

- I. Project Title: Smallmouth bass control in the Green River
- II. Bureau of Reclamation Agreement Number(s): R10PG40081 & R09AP0871
- III. Principal Investigator(s):
M. Tildon Jones, U.S. Fish & Wildlife Service
1380 S 2350 W
Vernal, UT 84078
435-789-0351
tildon_jones@fws.gov
- Julie Howard, UDWR-Moab
1165 S Hwy 191, Suite 4
Moab, UT 84532
435-259-3781
juliehoward@utah.gov
- IV. Abstract: This project was designed to control smallmouth bass abundance in order to reduce the negative impacts of this species on endangered fishes in the middle Green River. USFWS and UDWR crews completed eight scheduled passes in the Echo-Split reach and 2 passes in the Desolation reach in 2012. Both agencies removed 1,928 smallmouth bass between Echo Park and Split Mountain, mostly young-of-year (YOY; n=1,597) produced this summer. UDWR also removed 96 bass during the Desolation Canyon passes. Adverse weather conditions and equipment malfunctions resulted in low captures on the second Desolation pass.
- V. Study Schedule: 2004-ongoing
- VI. Relationship to RIPRAP:
GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN
 III.A.2. Identify and implement viable active control measures.
- GREENRIVER ACTION PLAN: MAINSTEM
 III.A.4.b.(3) Develop and implement control programs for smallmouth bass in middle and lower Green River to identify required levels of control.
- VII. Accomplishment of FY 2012 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Tasks 1 & 2. Smallmouth bass removal-Echo Park to Split Mtn.

Crews from both agencies completed all passes scheduled for 2012, for a total of 8 removal passes. Low numbers of fish were marked in previous years, and as a result bass were not marked in 2012 for population estimates. Pass 1 was conducted during the spawning period with 49 adults and 15 subadults were captured at that time (Table 1). Had marking occurred, these fish would have been tagged and released. Subsequent passes produced fewer fish than this first pass, and attempts to generate mark-recapture

estimates likely would have lacked precision. In eight passes, 1,928 bass were removed, including 125 adults, 56 subadults, and 1,747 young of year. Fish classified as young of year were as large as 130mm total length by the end of the sampling period (Figure 1b). Length frequency distributions showed no bass 80-140mm captured in the first five passes (Figure 1a). By pass 6 (27 July), a unimodal distribution of small bass appeared with fish up to 88mm. In passes 7-8 (mid-late August), this distribution widened to include fish 44-128mm, and only one fish was captured in the 129-175mm range. To adjust for this growing cohort, size classes were adjusted for each pass. Not including young of year fish, the majority of bass captured were 200-250mm TL. Length frequency data also suggest that the cohort spawned in 2007 did not make up a disproportionate percentage of the population in 2012. In fact, both total catch and relative abundance of fish from this cohort were less than those of similarly sized fish in previous years.

Catch rates over all passes for adult and subadult bass combined decreased to 1.1 fish/hour in 2012 (Figure 2), and was the lowest rate observed since removal began. Catch rates for adults and subadults combined were highest for the first pass, likely due to spawning activity (Figure 3). Spawning behavior and ripe fish were noted in the Island Park reach, just below the mouth of Whirlpool Canyon. The habitat in that reach is characterized by several channels with gravel or cobble substrate that form backwaters as flows drop. Higher catch rates for young of year in this reach and the Split Mountain reach further support this (Figure 4). The increase in catch rates for larger fish in August (passes 7-8) may have been due to exceptionally clear water conditions which allowed for better netting efficiency in deep water. Fish were visible and catchable in water more than a meter deep during the summer base flow period.

Ten bass with Floy tags were recaptured this year. These included seven fish with green tags that were marked in the study reach in previous years, and three fish with red tags from the study reach downstream. All three of the red-tagged fish were recaptured in the Split Mountain reach. Of the green tagged fish, two were tagged in 2009 and recaptured as adults in 2012. The rest were tagged in 2011. All tagged fish except one were recaptured in either Island Park or Split Mountain. Most of the tagged fish were caught in the first three passes.

Several other nonnative fish species were removed during the study period in 2012 (Table 2). One burbot was captured on June 27 near Greasy Pliers rapid in Whirlpool Canyon. This is the second burbot detected below Flaming Gorge Dam. The first was caught in 2010 near the Split Mountain boat ramp. Other species of concern captured included 20 northern pike, 10 walleye, and 1 gizzard shad.

Task 3: Completion of two removal trips within Desolation/Gray canyons from Sand Wash (RM 215.3) and Swasey's Rapid (RM 129.8) on the Green River.

