

COLORADO RIVER RECOVERY PROGRAM
FY 2011 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 123a

I. Project Title: Smallmouth Bass Control in the Green River

II. Principal Investigator(s):
Lead Agency: USFWS

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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. This project began in 2004 in an effort to determine smallmouth bass abundance and to reduce the negative impacts of nonnative fish species in the Green River. In 2007 additional passes were added to the project in order to model the level of effort needed to detect a population decline. Twelve passes were conducted from Echo Park through Split Mountain, including two passes where bass were marked. Three passes of removal during Colorado pikeminnow estimate sampling (FWS-Vernal) and one bass control trip (UDWR-Moab) were also conducted in Desolation Canyon this year to assess reported increases in bass densities there.

IV. Study Schedule: On track and to be continued as needed.

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.A.4. Develop and implement control programs for nonnative fishes in river reaches occupied by the endangered fishes to identify required levels of control.

VI. Accomplishment of FY 2011 Tasks and Deliverables, Discussion of Initial Findings and

Shortcomings:

Task 1. Eight removal passes from Echo Park to Split Mountain boat ramp (USFWS CRFP – Vernal; August – October 2011). Task 2. Two marking and two removal passes from Echo Park to Split Mountain boat ramp (UDWR Moab; June–August 2011). These task are combined for discussion of results in the Echo to Split Mountain section.

Twelve sampling passes were completed from Echo Park to Split Mountain Canyon. The low number of fish tagged and no recaptures in the subsequent pass precluded estimating the population with the Lincoln-Petersen method. Without a population estimate, it is not possible to determine the exploitation rate achieved this year. We are investigating other methods for estimating bass abundance in this reach, but those results are not available at this time.

Abundance Estimates, Exploitation, and Population Size Structure

Smallmouth bass (35 adults, 37 subadults) were marked with green Floy® tags on the fifth and sixth passes. No tagged fish were recaptured until pass eight. During the course of the study, only five tagged adults (15% of tags) and three subadults (8%) were recaptured. With such low recapture rates, estimating the population size will likely be difficult, but we are currently looking for other suitable methods. One hundred twenty-three adults and 133 subadults were removed from the population during the study period (Table 1). This includes smallmouth bass removed during two additional passes conducted collaboratively with CSU. These fish are reported here for the purpose of reporting overall removal, since nonnative fish removal is not the main goal of that study. Other fish captures from the CSU Lodore passes are reported under the Project 115 report.

The length frequencies of bass captured for the July through early August period and August-September period are shown in Figures 1a-b. Figure 2 shows length frequencies as percent of catch for all fish captured in 2008 through 2011. Adult fish made up a larger proportion of bass captured, although the total number caught was lower for every size class. No young-of-year bass were captured this year. Only one fish <100mm was caught in the last 6 passes, and it measured 93mm. It is likely that any fish spawned this year would have been too small to capture with electrofishing gear during the study. We have been able to track a cohort of bass spawned in 2007. These fish had started to recruit to adult size in 2010. Despite this large cohort, there was not an increase in adult captures this year. Coupled with the overall low catch rates and total captures, this would suggest these fish had low survival over the past year.

Catch Rates

Catch rates for smallmouth bass generally declined over the season (Figure 3). This was mainly influenced by decreasing catch rates for adult fish. We again noticed increased catch rates following increased turbidity from storm events. The overall catch rate for this reach decreased again compared to previous years (Figure 4). The trend in catch rates, as

well as total captures, suggests there has been a decline in the number of smallmouth bass in this reach over the last four years.

Movement

Seventeen tagged bass (13 adults, 4 subadults) were recaptured during the study. Of the fish tagged this year, all adults (n=4) were recaptured in the same reach in which they were tagged. One subadult was recaptured one reach downstream, and two remained in their original reach. No bass tagged in this study reach were caught upstream in Yampa Canyon. There were two adult bass with red tags (from Uinta Basin reach) that had been at large since 2009. One fish was recaptured in Whirlpool Canyon and was a female expressing eggs. The other was captured in Split Mountain. A subadult tagged downstream also moved into our study reach.

This year, six adult fish tagged in 2010 were recaptured. Four of these were recaptured in the same reach, and the other two had moved downstream into the Island Park reach. Tag data also allowed for the estimation of growth rates during the study period. Adults grew an average of 0.56mm/day, and subadults grew 0.75mm/day.

Ancillary Fish Captures

In addition to the smallmouth bass in the reach, numerous other nonnative and native species were captured (Table 2). Walleye captures remained relatively high this year, but were similar to the last few years. Walleye averaged 496mm total length (412-685mm), and most of the walleye (54%) were caught in Split Mountain Canyon. Small, unidentified chub (*Gila spp.*), presumably roundtail chub, were captured in much higher numbers this year, indicating these fish were successful in reproducing in the last two years. One tagged northern pike was also captured. Records indicate this fish was tagged by Colorado Parks and Wildlife in the Yampa River at river mile 81.6 in 2006.

Two bonytail were also recaptured in Whirlpool Canyon. These fish were stocked in September 2010 at Echo Park and had been at large almost a year. These fish make a total of three bonytail recaptured this summer from last fall's stocking at Echo Park.

