fuller. 2002. Feasibility of channel catfish reduction in the lower Yampa River. Final Report, Project 88. Submitted to the Recovery Implementation Program, U.S. Fish and Wildlife Service, Denver, CO.

Tyus, H.M., and J.F. Saunders. 1996. Nonnative fishes in the upper Colorado River basin and a strategic plan for their control. Final Report of University of Colorado Center for Limnology to Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

Lentsch, L.D., R.T. Muth, P.d. Thompson, B.G Hoskins and T.A. Crowl. 1996. Options for selective control of nonnative fishes in the upper Colorado River basin. Utah Division of Wildlife Resources Publication 96-14, Salt Lake City, Utah.

Figure 2. 1999 – 2004 Length frequency of channel catfish collected electofishing in the lower Yampa River.



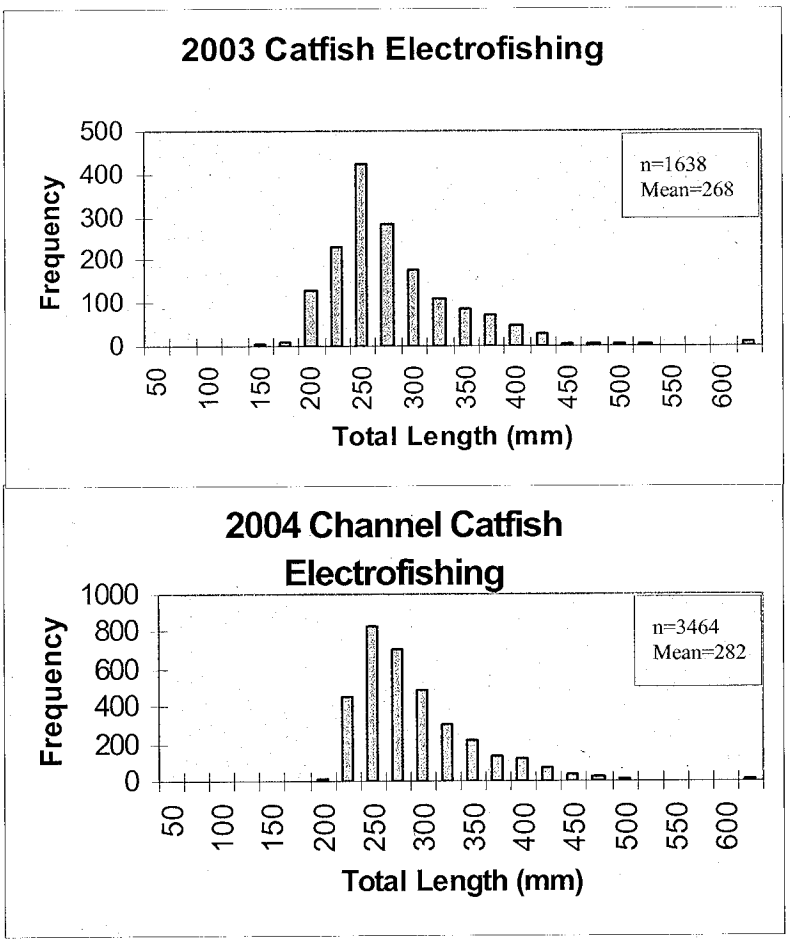
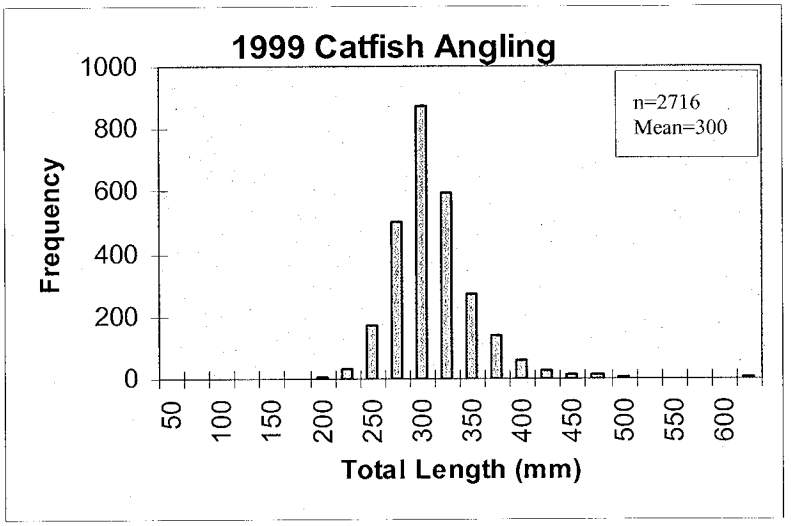
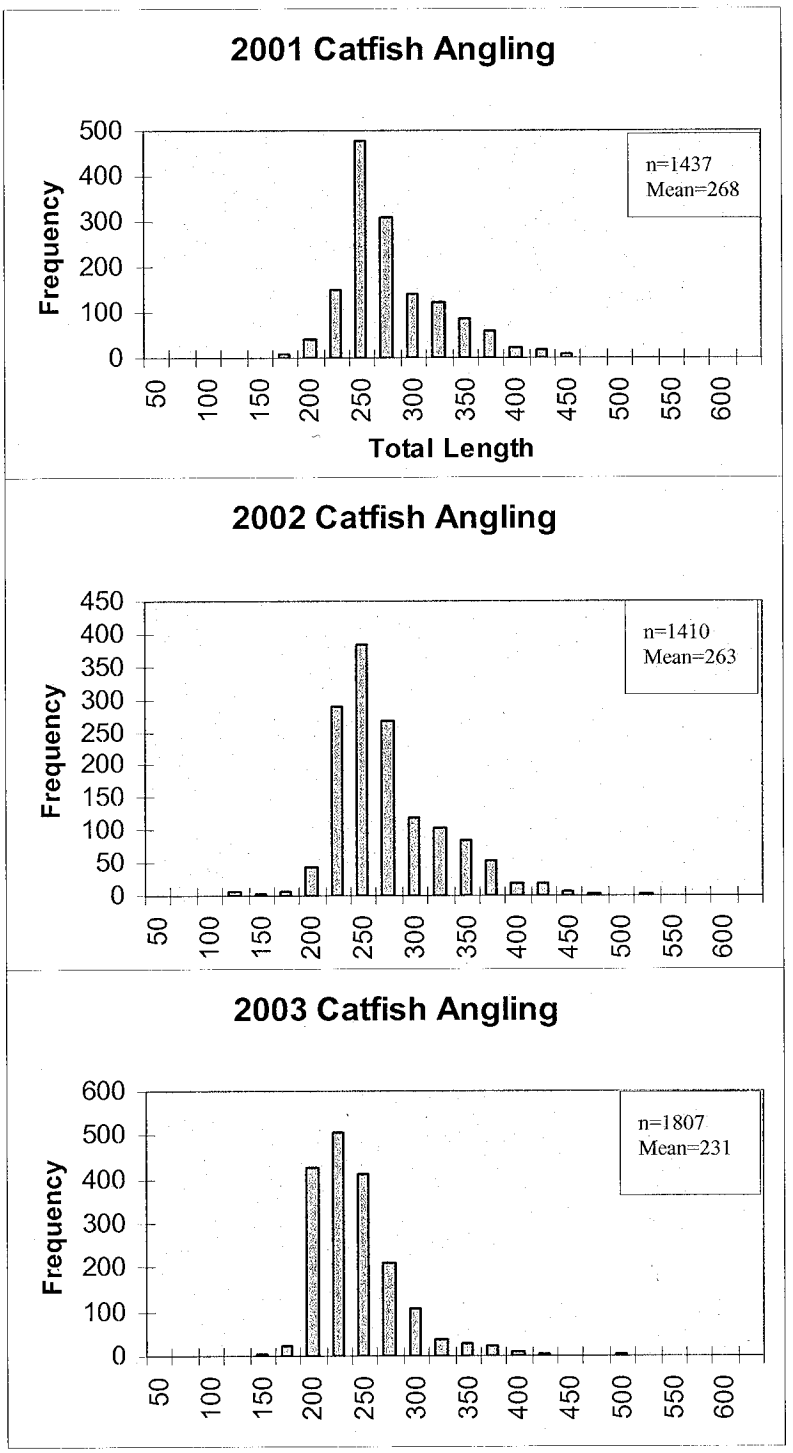


Figure 3. 1999 – 2004 Length frequency of channel catfish collected angling in the lower Yampa River




2001 Catfish Angling
Frequency
Total Length
n=1437
Mean=268
2002 Catfish Angling
Frequency
n=1410
Mean=263
2003 Catfish Angling
Frequency
n=1807
Mean=231