Two removal passes were attempted by UDWR Moab (mid-June to mid-July). High winds and low water during the first pass limited sampling to river miles 215.3-166.9 (Sand Wash to Chandler Canyon). Sampling during the second pass was extremely

limited due to difficulties with the new ETS electrofishing units (Figure 5). Data from the first pass will be used in CPUE analyses and compared to previous years. The additional bass removed during the Colorado pikeminnow estimates performed by USFWS (April-May) will be discussed but not compared to past results. Other nonnatives captured during the six passes will be considered and compared to previous years. A total of 273 smallmouth bass were removed during 280 hours of electrofishing (6 passes: 4 FWS, 2 UDWR) (Table 3).

Catch Rates, Distribution, and Size Structure

Overall smallmouth bass catch rates for Deso/Gray have declined from 4.54 fish per hour in 2011 to 2.19 fish per hour, which is the lowest rate observed since the beginning of removal in this section (Figure 6). The total number of bass captured per mile declined from 1.46 in 2011 to 0.86 in 2012. Adult catch rates have been on the decline since 2004 and continued with a 26% decrease in adult catch rate from 2011. The subadult catch rate also declined from 2.92 in 2011 to 1.02 in 2012. Although catch rates were low the maximum catch rate for adults was 3.5 fish per hour and for subadults was 5.5 fish per hour; both maximum catch rates occurred between Jack Creek and Cedar Ridge (RM 185-190) in the middle of Desolation canyon (Figure 7).

While adult bass numbers have remained low over the last nine years, the increase in subadult catch documented in 2011 demonstrated the potential for successful spawning and recruitment within the reach. The subadult fish captured this year averaged 173 mm and ranged in size from 145–199 mm. Two young-of-year smallmouth (total lengths of 35 and 51mm) were captured at river mile 164 during the second UDWR pass (13-17 July). The continued capture of subadults and the additional capture of YOY fish within Deso/Gray illustrate potential spawning and recruitment success.

To compare removal efforts between spring and summer sampling in 2012 a length frequency histogram is presented for both time periods (Figure 8); these demonstrate that more adult fish were captured during the spring, while in the summer, as seen in the fall of 2011, sampling captures a broader range of sizes. The tendency for adult bass to move into shallower water during spawning may be contributing to more adult captures in the spring. The lack of juveniles in the spring sampling may be due to sampling methods which includes faster downstream speeds and a primary focus on capturing pikeminnow in habitats less preferable to bass.

Sampling within Deso/Gray resumed in 2011 after a two year hiatus due to reported increases in bass numbers and distribution. Sampling in 2011 was complicated by high discharge early in the season and resulted in a single sampling event by UDWR Moab in August when flows were above the 65 year average at approximately 4000 cubic feet per second (CFS) and water temperature averaged 20.4°C. Sampling in 2012 was characterized by very low discharge levels, below the 65 year average, at approximately 1900 CFS, and an average water temperature of 24.7°C. Although it appears as if catch rate declined significantly in 2012, confounding environmental factors and equipment malfunction may have affected sampling effectiveness.

Ancillary Fish Captures

In addition to the smallmouth bass in the reach, numerous other nonnative and native species were captured (Table 4). A total of 24 gizzard shad were removed during six passes, with 23 of these fish caught during the last two pikeminnow passes in May. Gizzard shad averaged 436mm total length (385-495mm). Although shad were found throughout Deso/Gray canyons, 11 fish were captured in the Price River on May 27. Previous to this year, UDWR Moab had recorded one other gizzard shad found within this reach in 2008. Green sunfish have increased in number from 5 captured in 2011 to 19 captured in 2012. Green sunfish averaged 98mm total length (12-143) and of the 19 sunfish captured, 94% were found within the first twenty miles below Sand Wash (RM 215.3) within Desolation canyon. During the six passes in 2012, 34 walleye were captured and averaged 479mm (366-624), where 20 were greater or equal to 450mm. USFWS observed ripe walleye congregating in riffles during the first pikeminnow pass, particularly at Jack Creek rapid on March 29. Walleye were frequently captured in the vicinities of Jack Creek, Rabbit Valley, and lower Gray Canyon. Seven white sucker with a mean total length of 289mm were also removed. Common nonnatives like channel catfish and carp were present throughout but not netted.

All species of endangered fish were captured, with razorback sucker being the most common (24), followed by pikeminnow (8), humpback chub (7), and bonytail (3) (Table 4). The totals for all endangered fish captures do not include captures during the FWS sampling, which are reported under a separate project.

VIII. Recommendations:

- Maximize bass removal passes in Echo-Split during the spawning period in June. Focus on Island Park and Split Mountain reaches, particularly secondary channels in Island Park. This may involve moving UDWR passes earlier in the summer, if possible.
- Continue not marking bass in the reach. Bass catch rates are highest during the spawning period, making this the most efficient time to achieve removal. Marking after the spawn has resulted in fewer tags released and low recapture rates. As a result, abundance estimates generated from these data have consistently been imprecise. Catch rates appear to represent bass densities in the reach well enough for comparisons between years.
- Continue smallmouth bass removal in Desolation/Gray Canyons by UDWR-Moab in either fall or summer depending on water conditions, 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 and a period of control which can serve as a standard monitoring time (June-August) as well as an opportunity to remove a wider range of cohorts, including fish which may spawn the following spring.