Task 3. Two removal passes in Desolation/Gray Canyons (UDWR Moab)

Only one removal pass was completed by UDWR Moab due to high spring flows continuing into the end of July. The delay was experienced for most recovery program projects and caused a compression of work in terms of available time and manpower. In terms of catch rates and distribution, only the UDWR removal will be presented and compared to past years to maintain consistent timing (late summer-fall). The additional bass removed during the Vernal FWS pikeminnow estimates (early spring) will be discussed but not compared to past results. During four passes of sampling 421 smallmouth bass were removed during 187.5 hours of electrofishing in Desolation/Gray Canyons (Table 3).

Catch Rates, Distribution, and Size Structure

Overall smallmouth bass catch rates for Deso/Gray have increased to 4.54 fish per hour, which is the second highest rate observed since 2004 and 40% higher than recorded during 2005–08 (Figure 5). Most of the increase in catch rates was driven by higher juvenile catches, especially in the upper 20 miles of the reach (Figure 6). The average catch rate for juveniles was 2.92 across the entire reach, but on a sectional scale (approx. 5 miles) the maximum catch rate was 9.98 fish per hour (Figure 6). Adult catch rates have dropped significantly since 2004, with an average CPUE of 1.48, which is the lowest catch rate in the Green River basin.

While it is encouraging that adult bass numbers appear to have remained low or be declining over the last eight years, the current increase in juvenile catch demonstrates successful spawning and recruitment within the reach. The juvenile fish captured this year averaged 139 mm and ranged in size from 88–199 mm; from past growth rates these fish are likely recruits from 2009 and 2010 (Figure 7). If the current juvenile cohort successfully overwinters again they could provide a large influx of spawning age individuals throughout the reach.

The distribution of smallmouth bass within the Desolation/Gray Canyons has changed greatly since removal was initiated in 2004 (Figure 6). Both adults and juveniles have increased their distribution downstream by approximately 30 miles. The relative abundance of adults and juveniles within the reach has reversed since 2004, with adult catch rates declining nearly five-fold and juveniles increasing.

To compare removal efforts between spring and fall sampling in 2011 a length frequency histogram is presented for both time periods (Figure 7); they demonstrate that the spring catch is almost entirely adult fish, while the fall sampling captures a broader spectrum of cohorts. The lack of juveniles in the spring sampling is likely due to sampling methods which includes faster downstream speeds and a primary focus of capturing pikeminnow.

Ancillary Fish Captures

In addition to the smallmouth bass in the reach, numerous other nonnative and native species were captured (Table 4). Total walleye captures (51) increased greatly over past years, especially when spring sampling by the FWS is included. Walleye averaged 442 mm total length (358–657 mm), and captures were distributed throughout Desolation and Gray Canyons. Other nonnatives captured include brown trout (3), white sucker (1), and green sunfish (5). Common nonnatives like channel catfish and carp were present throughout but not netted.

All species of endangered fish were captured in the one fall pass completed by UDWR, with razorback sucker being the most common (35), followed by pikeminnow (27), humpback chub (18), and bonytail (1) (Table 4). The totals for all endangered fish captures do not include captures during the FWS sampling, which are reported under a separate project.

Task 4. Data entry, analysis, and reporting – October/November 2011.

Data entry is complete and will be transferred to the UCRRP nonnative database manager by the end of December 2011. This annual report completes the reporting requirement for the project however; these results will be presented, discussed, and analyzed further at the annual nonnative control workshop December 8–9, 2011.

VII. Recommendations:

- Continue this project to evaluate the ongoing removal of fish in the long term, as recommended by the Modde and Haines model. This season represented the fifth consecutive year of decreasing catch rates and overall number of bass caught. The removal of fish by this project, in addition to decreased reproduction and recruitment from unfavorable flows and water temperatures, appears to have reduced the population as a whole. Despite a large number of fish being produced in 2007, it appears this cohort did not recruit into adult size this year. When possible, restore funding to allow intensive removal in this reach in order to test and refine the validity of the Haines and Modde model.
- Continue to remove adult fish during the spawning season. By targeting the beginning of spawning for removal, more adults were removed early in the study when catch rates were higher. The number of adults declined dramatically after the initial passes, making their removal less likely. This approach will make estimating the population more difficult, but increases the chances of removing fish before they are able to reproduce.
- Monitor burbot and walleye captures closely. Both species should be collected for otolith microchemistry analyses in the future. This will allow us to determine their origin and what year they reached the river, presumably after escaping from nearby reservoirs.
- Continue one pass of smallmouth bass removal in Desolation/Gray Canyons by UDWR-Moab in the fall and continue bass and walleye removal by FWS-Vernal during spring sampling for Colorado pikeminnow in April and May. This allows control of adults prior to spawning periods and a period of control which can serve as a standard monitoring period (August).