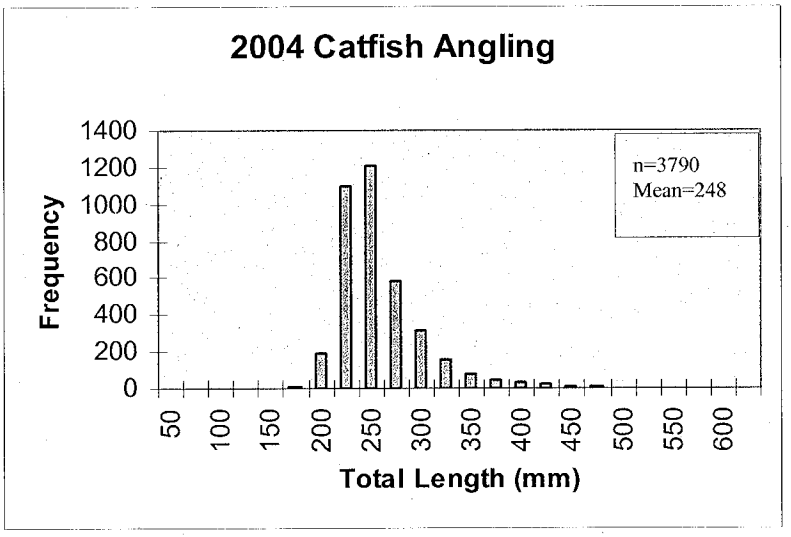


Figure 4 . 2004 smallmouth bass catch per hour electrofishing with flow.

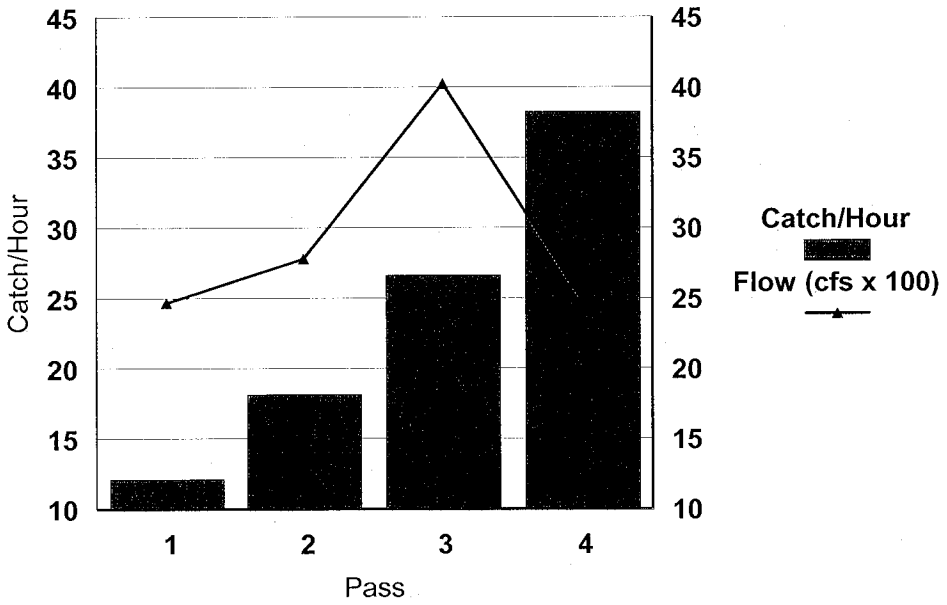


Figure 5. Percent smallmouth bass removed per pass electrofishing and angling.

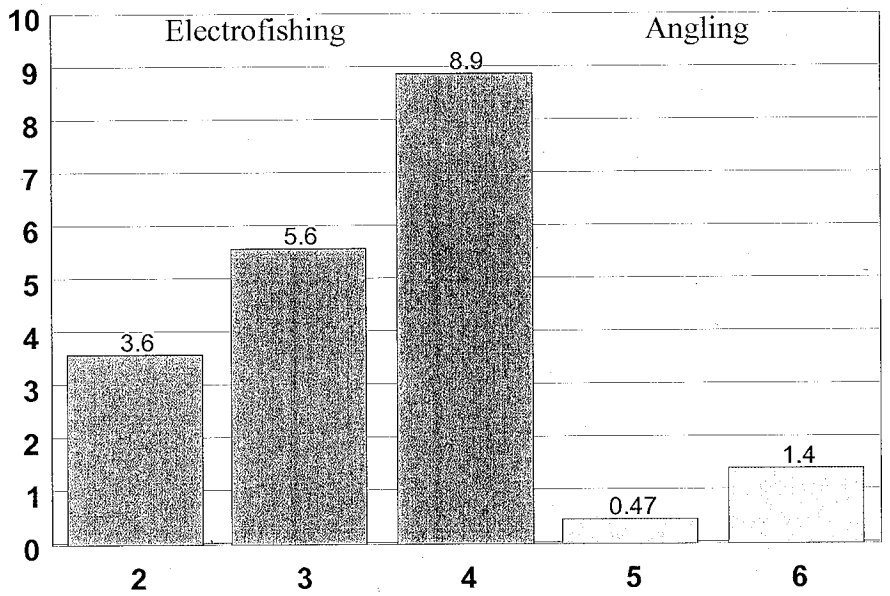


Figure 6. 2004 theoretical smallmouth bass depletion projection by electrofishing three passes/year.