- Electrofishing units mounted on rafts are particularly susceptible to high winds where sampling efficiency may decrease significantly or, due to crew safety issues, sampling may halt altogether. It is recommended that a protocol is developed to categorize wind speed, an important environmental factor that can dramatically affect sampling.

IX. Project Status: On track and ongoing

X. FY 2012 Budget Status

- A. Funds Provided: \$186,979
- B. Funds Expended: \$186,979
- C. Difference: \$0
- D. Percent of the FY 2012 work completed, and projected costs to complete: 100%
- E. Recovery Program funds spent for publication charges: -0-

XI. Status of Data Submission: Data are in Recovery Program NNF database format and will be submitted to the database coordinator by December 31, 2012.

XII. Signed: M.T. Jones & J. Howard 13 November 2012
Principal Investigators Date

Table 1. Total bass caught in Echo-Split reach by pass and size group, 2012. All fish were removed.

Pass	YOY	Subadults	Adults	Total
1-FWS, 19-21 June		15	49	64
2-FWS, 26-28 June		14	19	33
3-UDWR, 2-4 July		6	10	16
4-UDWR, 5-7 July		2	7	9
5-UDWR, 24-26 July	11	5	2	18
6-UDWR, 27-29 July	201	5	5	211
7-FWS, 14-16 August	408	4	15	427
8-FWS, 21-23 August	1,127	5	18	1,150
Totals	1,747	56	125	1,928

Table 2. Ancillary fish captures in the Echo-Split study reach, 2012.

Species	Number Captured
Black bullhead (<i>Ameiurus melas</i>)	2
Bluegill (<i>Lepomis macrochirus</i>)	15
Burbot (<i>Lota lota</i>)	1
Gizzard shad (<i>Dorosoma cepedianum</i>)	1
Green sunfish (<i>Lepomis cyanellus</i>)	74
White sucker and hybrids (<i>Catostomus commersonii</i> , spp.)	330
Northern pike (<i>Esox lucius</i>)	20
Walleye (<i>Sander vitreus</i>)	10
Colorado pikeminnow (<i>Ptychocheilus lucius</i>)	34
Bonytail (<i>Gila elegans</i>)	6
Roundtail chub (<i>Gila robusta</i>)	11
<i>Gila</i> spp. (usually TL <100mm)	8

Table 3. Total smallmouth bass captured in Deso-Gray reach by pass and size class, 2012. Smallmouth bass removal occurred during all sampling passes.

Pass	YOY	Subadults	Adults	Total
	<100mm	100-199mm	>199mm	
1-FWS (28 March-2 April)	0	1	38	39
2-FWS (12-16 April)	0	3	37	40
3-FWS (9-14 May)	0	32	45	77
4-FWS (23-27 May)	0	10	16	26
5-UDWR (20-24 June)	0	36	44	80
6-UDWR (13-17 July)	2	1	13	16
Totals	2	83	193	278

Table 4. Ancillary fish captures in the Deso-Gray study reach, 2012. Nonnative totals include captures from FWS pikeminnow surveys (UDWR capture numbers in parentheses). Native totals include only UDWR bass control.

Species	Number Captured (UDWR)	CPUE (fish/hr)
Green sunfish (<i>Lepomis cyanellus</i>)	19 (17)	0.45
Walleye (<i>Sander vitreus</i>)	34 (3)	0.08
Gizzard shad (<i>Dorosoma cepedianum</i>)	24 (1)	0.03
White sucker (<i>Catostomus commersonii</i>)	7 (0)	0.00
Colorado pikeminnow (<i>Ptychocheilus lucius</i>)	8	
Razorback sucker (<i>Xyrauchen texanus</i>)	24	
Bonytail (<i>Gila elegans</i>)	3	
Humpback chub (<i>Gila cypha</i>)	7	