VIII. Project Status: On track and ongoing

IX. FY 2011 Budget Status

- A. Funds Provided: **\$188,465**
- B. Funds Expended: **\$188,465**
- C. Difference: -0-
- D. Percent of the FY 2011 work completed, and projected costs to complete: 100%
- E. Recovery Program funds spent for publication charges: -0-

X. Status of Data Submission (Where applicable):

Project 123a-FY 2011 Annual Report- 5

Submission pending completion of reporting, expected no later than 12/31/2011.

XI. Signed: M.T. Jones & P. Badame 11/14/2011
 Principal Investigators Date
(Submitted electronically)

Table 1. Total fish caught by pass and size class, 2011(Echo-Split). Bass subadults and adults were tagged and released in passes 5 and 6. Removal occurred for all other passes. Parentheses indicate tags recaptured.

Pass	<100mm	Subadults	Adults	Total
1	0	5	8	13
2	7	8	16	31
3	5	16	22	43
4	12	15	16	43
5	12	24*	14*	50
6	4	20*	22*	46
7	0	13	9	22
8	1	10	4 (1)	15
9	0	22 (1)	9 (1)	31
10	0	20 (1)	13 (1)	33
11	0	12	8 (1)	20
12	0	3 (1)	8 (1)	11
CSU	0	2	9	11
Totals	41	170	158	369

Table 2. Ancillary fish captures in the study reach (Echo–Split).

Species	Number Captured
Black bullhead (<i>Ameiurus melas</i>)	13
Black crappie (<i>Pomoxis nigromaculatus</i>)	9
Bluegill (<i>Lepomis macrochirus</i>)	2
Green sunfish (<i>Lepomis cyanellus</i>)	60
White sucker and hybrids (<i>Catostomus commersonii</i> , spp.)	561
Northern pike (<i>Esox lucius</i>)	13
Walleye (<i>Sander vitreus</i>)	26
Colorado pikeminnow (<i>Ptychocheilus lucius</i>)	18
Razorback sucker (<i>Xyrauchen texanus</i>)	4
Razorback X Flannelmouth hybrid	1
Bonytail (<i>Gila elegans</i>)	2
Roundtail chub (<i>Gila robusta</i>)	17
<i>Gila</i> spp. (usually TL <100mm)	255

Table 3. Total fish caught by pass and size class, 2011(Deso–Gray). Smallmouth bass Removal occurred during all sampling passes.

Pass	YOY <100mm	Subadults 100-199mm	Adults >199mm	Total
1-FWS	0	1	62	63
2-FWS	0	1	124	125
3-FWS	0	6	66	72
4-UDWR	0	106	55	161
Totals	0	113	308	421

Table 4. Ancillary fish captures in the study reach (Deso–Gray). Nonnative totals include captures from FWS pikeminnow surveys and UDWR bass control. Native totals include only UDWR bass control.

Species	Number Captured
Green sunfish (<i>Lepomis cyanellus</i>)	5
White sucker (<i>Catostomus commersonii</i> .)	1
Northern pike (<i>Esox lucius</i>)	0
Walleye (<i>Sander vitreus</i>)	51
Colorado pikeminnow (<i>Ptychocheilus lucius</i>)	27
Razorback sucker (<i>Xyrauchen texanus</i>)	35
Razorback X Flannelmouth hybrid	0
Bonytail (<i>Gila elegans</i>)	1
Roundtail chub (<i>Gila robusta</i>)	0
Humpback chub (<i>Gila cypha</i>)	18