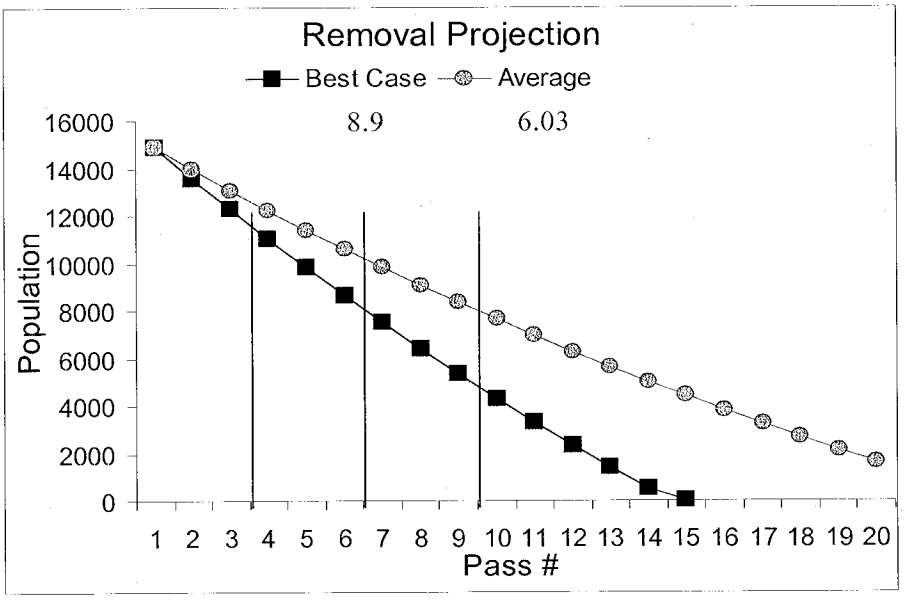


Figure 7. 2004 smallmouth bass movement; the distances from capture (0) to point of recapture (river mile).

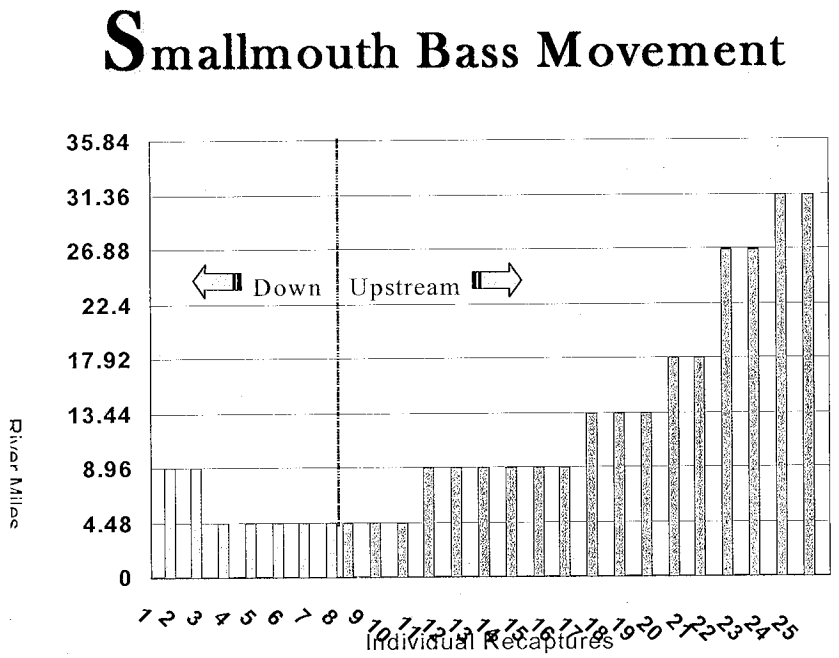


Figure 8. 2004 smallmouth bass year-class cohorts, total numbers and total lengths