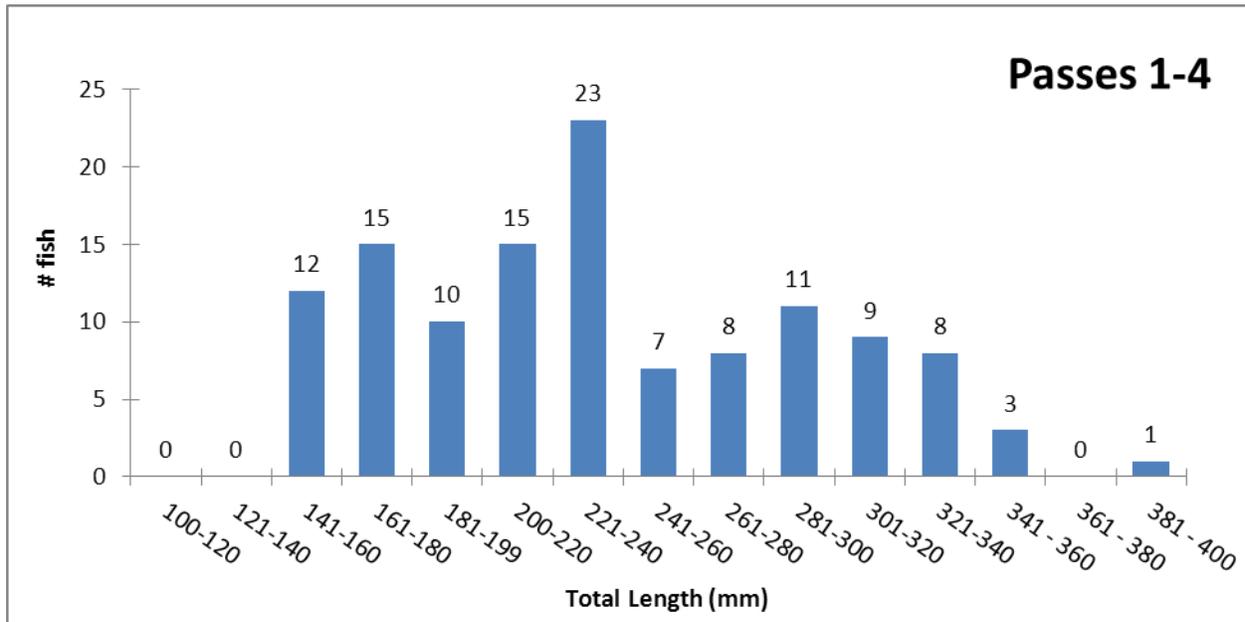


Figure 1a. Length frequency distribution of smallmouth bass captured in Echo-Split reach, passes 1-4, 2012.

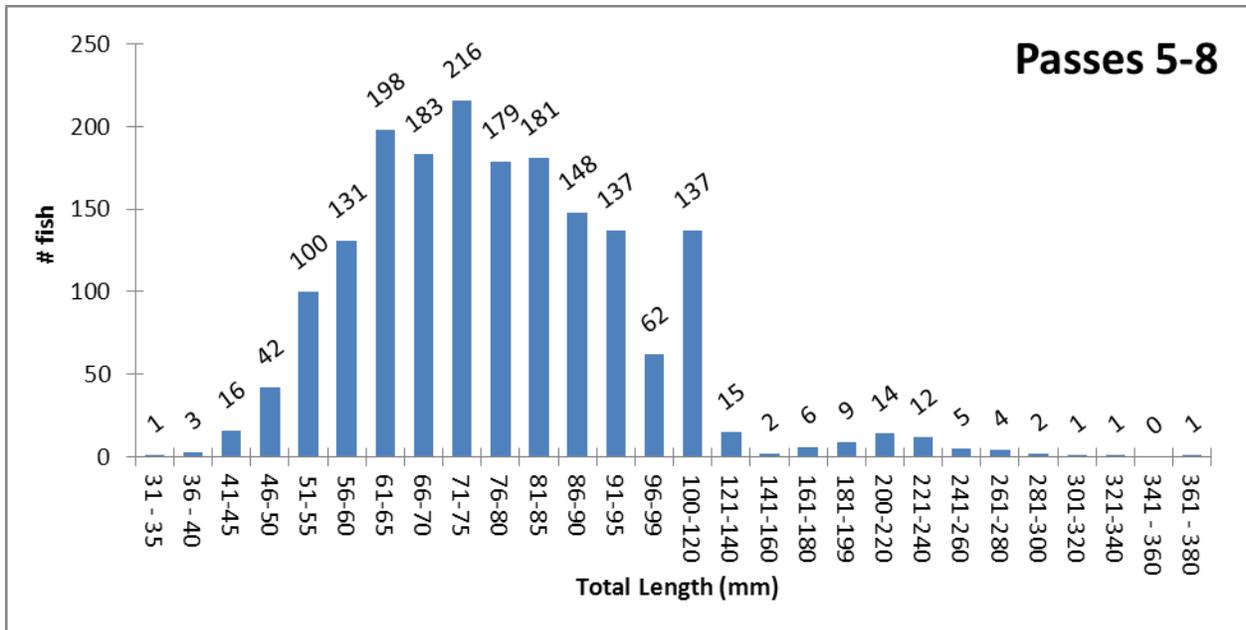


Figure 1b. Length frequency distribution of smallmouth bass captured in Echo-Split reach, passes 5-8, 2012.