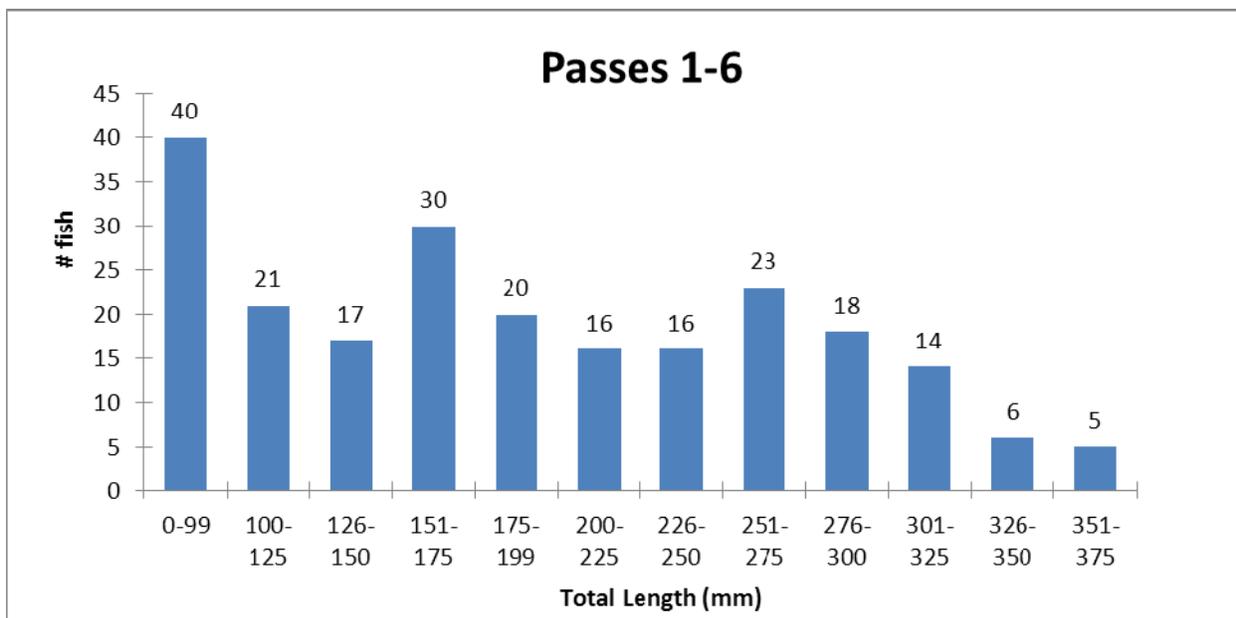


Figure 1a. Length frequency of smallmouth bass caught in July-early August 2011 (Echo–Split).

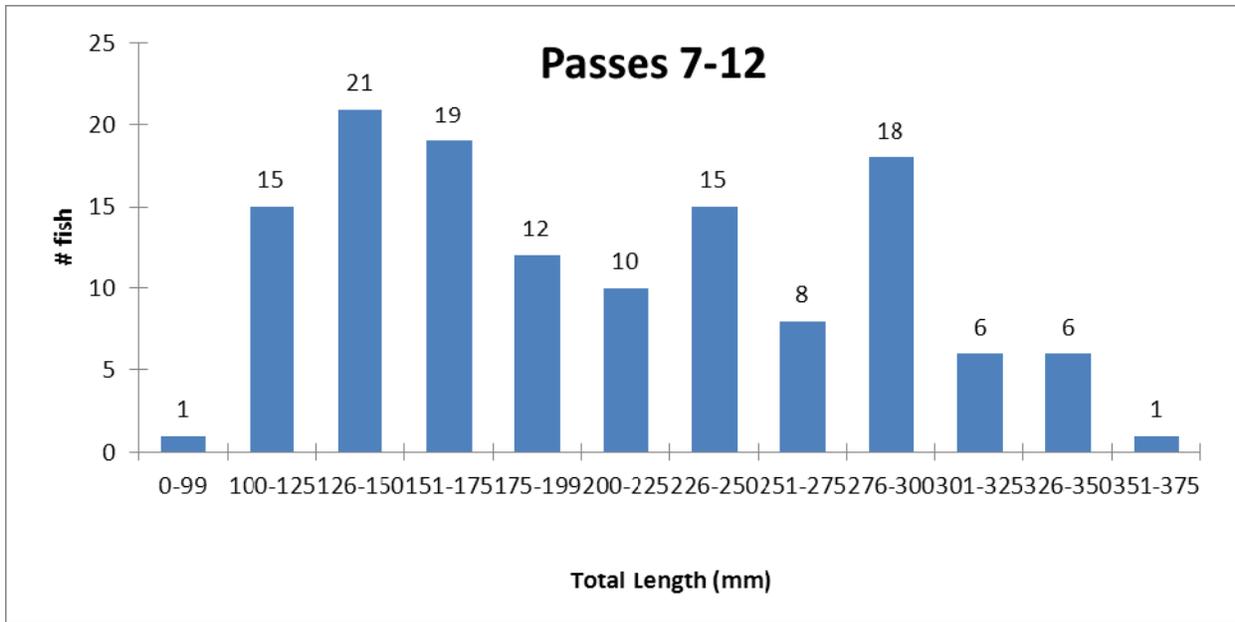


Figure 1b. Length frequency of smallmouth bass captured in the study reach (Echo-Split) at end of study (Aug.-Sept.) .