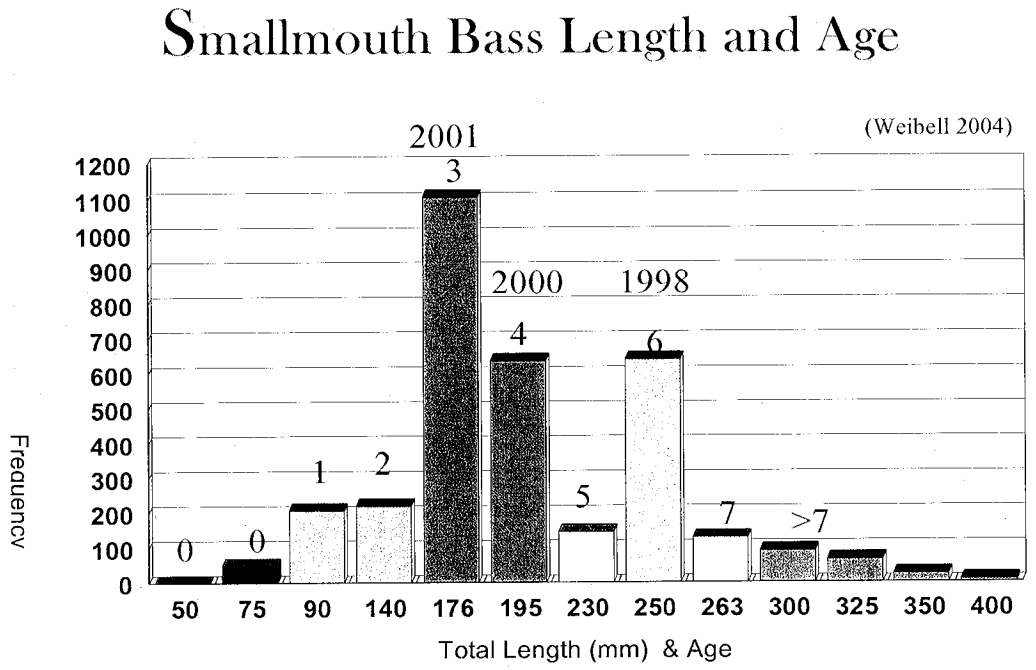
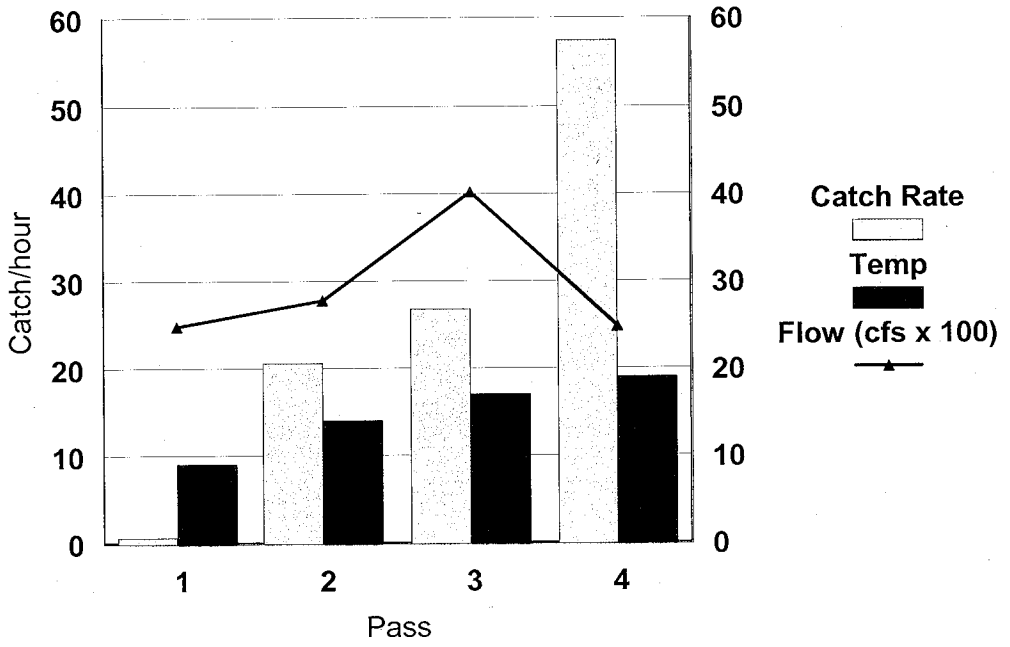



Figure 9. 2004 channel catfish catch per hour electrofishing with temperatures and flow.