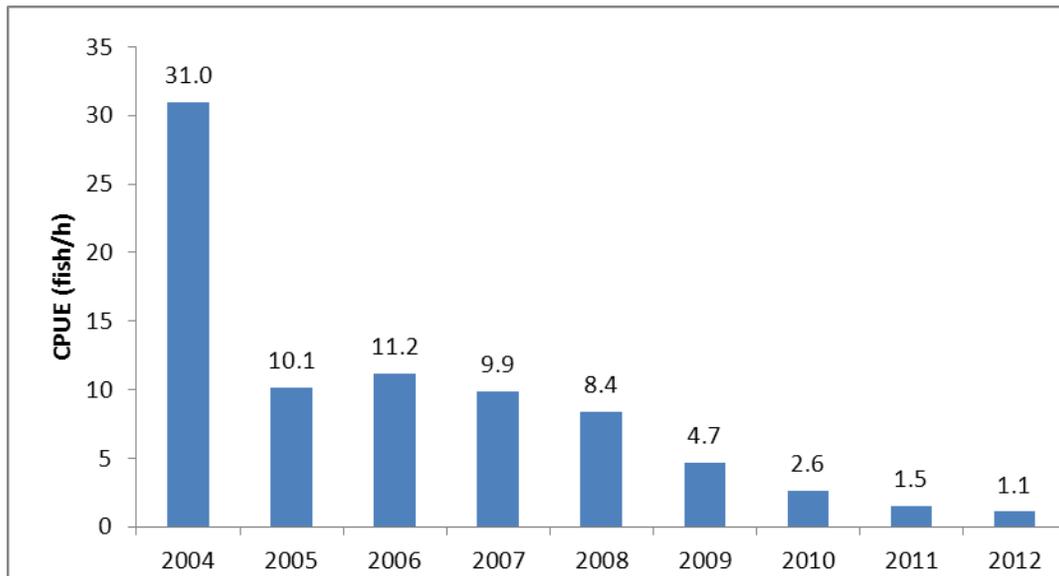


Figure 2. Catch per effort for adults and subadults, all passes, Echo-Split reach.

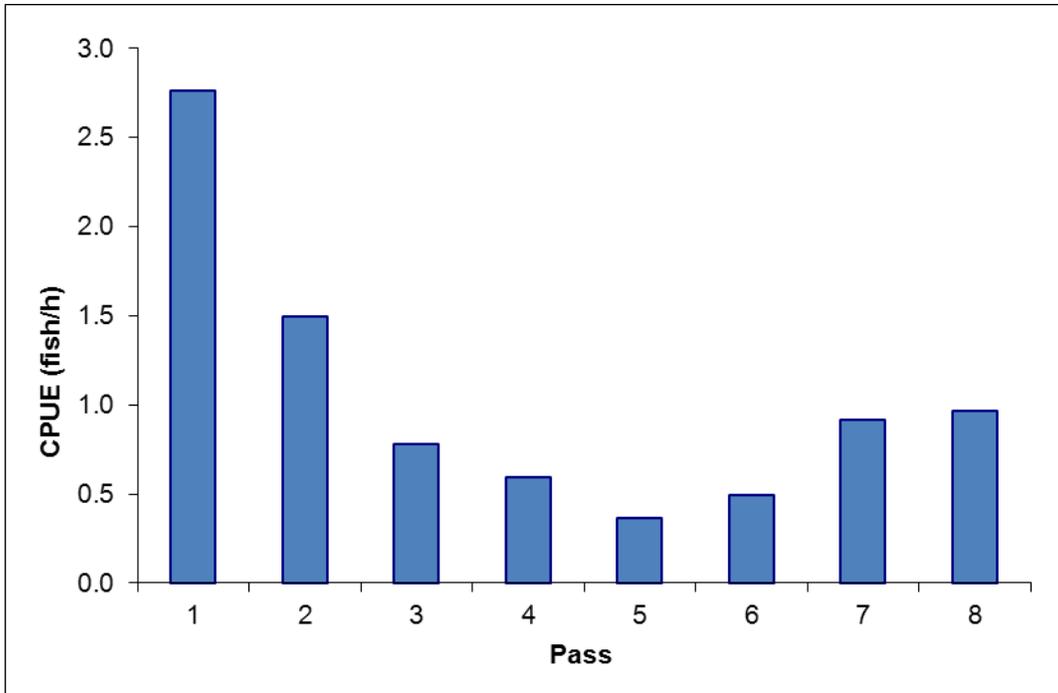


Figure 3. Catch rates for adults and subadults combined, by pass, 2012 (Echo-Split).