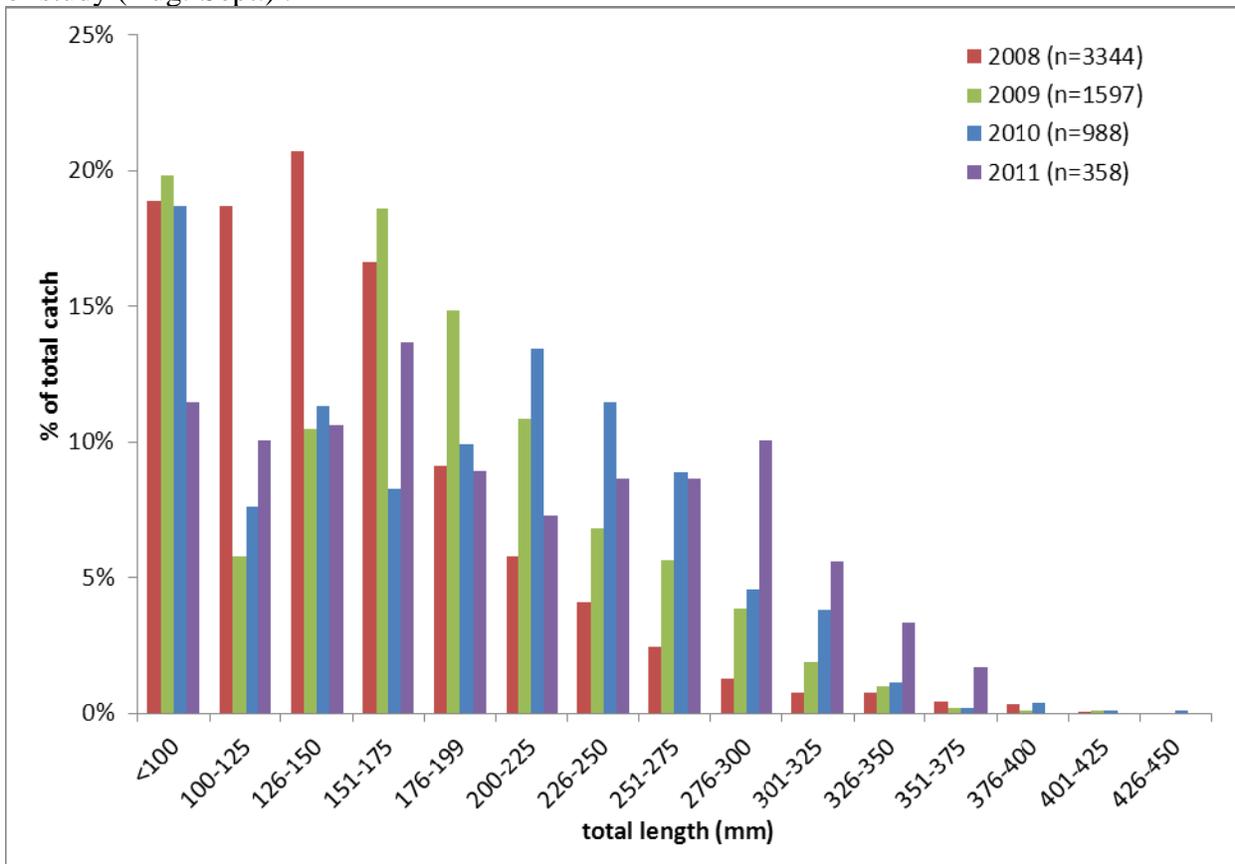


Figure 2. Length frequency of all smallmouth bass captured 2008-2011 (Echo-Split).

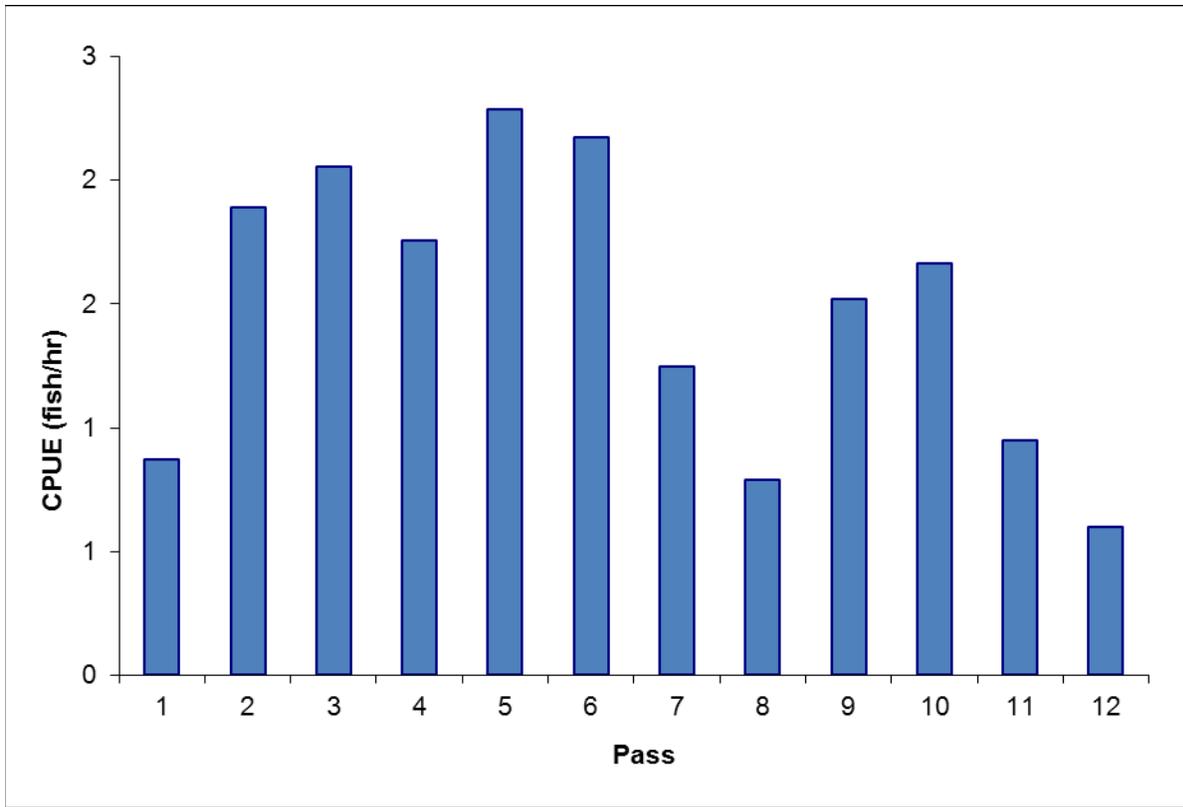


Figure 3. Smallmouth bass (subadult and adult) catch rate by pass, 2011 (Echo-Split).