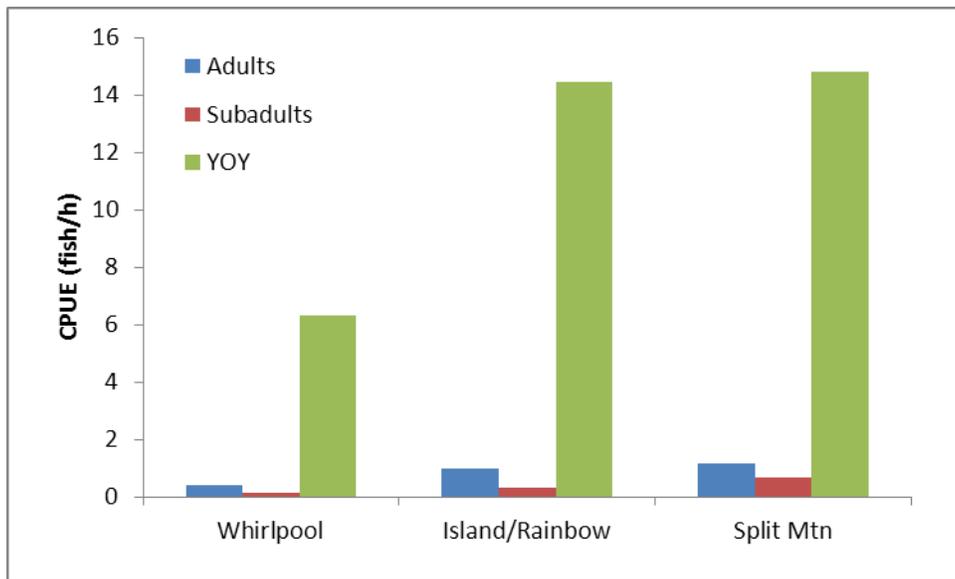


Figure 4. Catch rate by reach for each size class, 2012.

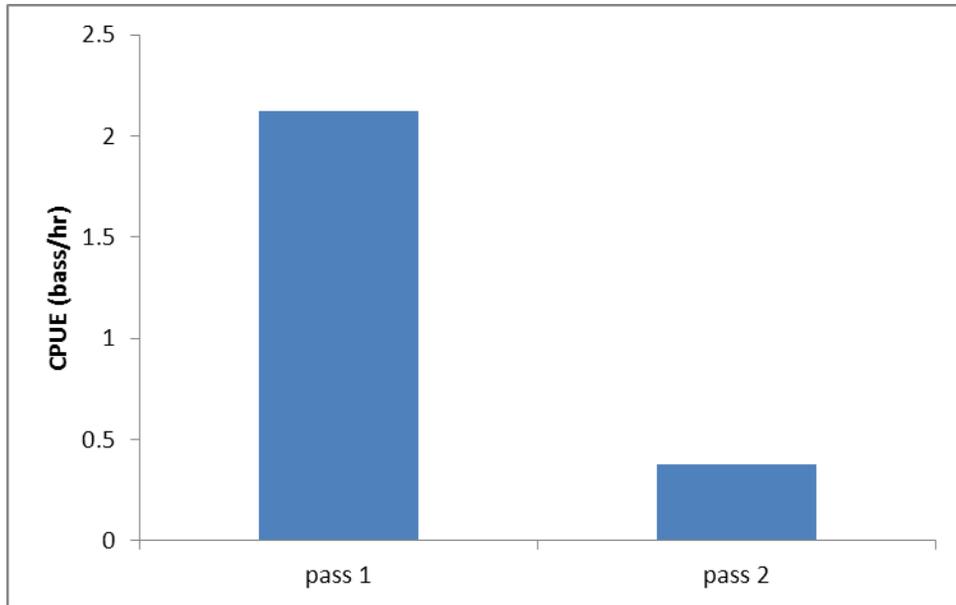


Figure 5. Smallmouth bass catch rates by pass, 2012 (Deso-Gray).