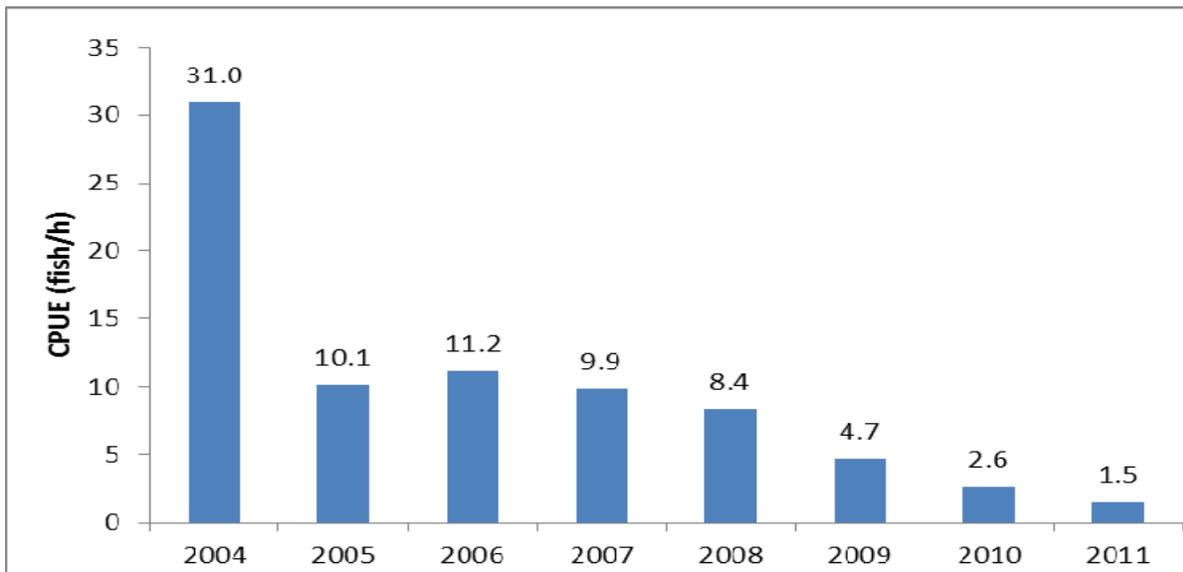


Figure 4. Smallmouth bass catch rates (subadult and adult) in the reach for 2004-2011 (Echo-Split).

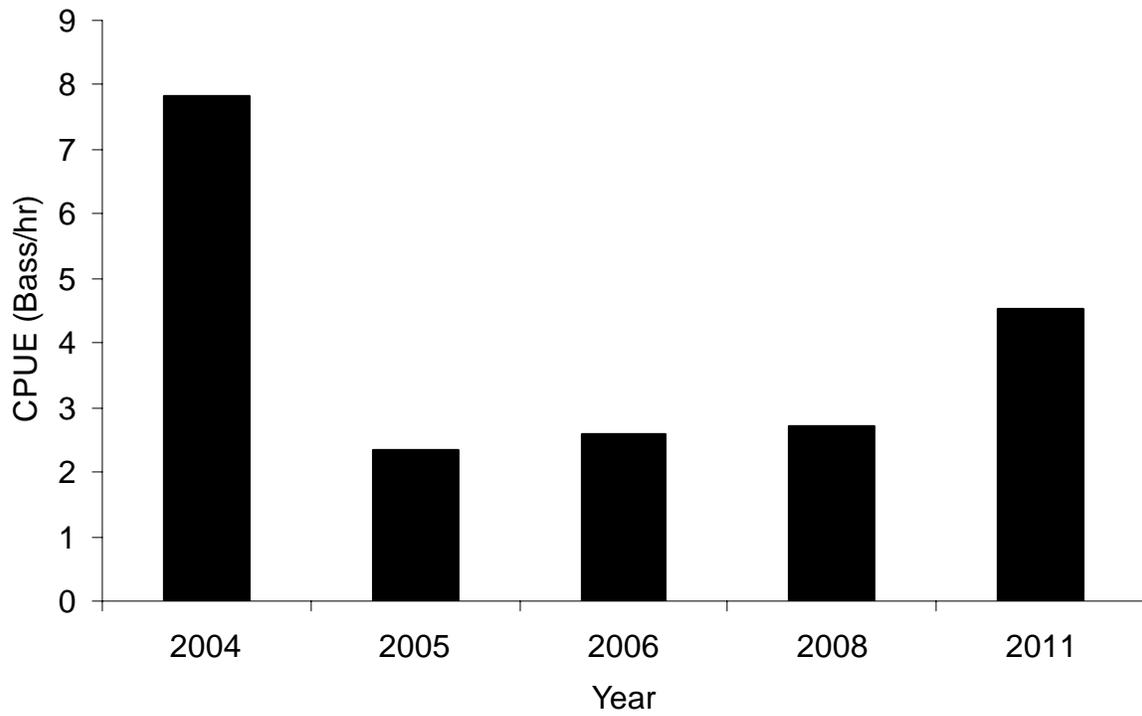


Figure 5. Smallmouth bass annual catch rates for adult and subadults (>75mm) 2004–2011 in the Deso-Gray reach of the Green River.

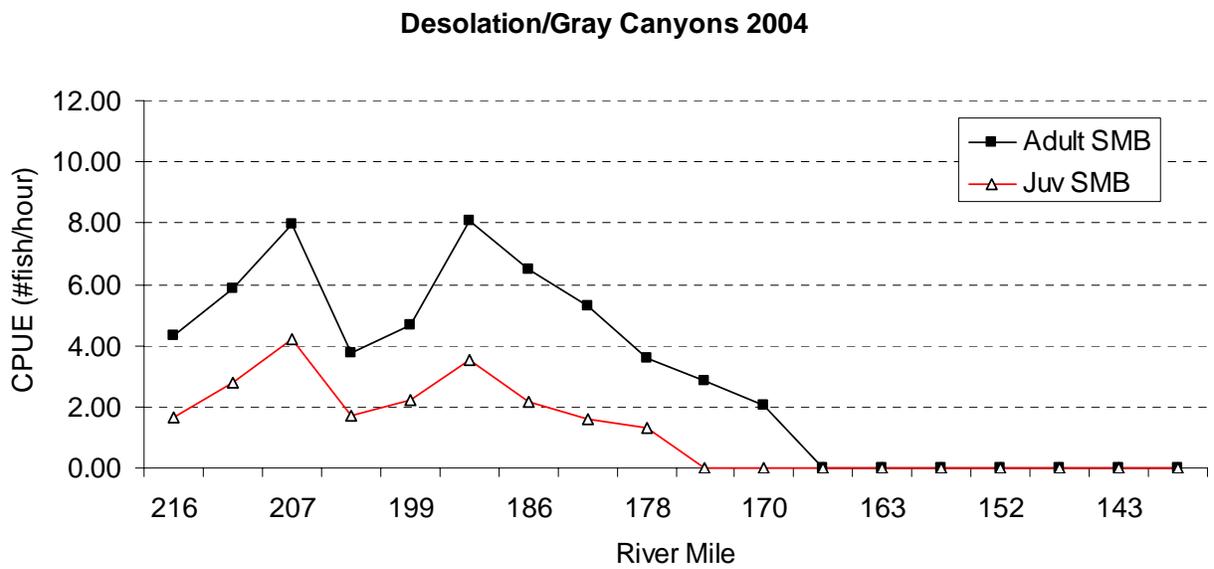
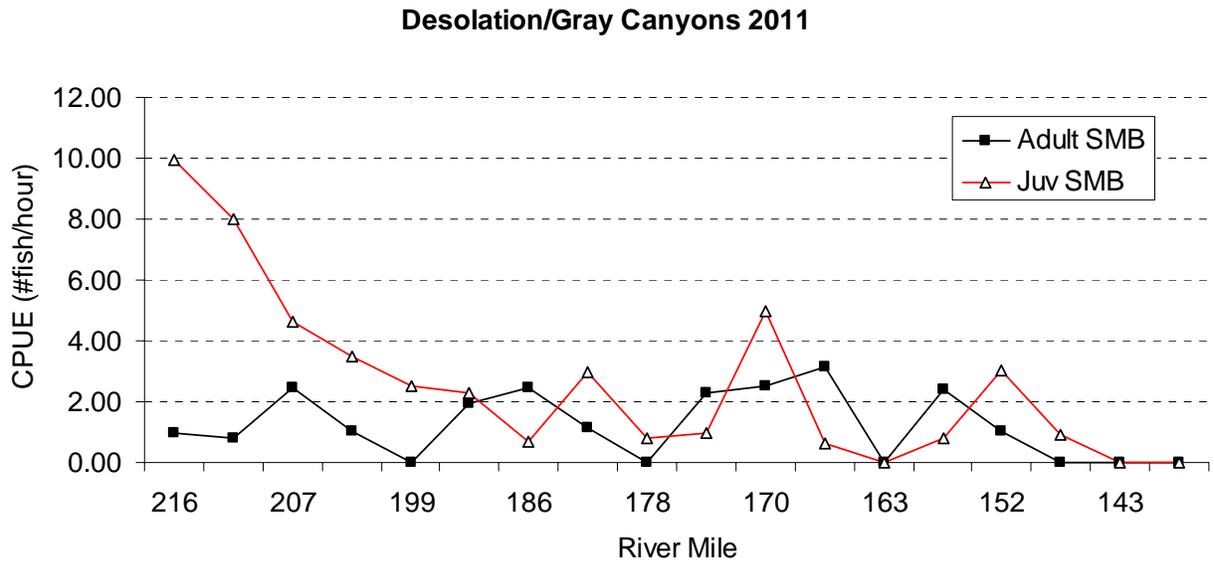


Figure 6. Smallmouth bass catch rate distribution by river mile for adult (>199 mm) and subadults (75-199 mm) in the Deso-Gray reach of the Green River, 2011 and 2004.