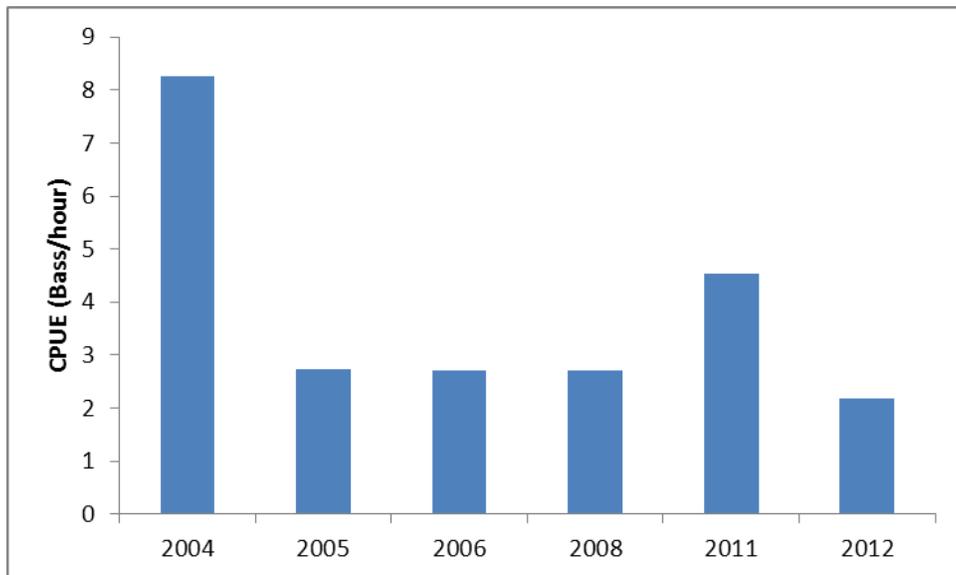


Figure 6. Smallmouth bass annual catch rates for adult and subadults (>75mm) 2004–2012 in the Deso-Gray reach of the Green River.

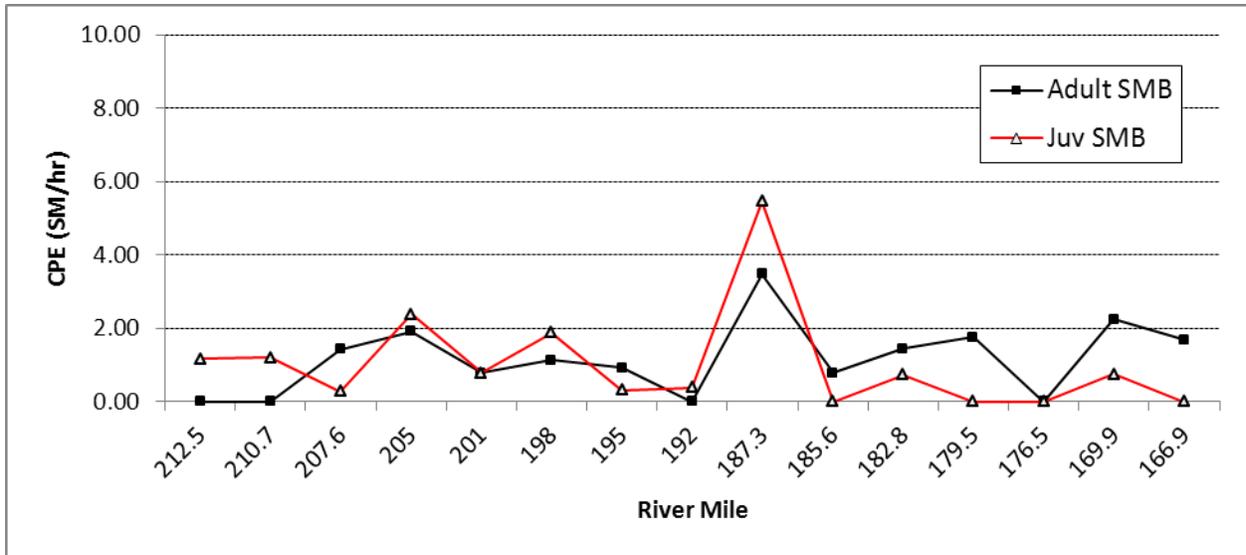


Figure 7. Smallmouth bass catch rates by size class and river mile, 2012 (Deso-Gray).