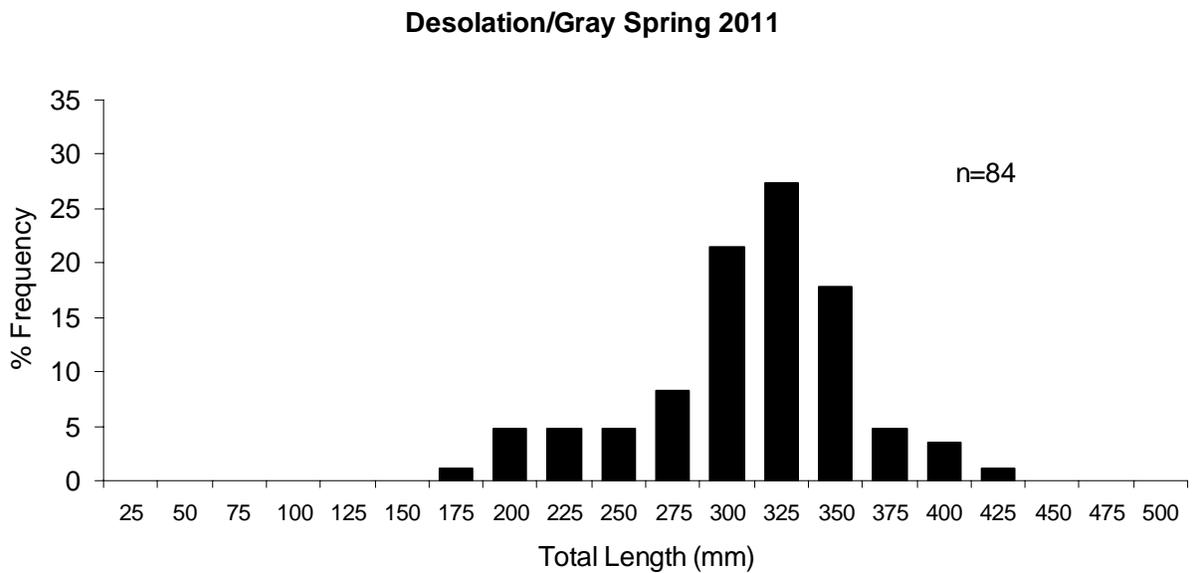
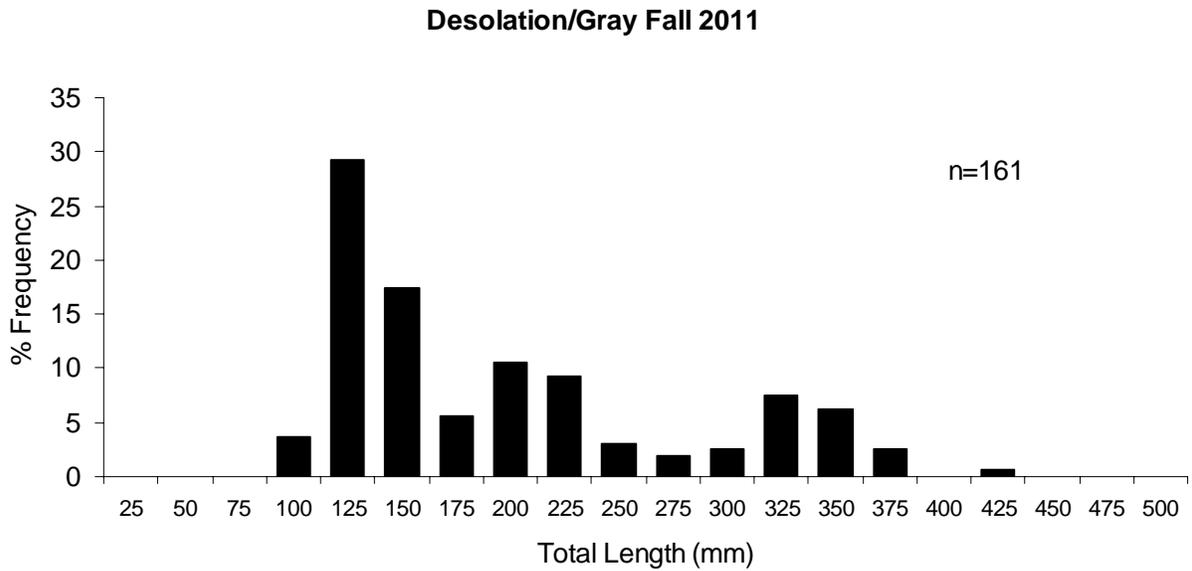


Figure 7. Length frequency histograms for smallmouth bass removed from Deso-Gray Canyons by UDWR Moab in the fall of 2011 (upper) and by Vernal FWS in the spring of 2011. The number of individuals measured (n) is included.