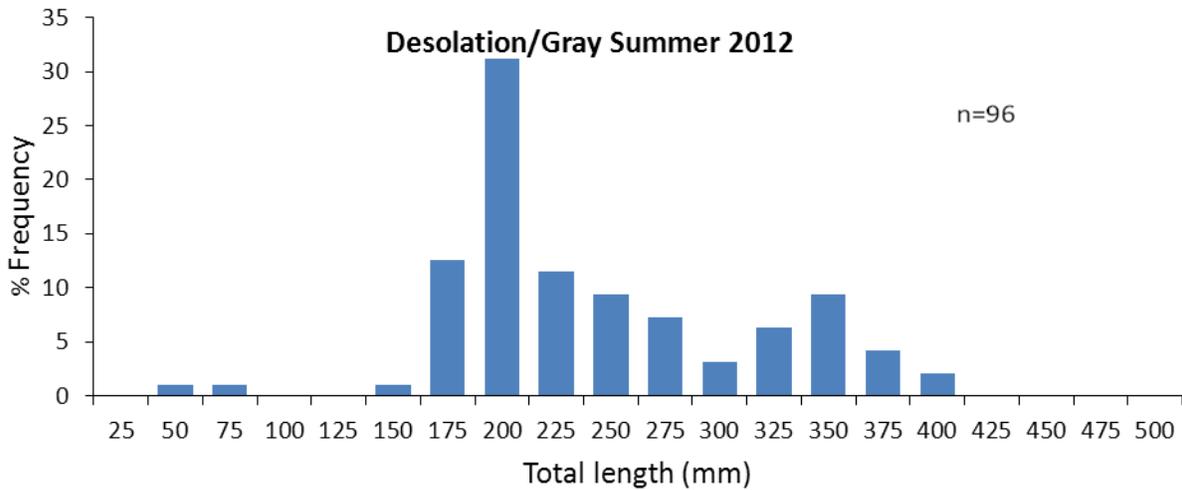
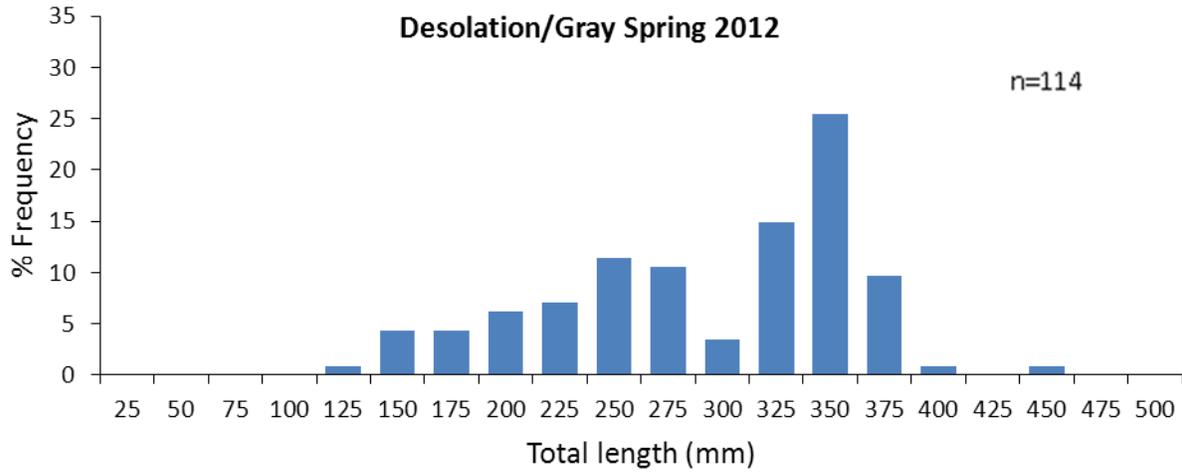


Figure 8. Length frequency histograms for smallmouth bass removed from Deso-Gray Canyons by Vernal FWS in the spring of 2012 (upper) and by UDWR Moab in the summer of 2012 (lower). The number of individuals measured (n) is included.

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: #R10PG40081

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 123a

Project Title: Smallmouth bass control in the Green River

Principal Investigator: M. Tildon Jones
U.S. Fish & Wildlife Service
Colorado River Fish Project
1380 S 2350 W
Vernal, Utah 84078
Phone: 435-789-0351
E-mail: tildon_jones@fws.gov

Project/Grant Period: Start date (Mo/Day/Yr):
End date: (Mo/Day/Yr):
Reporting period end date (Mo/Day/Yr): 9/30/2012
Is this the final report? Yes _____ No X

Performance: USFWS completed all of Task 1: 4 passes were conducted 19-28 June and 14-23 August 2012. With the submission of this report, Task 4 will also be complete. USFWS-Vernal captured and removed 1,674 smallmouth bass from the Green River. The majority of these (n=1,535) were young-of-year (YOY) fish produced this summer.

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R09AP0871

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 123a

Project Title: Smallmouth bass control in the Green River

Principal Investigator: *Julie Howard*
1165 S Hwy 191 Suite 4
Moab, UT 84532
juliehoward@utah.gov
435-259-3781

Project/Grant Period: Start date: 11/21/2008
 End date: 04/30/2015
 Reporting period end date: 09/30/2012
 Is this the final report? Yes _____ No X

Performance: Four removal passes were successfully completed (7/2-7/4/12, 7/5-7/7/12, 7/24-7/26/12, 7/27-7/29/12) on the Green River from Echo Park (RM 344.5) to Split Mountain (RM 319.5). A total of 254 smallmouth bass were removed with total lengths ranging from 35mm to 330mm. Of the 254 bass captured, 212 were YOY (<100mm), 18 were juveniles (>100 and <199mm), and 24 were adults (>199mm). The average total length caught was 87±59 mm. These data were reported to the PI in September of 2012. Two removal passes were completed (6/20-6/24/12, 7/13-7/17/12) on the Green River from Sand Wash (RM 215.3) to Swasey's Rapid (RM 129.8). High winds affected sampling efficiency during both passes, and difficulties related to the new ETS electrofishing equipment nearly negated the second pass. A total of 96 smallmouth bass were removed (80 on the first pass and 16 on the second) with total lengths ranging from 35mm to 379mm. Of the 96 bass captured, 2 were YOY, 37 were juveniles and 57 were adults. The average total length caught was 232±70mm. These data were analyzed and reported within the annual report for project #123a by November of 2012. Task 2 and 3 were completed.